

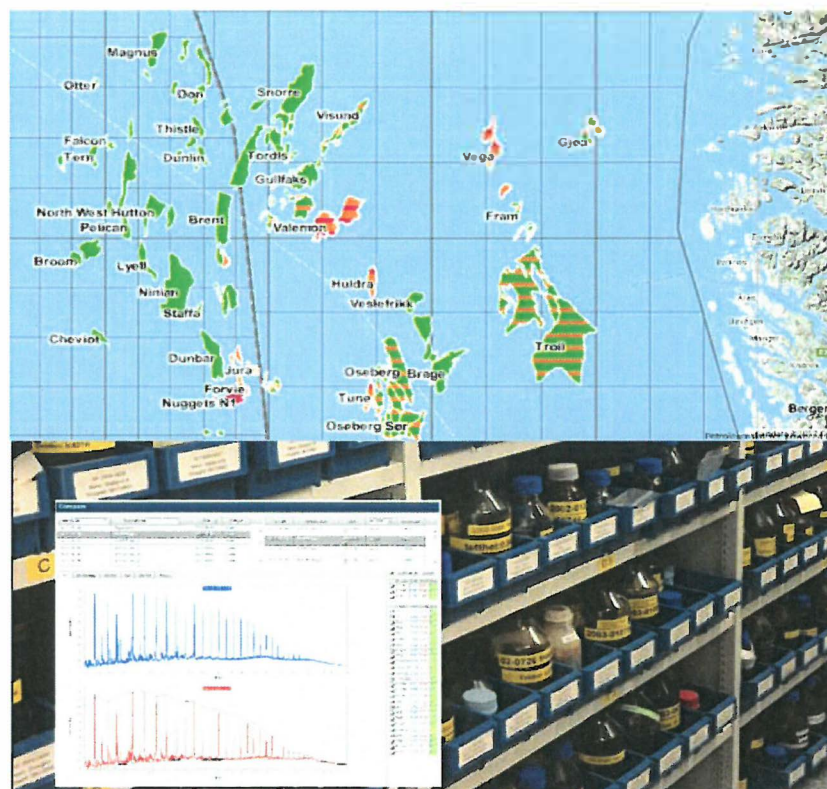
Rapport

Implementering av norske oljer i COSIWEB

Forfatter(e)

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2017-09-06

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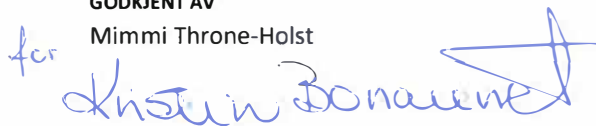
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Implementering av norske oljer i COSIWEB

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COSIWEB (Computerized Oil Spill Identification) er en internasjonal database som brukes i forbindelse med oljesølidentifikasjon, både for å sammenligne forurensningsprøver med mulige kilder i samme sak, men også med øvrige prøver i databasen.

Databasen har inneholdt svært få norske råoljer og oljeprodukter, men er nå oppdatert med 117 norske råoljer og 6 hybridoljer. COSIWEB er et nyttig screeningverktøy ved et oljesøl og databasen inneholder pr. i dag omlag 3600 oljer og oljeprodukter. Norge har 363 prøver i COSIWEB etter den oppdatering som SINTEF har gjort.

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Liv-Guri Faksness**GODKJENT AV**
Mimmi Throne-Holst

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1 Innledning

COSIWEB (Computerized Oil Spill Identification) er en internasjonal database som brukes i forbindelse med oljesølidentifikasjon, både for å sammenligne forurensningsprøver med mulige kilder i samme sak, men også med øvrige prøver i databasen. Databasen har inneholdt svært få norske råoljer og oljeprodukter. Med en oppdatering av COSIWEB med 117 råoljer og 6 hybridoljer, oljer som SINTEF har tilgjengelig på sitt oljelager, har nytteverdien av COSIWEB økt, og man har et bedre grunnlag for å sammenligne ukjente prøver med mulige norske oljer. COSIWEB er et nyttig screeningverktøy ved et oljesøl. Databasen COSIWEB inneholder nå omlag 3600 oljer og oljeprodukter, Norge har 363 prøver i COSIWEB etter den oppdatering som SINTEF har gjort.

Oljeprøvene ble behandlet og analysert som beskrevet i kapittel 5 i CEN (2012) og lastet opp i COSIWEB etter beskrivelse på WEBSidene til Bonn-OSINET og i henhold til gitt konfidensialitet. En kort veiledning i bruk av COSIWEB er gitt i kapittel 3.

2 Prøvebehandling og analyser

Alle prøvene ble behandlet som beskrevet i CEN (2012) kapittel 5, "Sample preparation". Oljeprøvene ble løst i diklormetane (DCM) i en konsentrasjon på 3-7 mg/mL og analysert på gaskromatograf med flammeioniserings detektor (GC/FID) med påfølgende analyse på gaskromatograf med masseselektiv detektor (GC/MS).

En oversikt over alle prøvene som er lastet opp i COSIWEB er gitt i vedlegg A.

Analysebetingelsene for GC/FID er gitt i CEN (2012) Annex A og for GC/MS i CEN (2012) Annex B.

3 Databasen COSIWEB, bruk og veiledning

COSIWEB er en web-basert database. Den er utviklet i Tyskland ved Bundesamt für Seeschifffahrt und Hydrographie 2011 (BSH). Alle laboratoriene som er medlemmer i "Oil Spill Identification Network of Experts within the Bonn Agreement" er gitt tilgang til COSIWEB med brukernavn og passord, Figur 3-1. Prøvene og opplysningene som er gitt i COSIWEB skal behandles med konfidensialitet.

COSIWEB er en eldre generasjon database som følger strenge algoritmer for både filtype og navngiving. I COSIWEB gis hver ny identifikasjons-case et nytt casenummer, typisk NOn_+1.



Figur 3-1: Pålogging i COSIWEB

3.1 Karakterisering av GC/FID – nivå 1 og opplasting til COSIWEB

Figur for protokoll/beslutningskart er gitt i Vedlegg E og er fra CEN (2012).

Oljesøidentifikasjon starter med en screeninganalyse på GC/FID. Analysebetingelsene for GC/FID er gitt i CEN2012 Annex A.

Screeninganalysen på GC/FID brukes til å vurdere hvilken oljetype, kokepunktsonråde og grad av forvitring. Dersom GC/FID-kromatogrammene viser variasjoner mellom mulige kildeprøver og spillprøver skal man alltid gå videre med analyse av prøvene på GS/MS - nivå 2.

For opplasting av GC/FID-filer til COSIWEB må hver fil først eksporteres til en AIA fil enkeltvis. Dette gjøres enklest ved å opprette en mappe som man f.eks. kan navngi «Case NOn_+1 GC-FID». Når konverteringen er fullført må man gå inn i hver enkelt mappe og gi nytt navn til signalet (typisk bare kalt «signal01»).

Retensjonstiden til pristan og phytan brukes til å normalisere retensjonstidene for alle GC/FID-analysene i databasen og disse skal oppgis ved opplasting av filene til COSIWEB.

3.2 Karakterisering av GC-MS – nivå 2 og opplasting til COSIWEB

Figur for protokoll/beslutningskart er gitt i Vedlegg E.

På nivå 2 skal mistenkte spill- og kildeprøver analyseres på en GC/MS. Analysebetingelsene er gitt i CEN2012 for GC/MS Annex B.

GC/MS-analysene er nødvendige for å utføre en visuell vurdering av utvalgte ionemasser (mz) for å sammenligne prøver og identifisere opplagte likheter og ulikheter mellom prøver i et spilltilfelle.

Ved opplasting av GC/MS-analysen til COSIWEB, utfører COSIWEB ulike statistiske beregninger på utvalgte biomarkører og PAH-analytter ved sammenligning av to prøver.

For at en GC/MS analyse skal kunne lastes opp i COSIWEB, må analyselaboratoriet ha kontroll på analysebetingelsene og være utført i henhold til CEN2012 Annex B. Retensjonstiden for 30ab hopane (mz 191) må være 47,8 minutter og for 3-metyl-fenantren (mz 192) 30,0 minutter.

GC/MS-filene eksporteres til AIA format og navnsettes på samme måte som GC/FID. Det er viktig at man kontrollerer hver enkelt fil før ny navngiving til COSIWEB_ID og opplasting i databasen.

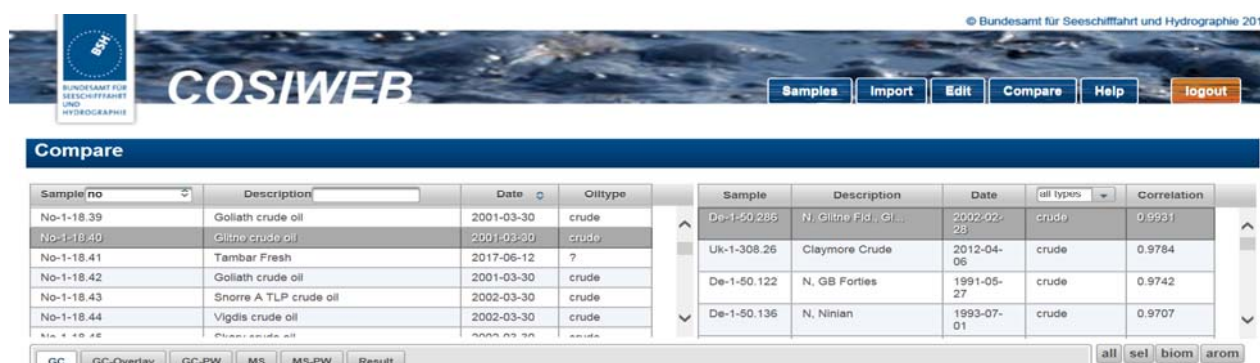
3.3 Prøveidentifisering, verifisering og import

Når filene er lastet opp i COSIWEB kan man gå inn i fanen «edit» og inspiserer prøvene og gi en kort beskrivelse som navn på oljen, funnsted eller lignende og SINTEF-ID (Figur 3-2). Det kreves at det legges inn en prøvetakingsdato, oljetype og at det krysses av for at GC/FID og GC/MS har blitt kontrollert og funnet i orden. Deretter går man gjennom en verifisering før prøven importeres inn i COSIWEB - databasen. Først da er det mulig å sammenligne prøven med andre prøver i databasen.



Figur 3-2: Beskrivelse og verifisering av prøven for siste opplasting i COSIWEB

Nå vil man få en rask indikasjon på oljetype og forslag til prøver som matcher. COSIWEB gir en korrelasjons-score på likhet med prøver som ligger i databasen. Man kan velge å sammenligne prøver fra samme case, samme laboratoriet, samme oljetype eller søke i hele databasen (Figur 3-3).



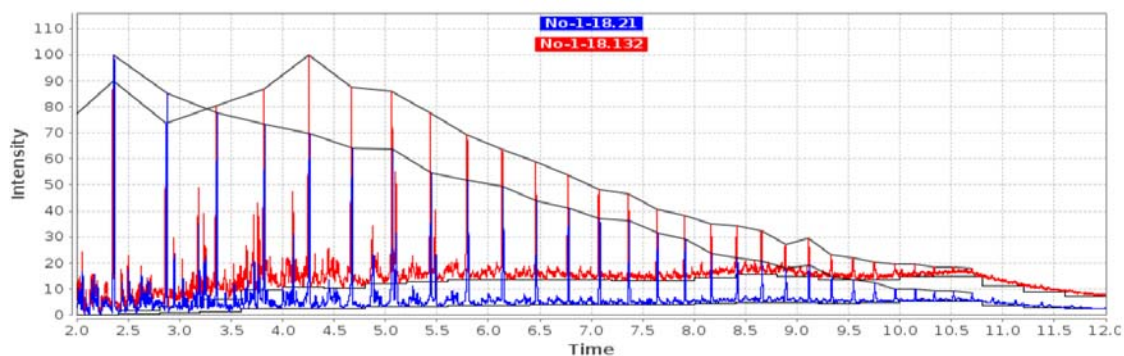
Figur 3-3: Valg av parameter ved sammenligning av prøver

4 Resultater

En oversikt over de norske oljene er gitt i Vedlegg A. GC/FID kromatogrammer av disse oljene er vist i Vedlegg B og GC/MS ionekromatogrammer av hopaner (m/z 191), triaromatiske steraner (m/z 231), C4-fenatrener med retene (m/z 234) og C1-fenatrener (m/z 192) i Vedlegg C.

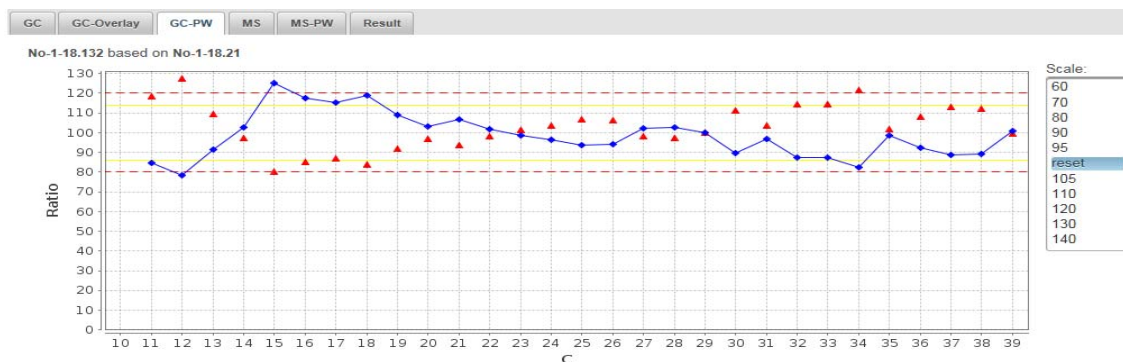
4.1 Vurdering av GC/FID analysen

Ved å velge funksjonene «overlay» kan det gjøres en karakterisering av prøvene, oljetype og grad av forvitring samt en enkel visuell vurdering av likheten. Like viktig; man kan raskt karakterisere opplagte ulikheter mellom to prøver (Figur 4-1).



Figur 4-1: Overlay av GC kromatogram

Ved sammenligning av en kildeprøve og en spillprøve, beregnes et GC-PW-plot, oppgitt i %, basert på responsen til n-alkanene og normalisert mot den gjennomsnittlige responsen til n-C20 til n-C24 (Figur 4-2). Dette kan gi verdifull informasjon ved sammenligning av to prøver og gir en indikasjon på om prøvene har forskjellig forvitningsgrad.

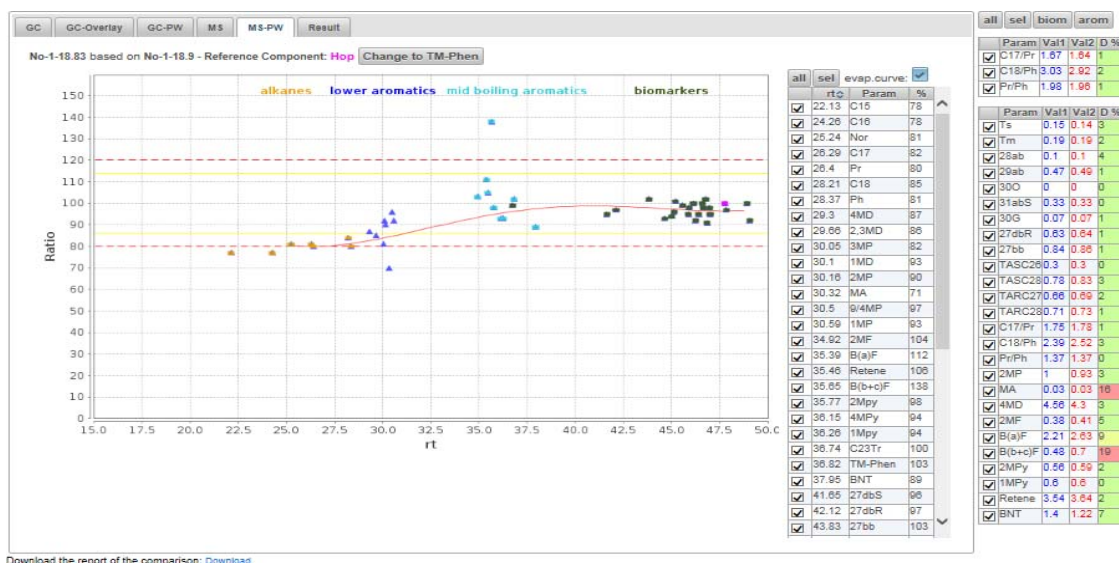


Figur 4-2: GC-PW-plot

4.2 Vurdering av GC/MS analysen

Responsten til utvalgte PAH'er og biomarkører benyttes til å beregne forholdstall som beskrevet i CEN (2012), kapittel 6.4 og 6.5. COSIWEB gir en tabell med en relativ forskjell i %. For at en spillprøve skal ha match med en kildeprøve, må den relative forskjellen i % være mindre enn 14%. Det gir en god visuell indikasjon på likhet i tillegg til å vurdere korrelasjons-scoren som COSIWEB oppgir (Figur 4-3). Like viktig er det å utføre en visuell vurdering av alle ionekromatogrammene av PAH'er og biomarkører og å karakterisere opplagte ulikheter og likheter.

MS-PW-plott og en tabell over forholdstall for sammenligning av prøver er et godt hjelpemiddel ved vurdering om en spillprøve har *positive match* eller *non-match* til en kildeprøve. Man kan fort se åpenbare forskjeller og likheter i typer forvitring og komponentsammensetning.



Figur 4-3: PW plot og tabell over forholdstall fra COSIWEB

4.3 Rapport fra COSIWEB

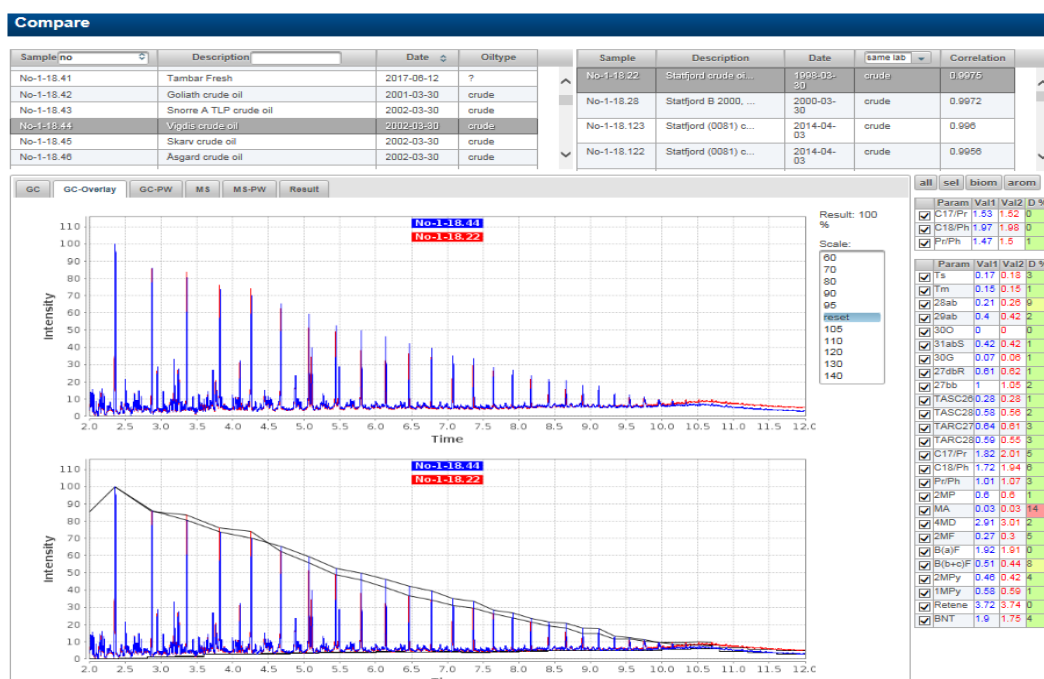
COSIWEB har en rapportgenerator som genererer en rapport av de prøvene som er lastet opp for sammenligning. Eksempel på en "COSI (Computerized Oil Spill Identification) Report" ved sammenligning av råoljene Vigdis vs. Statfjord er gitt i Vedlegg D.

Rapporten sikrer at alle viktige parametere er tatt med i vurderingen slik at man på et vitenskapelig grunnlag skal kunne trekke en konklusjon om en kildeprøve og en spillprøve er "Non-match, Inconclusive, Probable match eller Positive match".

5 Oppsummering

COSIWEB er med dette bidraget blitt et mer nyttig verktøy ved identifisering av oljeutslipp av norske råoljer i norske farvann, men også i tilfeller med uhell ved frakt av råolje fra norsk sokkel i andre deler av verden.

COSIWEB er et screening verktøy og resultater fra databasen må sammenlignes med opplysninger fra scenariet rundt et utslipp. Som vist i figur 5-1 konkluderer COSIWEB med at råolje fra Vigdis-feltet viser positive match med råolje fra Statfjord. GC/FID-kromatogrammene viser identitet, men opplysninger om prøvetaking og funn må vurderes sammen med den tekniske analysen.



Figur 5-1: Søk på match med Vigdis

For å kunne trekke en konklusjon er det en forutsetning med lang erfaring og kompetanse på olje og dens ulike egenskaper. Det viktigste er den visuelle inspeksjonen, forståelse og vurdering som laboratoriepersonell og analytikere utfører i sammenstilling av alle relevante data for å trekke en konklusjon i et reelt oljeutslippshell.

Summen av alle opplysninger fra COSIWEB og manuell vurdering gjør at vi på et sikkert grunnlag kan konkludere etter CEN (2012) med "Non-match, Inconclusive, Probable match eller Positive match".

6 Referanse

CEN2012. Oil spill identification. Waterborne petroleum and petroleum products. Part 2: Analytical methodology and interpretation of results based on GC-FID and GC-MS low resolution analyses. CEN/TR15522-2:2012).

A Vedlegg A: Oversikt over prøver lagt inn i COSIWEB

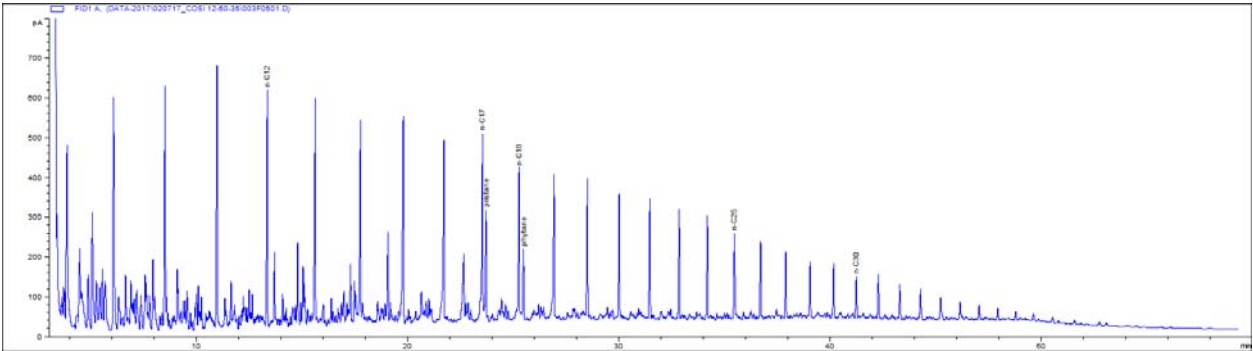
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no18_02	H3958/fersk Yme
no18_03	H4363/fersk Tordis
no18_04	H4363/fersk Tordis
no18_05	1997-0006/Fersk Njård
no18_06	1997-0006/Fersk Njård
no18_07	1997-0016/Fersk kristin
no18_08	1997-0016/Fersk kristin
no18_09	1997-0276/Fersk Norne
no18_10	1997-0276/Fersk Norne
no18_11	1998-0038/Fersk Elli South
no18_12	1998-0038/Fersk Elli South
no18_13	1998-0039/Fersk Tau
no18_14	1998-0039/Fersk Tau
no18_15	1998-0040/Fersk Elli
no18_16	1998-0040/Fersk Elli
no18_17	1998-0047/Fersk Sleipner Vest
no18_18	1998-0047/Fersk Sleipner Vest
no18_19	1998-0116/ fersk Fram
no18_20	1998-0116/ fersk Fram
no18_21	1998-0122/ Arne fersk
no18_22	1998-0170/ Statfjord fersk
no18_23	1998-0170/ Statfjord fersk
no18_24	1999-0002/ Ula fersk
no18_25	1999-0027/ Visund fersk
no18_26	1999-0337/ Siri fersk
no18_27	2000-0036/ Statfjord A
no18_28	2000-0037/ Statfjord B
no18_29	2000-0043/ Statfjord C fersk
no18_30	2000-0052/ troll B fersk
no18_31	2000-0218/ Norne fersk
no18_32	2000-0600/ Eldfisk fersk
no18_33	2000-0601/ Valhall fersk
no18_34	2000-0631/ Gyda fersk
no18_35	2000-0614/ Tor fersk
no18_36	2000-0622/ Embla fersk
no18_37	2001-0063/ Vale fersk
no18_38	2001-0063/ Vale fersk
no18_39	2001-0104/ Goliath fersk
no18_40	2001-0247/ Glitne fersk
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Sample ID (COSIweb)	SINTEF-ID / oljenavn
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no18_44	2002-0068/ Vigdis fersk
no18_45	2002-0135/ Skarv fersk
no18_46	2002-0599/ Åsgard fersk
no18_47	2002-0600 Smørbukk sør
no18_48	2003-0107/ heidrun Tilje fersk
no18_49	2003-0348/ heidrun åre fersk
no18_50	2003-1149/ Tyrihans Nord fersk
no18_51	2003-1150/ Tyrihans sør fersk
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no18_54	2003-2133/ oseberg Øst fersk
no18_55	2003-2192/ Oseberg C fersk
no18_56	2003-2498/ Grane fersk
no18_57	2003-2805/ Oseberga fersk
no18_58	2004-0484/ Brage fersk
no18_59	2004-0965/ Draugen fersk
no18_60	2004-1810/ Oseberg blend fersk
no18_61	2004-2319/ Balder fersk
no18_62	2005-0722/ troll b fersk
no18_63	2005-0843/ troll b fersk
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no18_67	2007-0426/draugen fersk
no18_68	2007-0530/ Alvheim Boa fersk
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no18_71	2008-0227/ Visund fersk
no18_72	2008-0282/ Alvheim fersk
no18_73	2008-0470/ Rev fersk
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no18_82	2009-0547/Svale fersk
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no18_84	2009-0548/ Stær fersk
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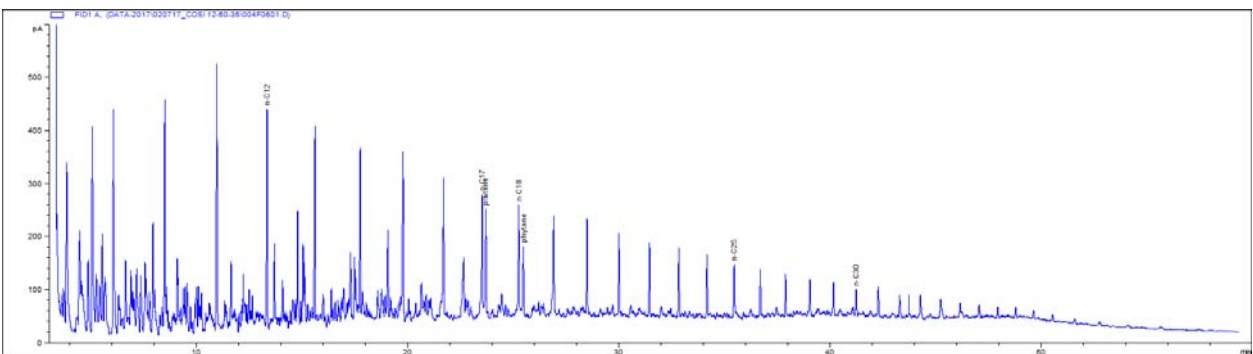
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no18_89	2009-0703/Volund fersk
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no18_91	2010-0030/ Realgrunnen fersk
no18_92	2010-0159/ Balder fersk
no18_93	2010-0327/ Luno fersk
no18_94	2010-0351/ Jordbær fersk
no18_95	2010-0504/ Gjøa fersk
no18_96	2011-0001/ Draupne fersk
no18_97	2011-0017/ Trym fersk
no18_98	2011-0444/ Avaldsnes fersk
no18_99	2011-0590/ Veslefrikk fersk
no18_100	2011-0602/ Oselvar fersk
no18_101	2012-0004/ Veslefrikk fersk
no18_102	2012-0056/ Gudrun fersk
no18_103	2012-0059/ Oseberg Blend fersk
no18_104	2012-0059/ Oseberg Blend fersk
no18_105	2012-0091/ Maria fersk
no18_106	2012-0243/ Havis fersk
no18_107	2012-0245/ Oseberg Sør fersk
no18_108	2012-0246/ Brage fersk
no18_109	2012-0247/ Oseberg Sør fersk
no18_110	2012-0331/Grane fersk
no18_111	2012-0333/Oseberg Øst fersk
no18_112	2012-0340/Fram fersk
no18_113	2012-0341/Oseberg A fersk
no18_114	2012-0341/Oseberg A fersk
no18_115	2012-0556/ Grane fersk
no18_116	2013-0409/ troll B fersk
no18_117	2013-0580/ Luno II fersk
no18_118	2013-0582/ Vale fersk
no18_119	2013-0595/ Skarfjell fersk
no18_120	2013-0833/ Skarv fersk
no18_121	2014-0076/ Marulk fersk
no18_122	2014-0081/ Statfjord fersk
no18_123	2014-0081/ Statfjord fersk
no18_124	2014-0094/ Pil fersk
no18_125	2014-0116/ Drivis fersk
no18_126	2014-0336/ Brynhild fersk
no18_127	2014-0571/ Ormen Lange fersk
no18_128	2015-0029/ Alta fersk
no18_129	2015-0061/ Grane fersk
no18_130	2015-0063/ Bøyla fersk
no18_131	2015-0546/ Martin Linge fersk
no18_132	MC-2016-84-S2-S5-S1 Grane bl

Sample ID (COSIweb)	SINTEF-ID / oljenavn
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no18_134	MC-2016-0231 HDME fersk
no18_135	MC-2016-0232 DMA fersk
no18_136	MC-2016-0233 ULSFO fersk
no18_137	MC-2016-0320-S1-S2 Wisting fersk
no18_138	MC-2016-0360 Troll NTNU fersk
no18_139	2017-113-C1 Sigyn fersk
no18_140	2005-0439 Sintef mix
no18_141	2005-0439 Sintef mix
no18_142	2005-0439 Sintef mix
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no18_145	SINTEF-mix 2017
no18_146	SINTEF-mix 2017
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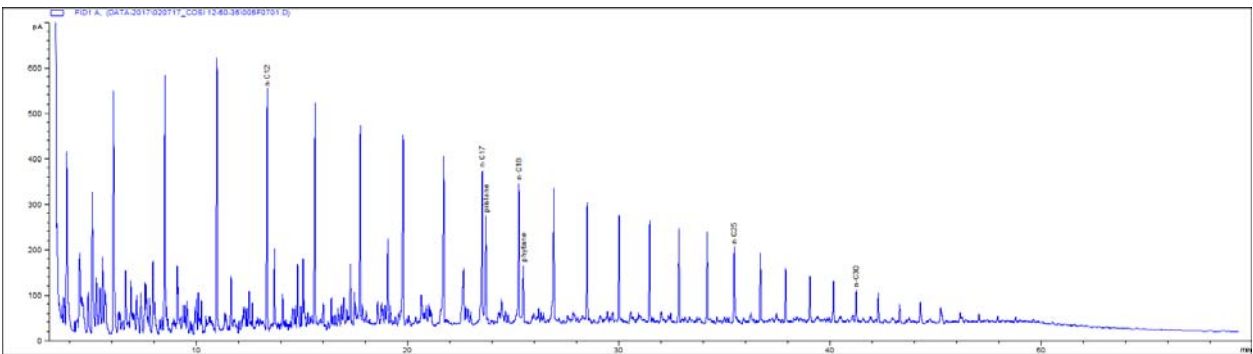
B Vedlegg B: Kromatogrammer fra GC/FID



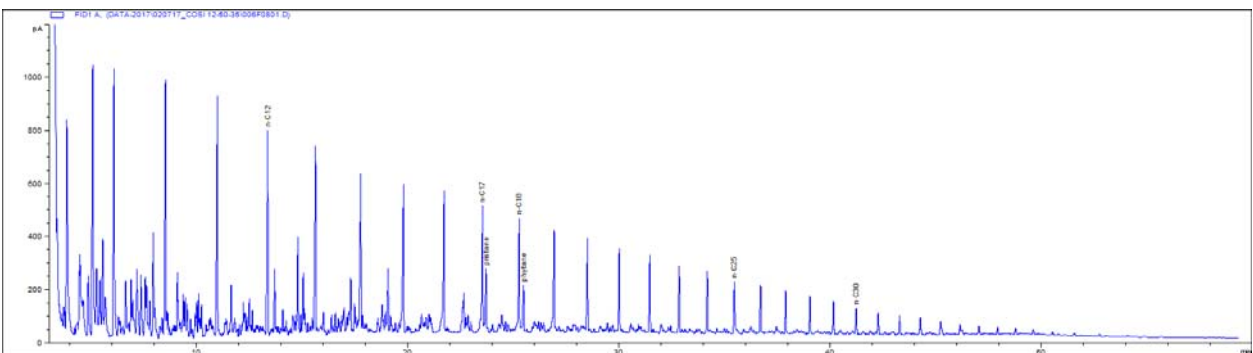
H3958 Yme



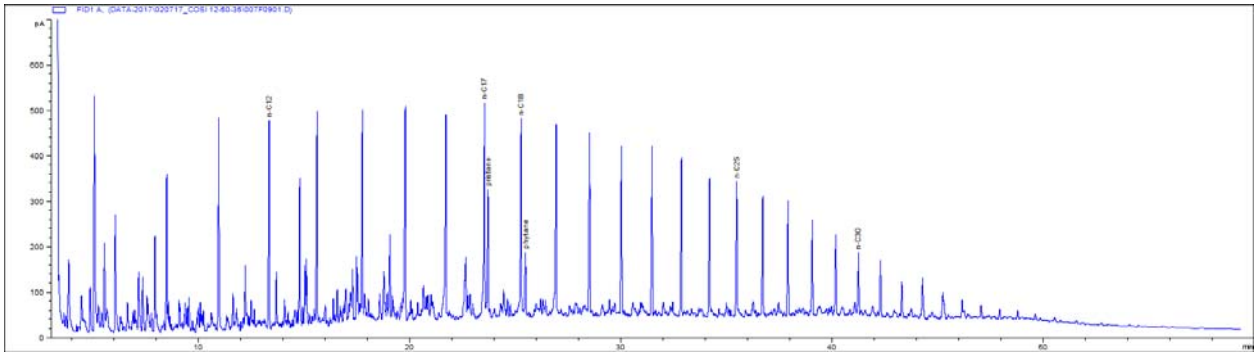
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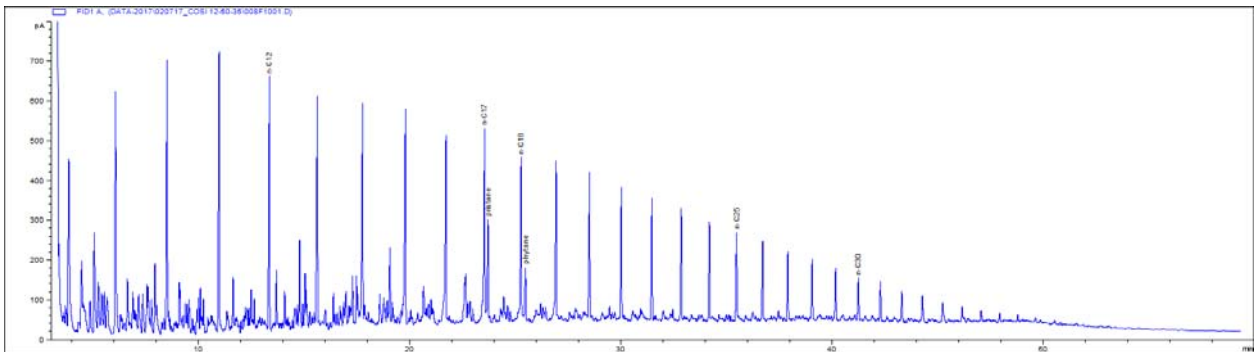
1997-0006 Njord



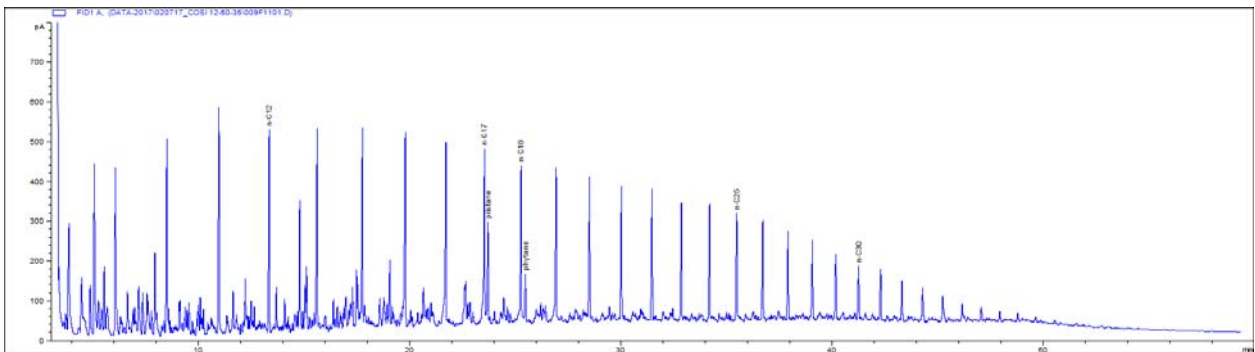
1997-0016 Kristin



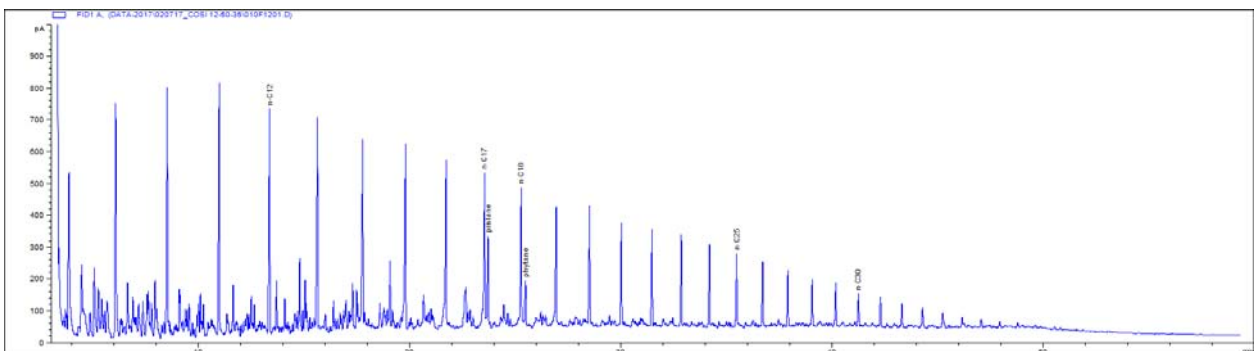
1997-0276 Norne



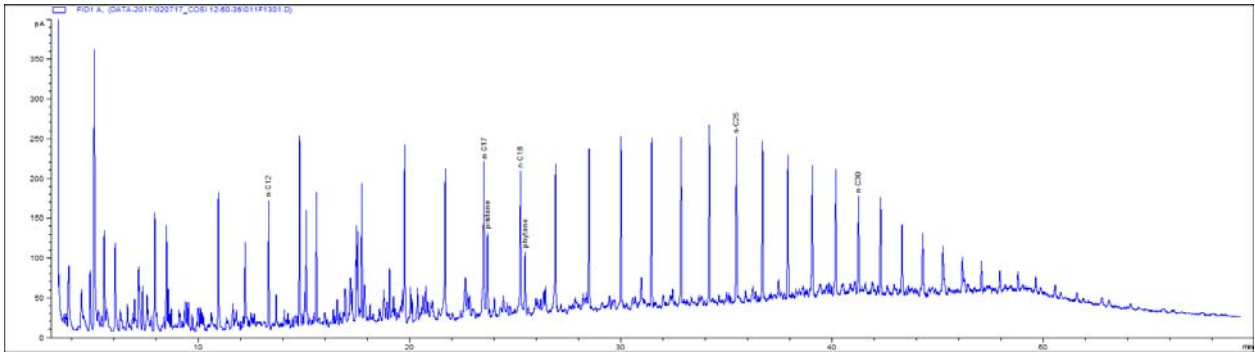
1998-0038 Elli South



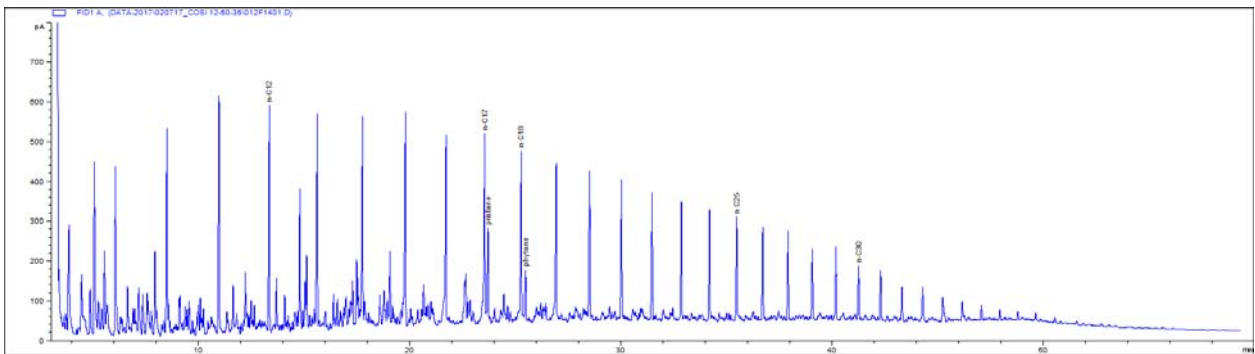
1998-0039 Tau



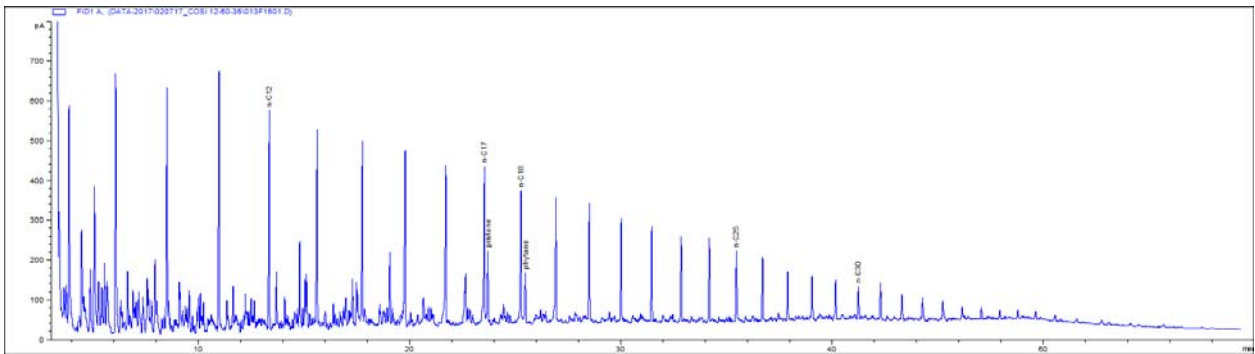
1998-0040 Elli



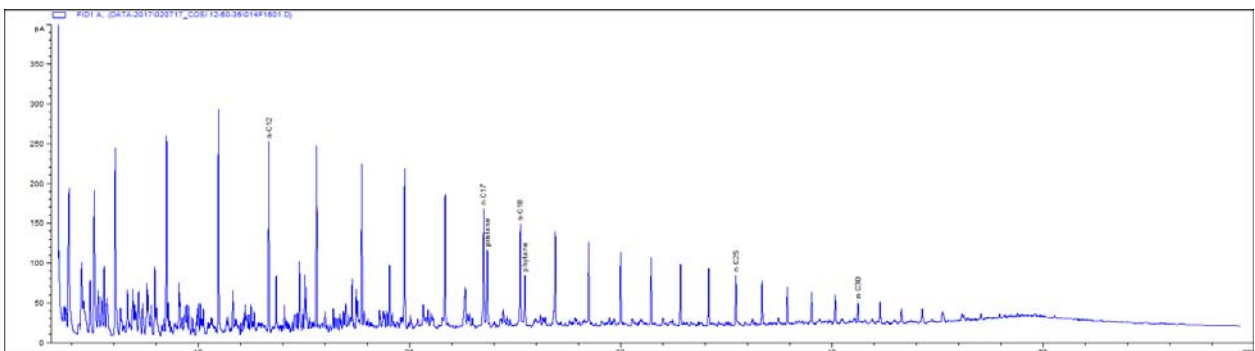
1998-0047 Slepner



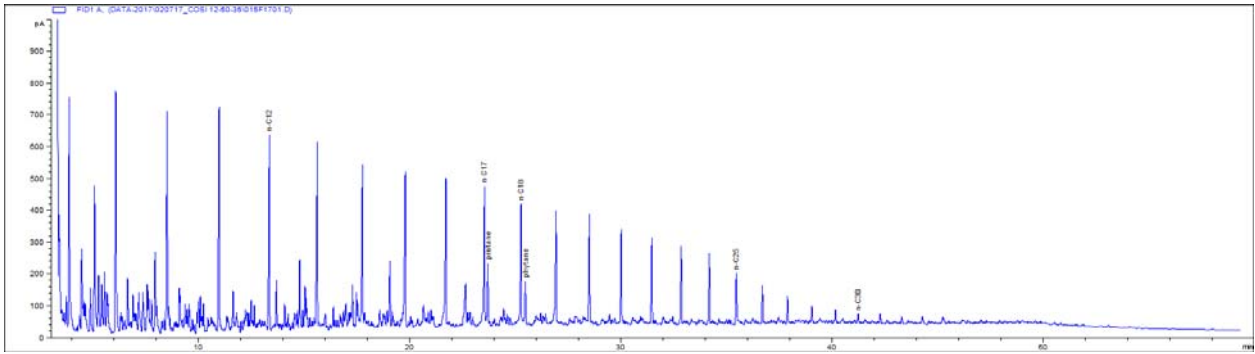
1998-0116 Fram



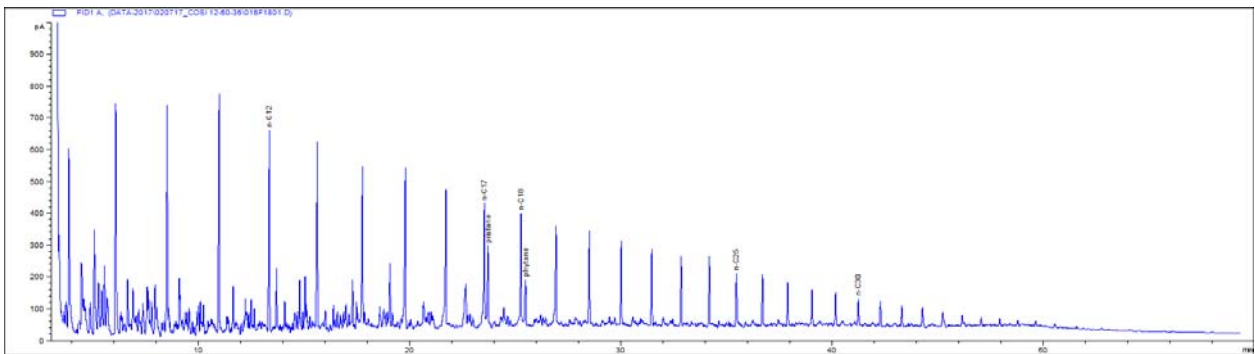
1998-0122 South Arne



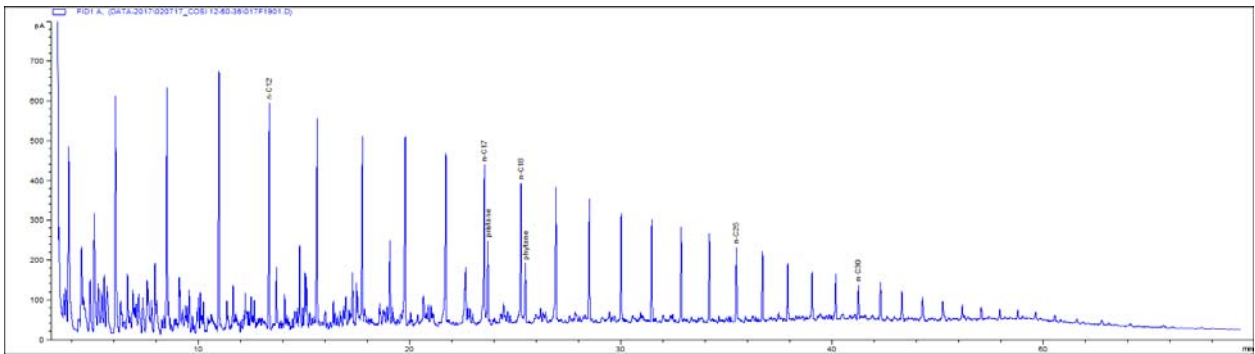
1998-0170 Statfjord



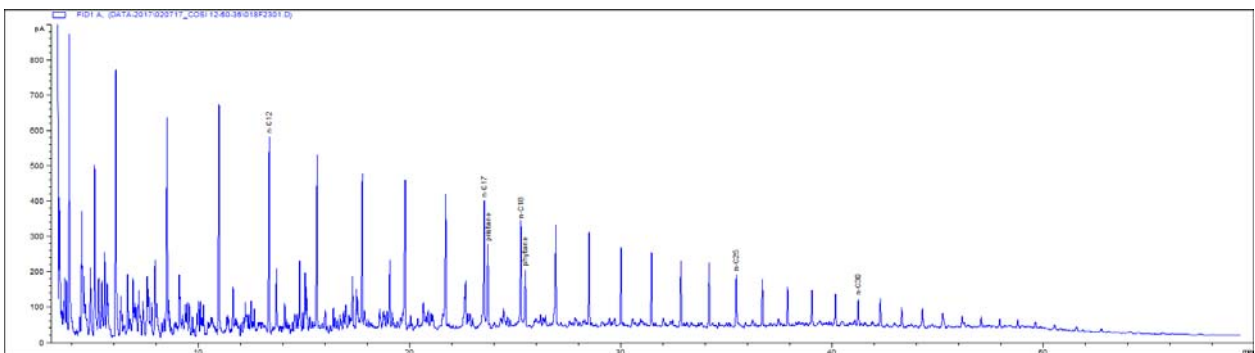
1999-0002 Ula



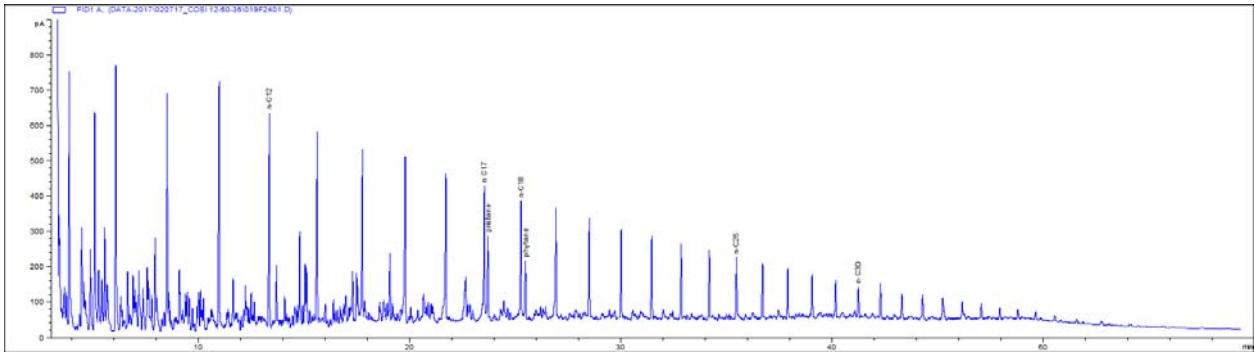
1999-0027 Visund



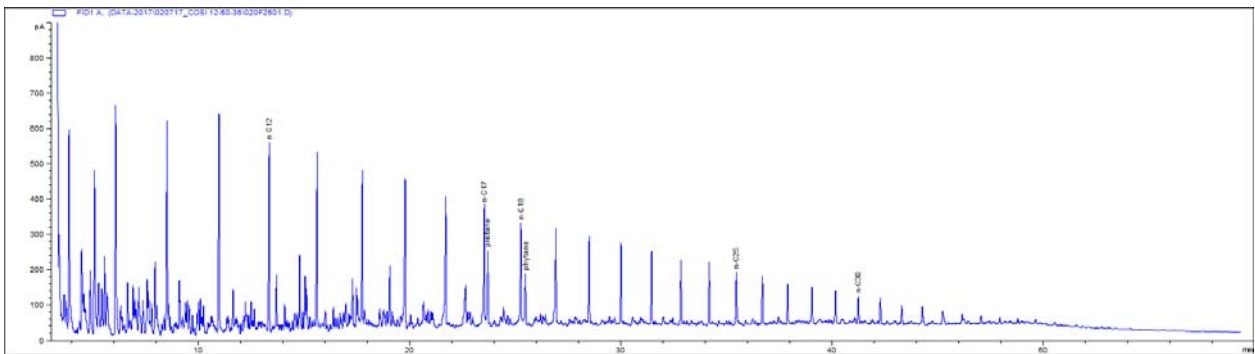
1999-0337 Siri



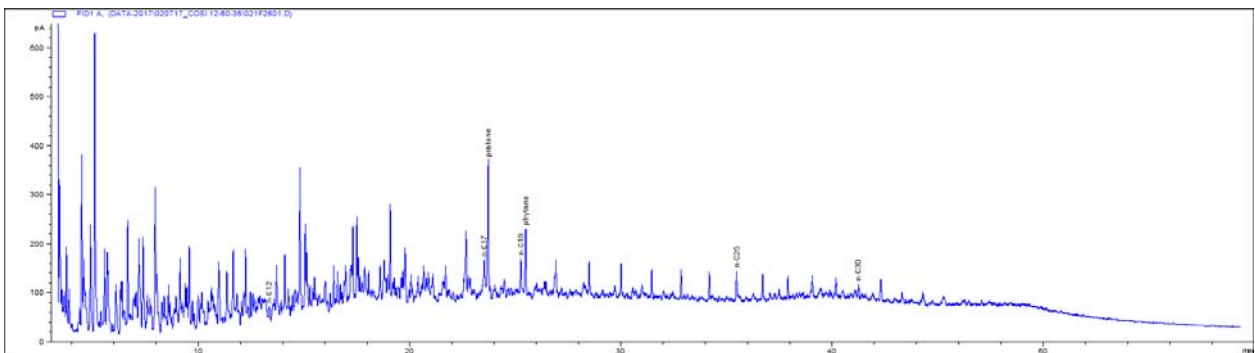
2000-0036 Statfjord A



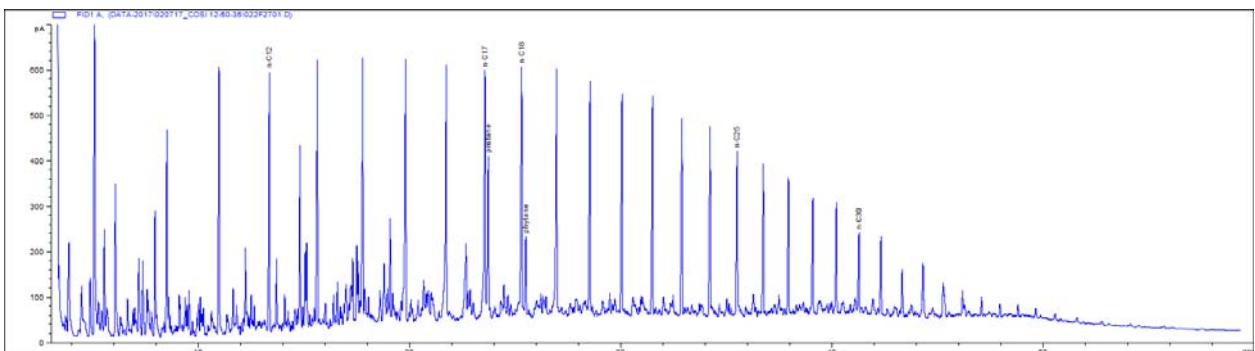
2000-0037-Statfjord B



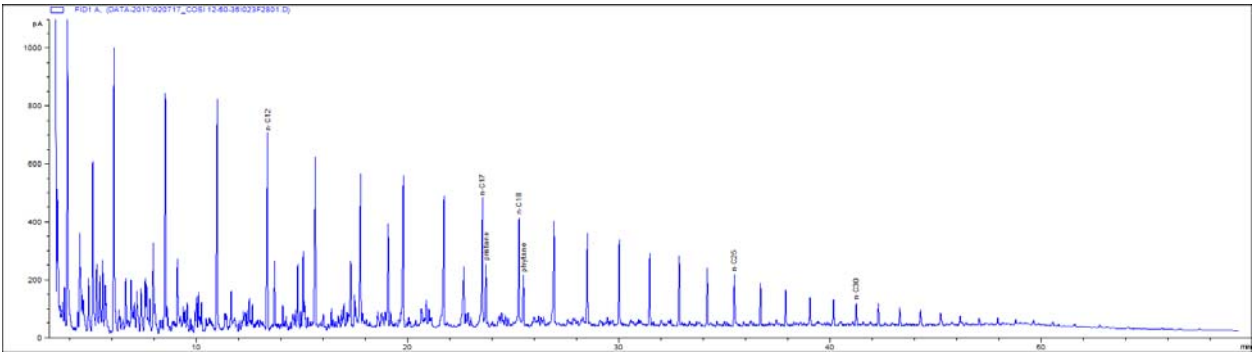
2000-0043 Statfjord C



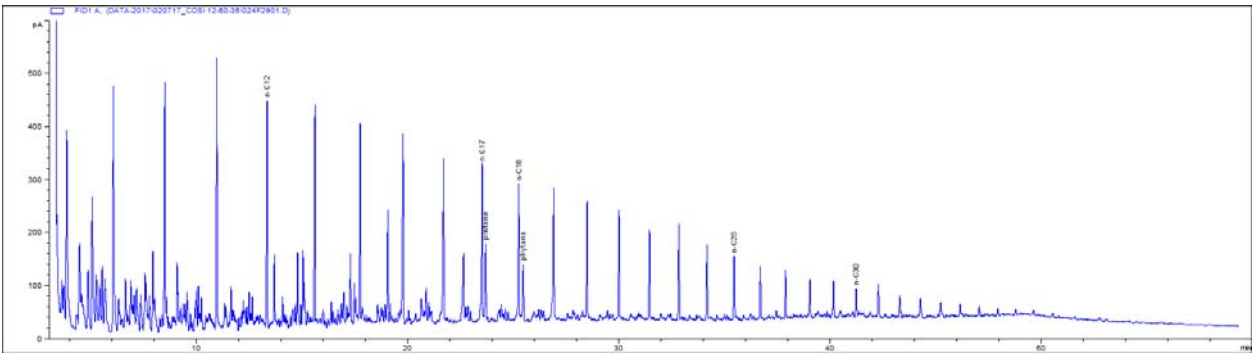
2000-0052 Troll B



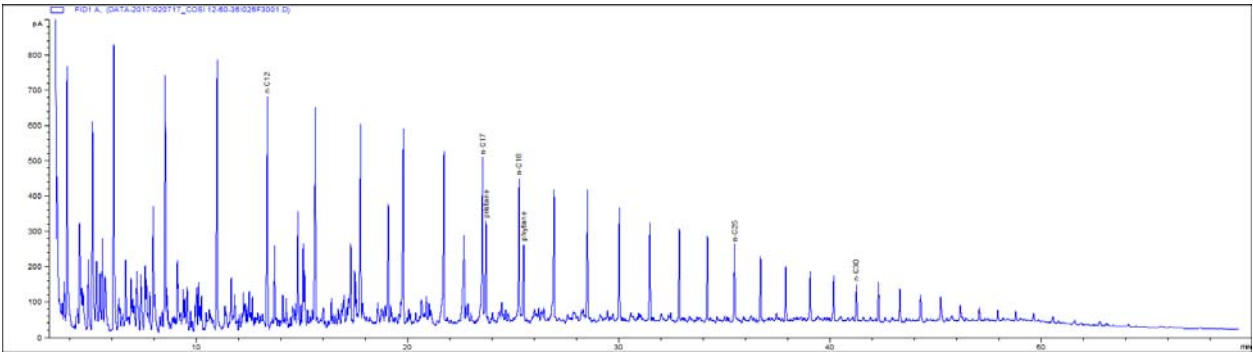
2000-0218 Norne



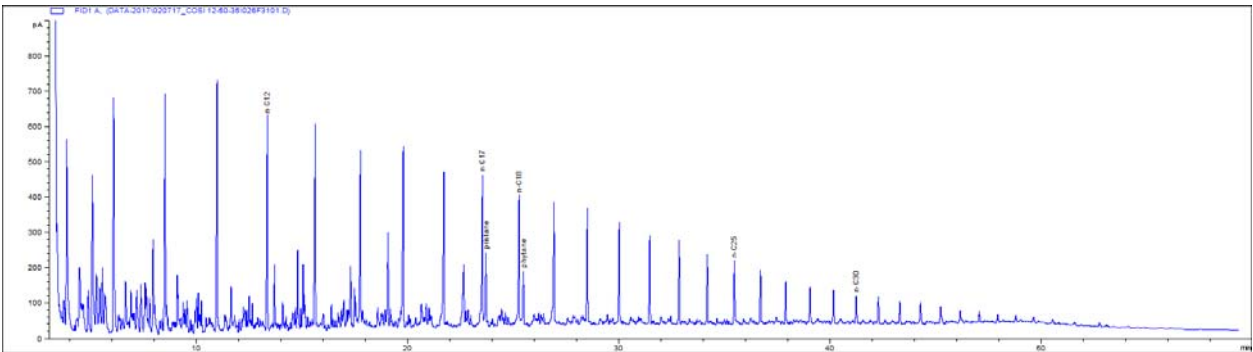
2000-0600 Eldfisk



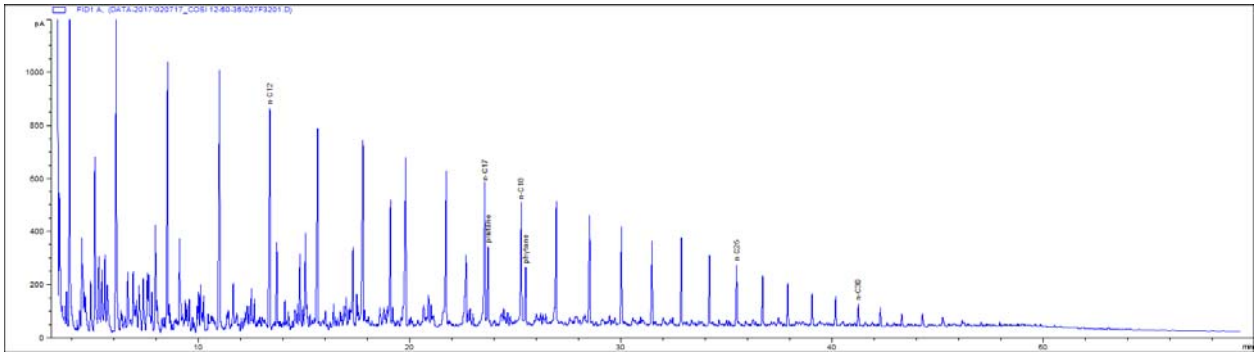
2000-0601 Valhall



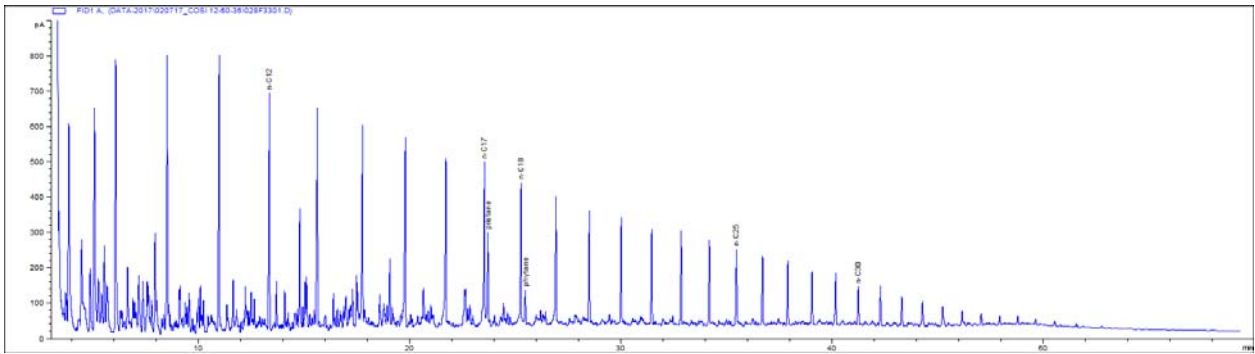
2000-0613 Gyda



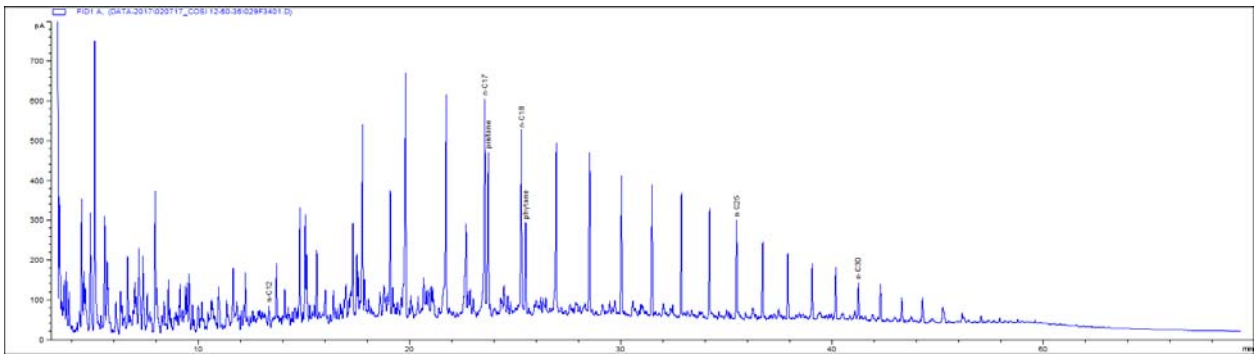
2000-0614 Tor



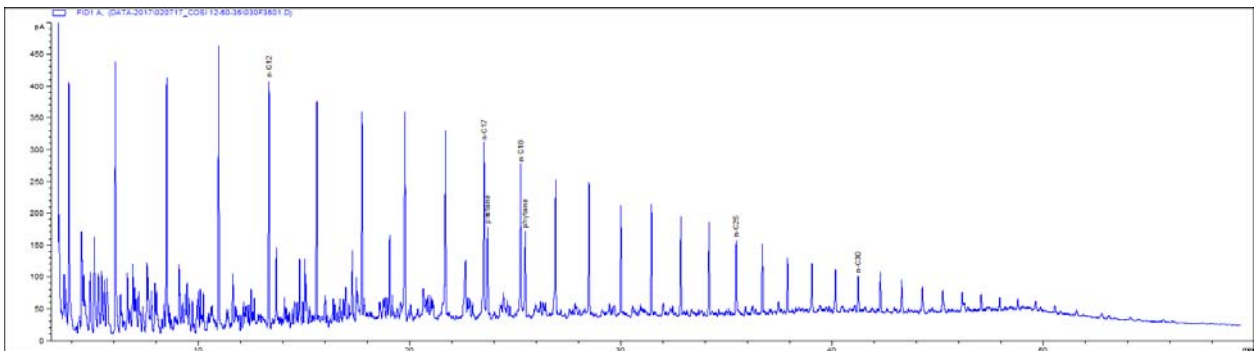
2000-0622 Embla



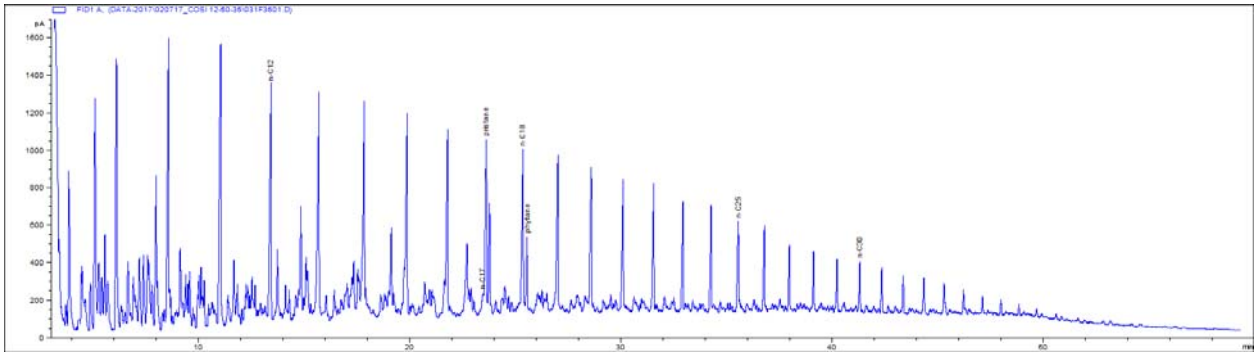
2001-0063 Vale



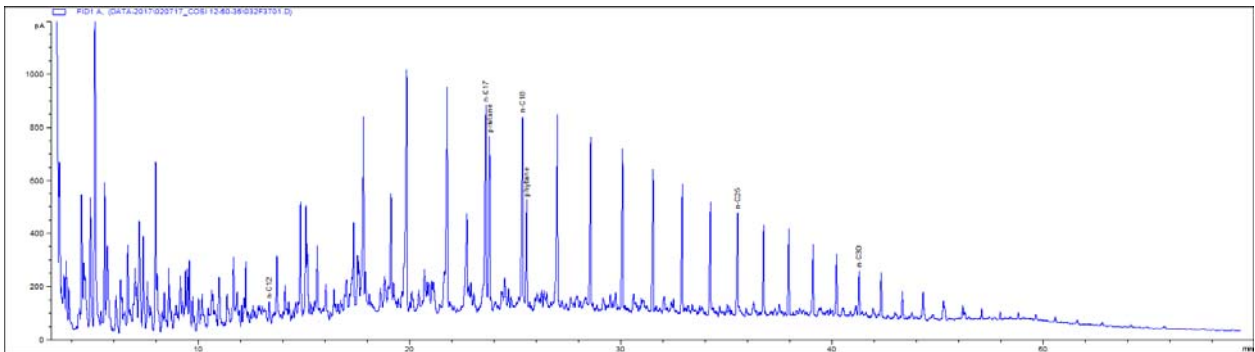
2001-0104 Goliath



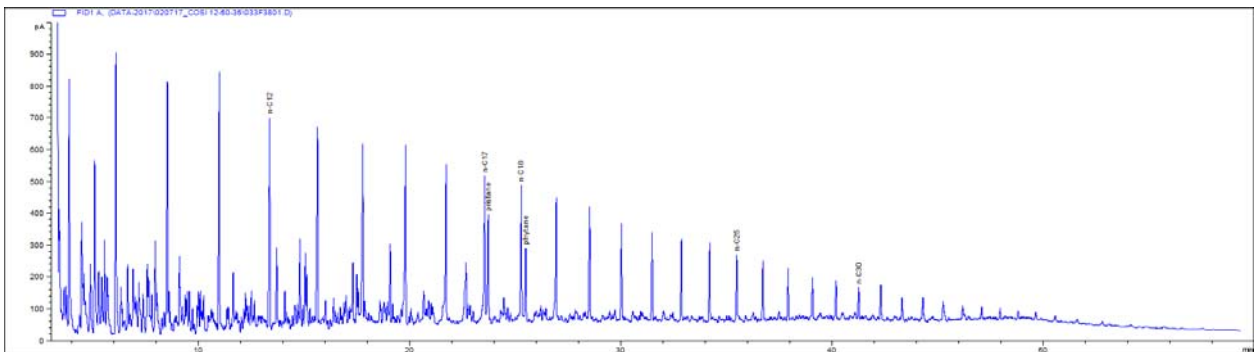
2001-0247 Glitne



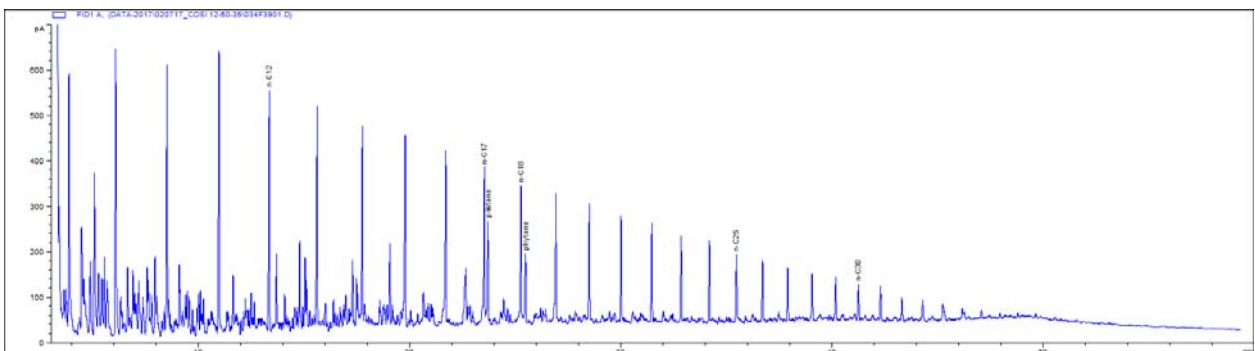
2001-0631 Tambar



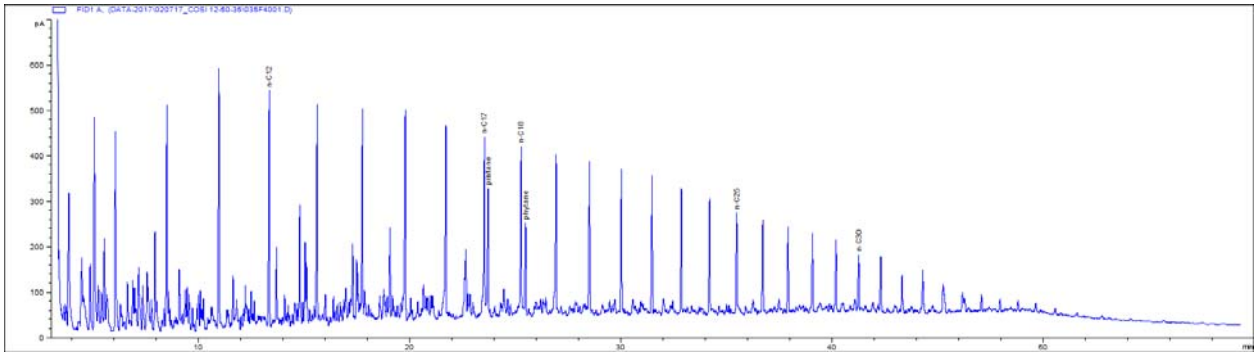
2001-0729 Goliath



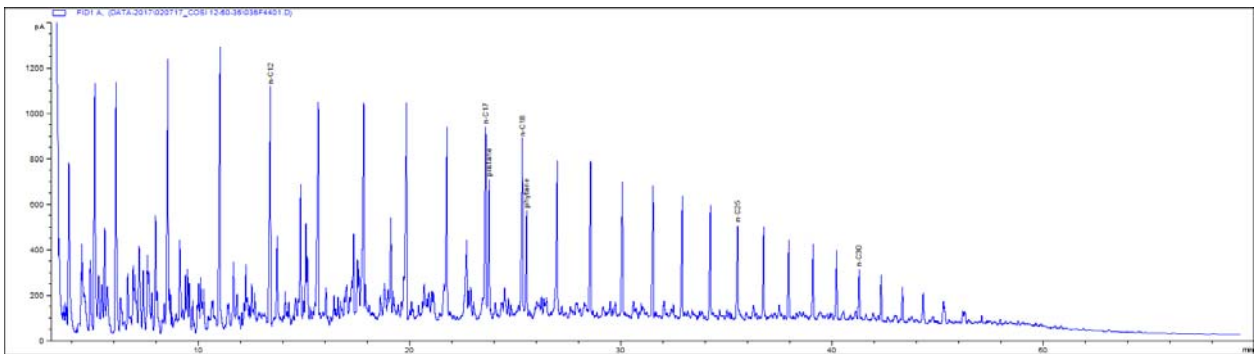
2002-0067 Snorre A TLP



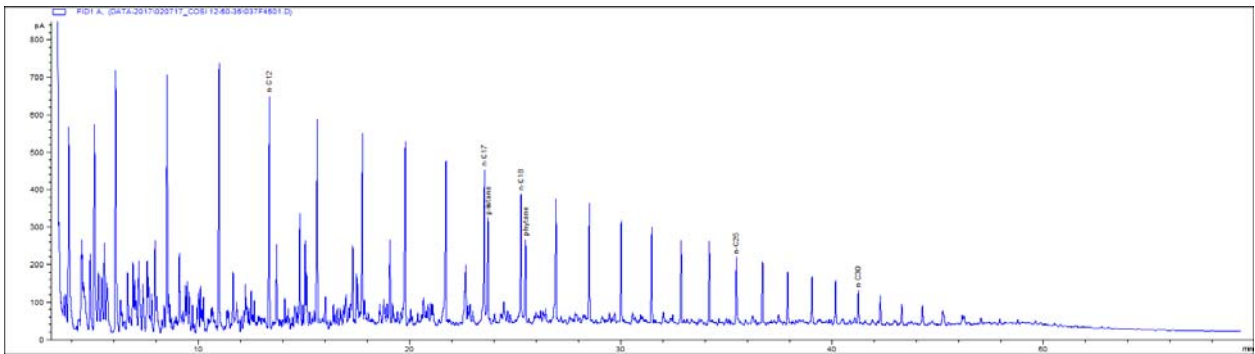
2002-0068 Vigdis



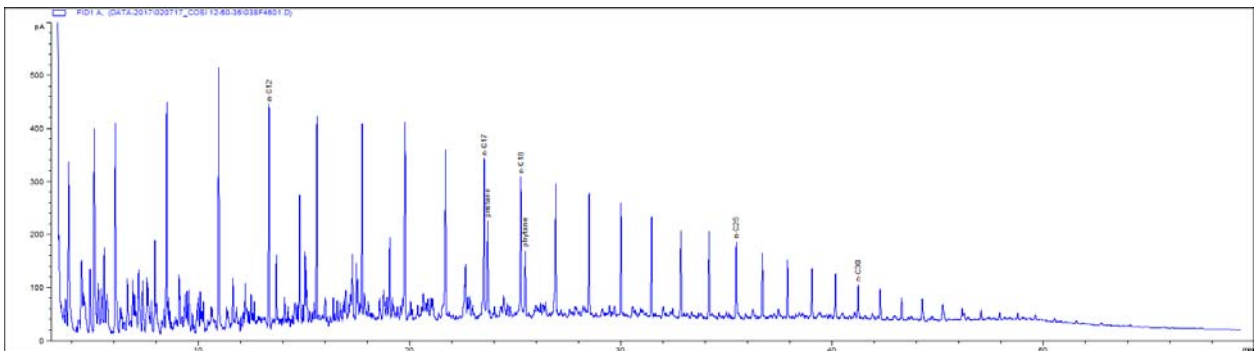
2002-0135 Skarv



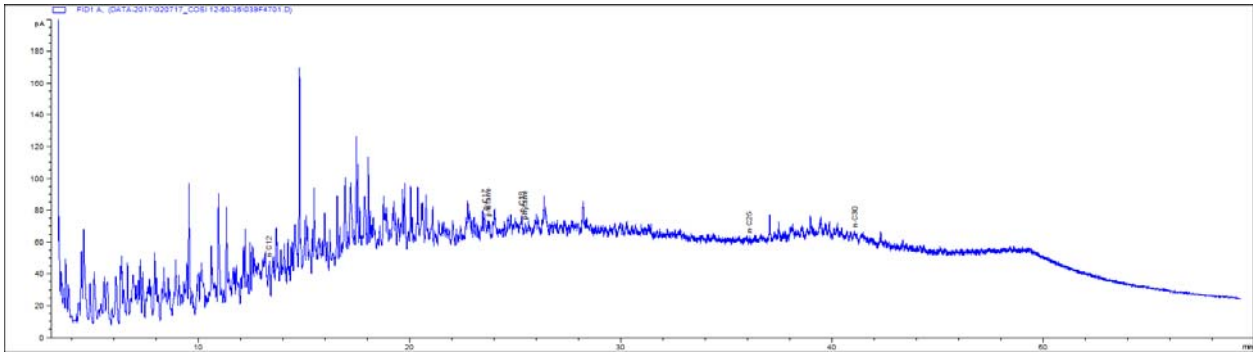
2002-0599 Åsgard



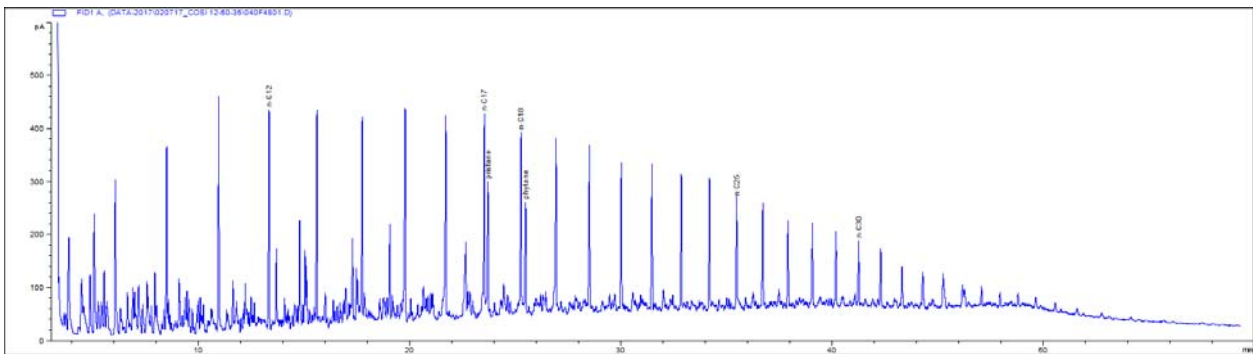
2002-0600 Smørbukk Sør



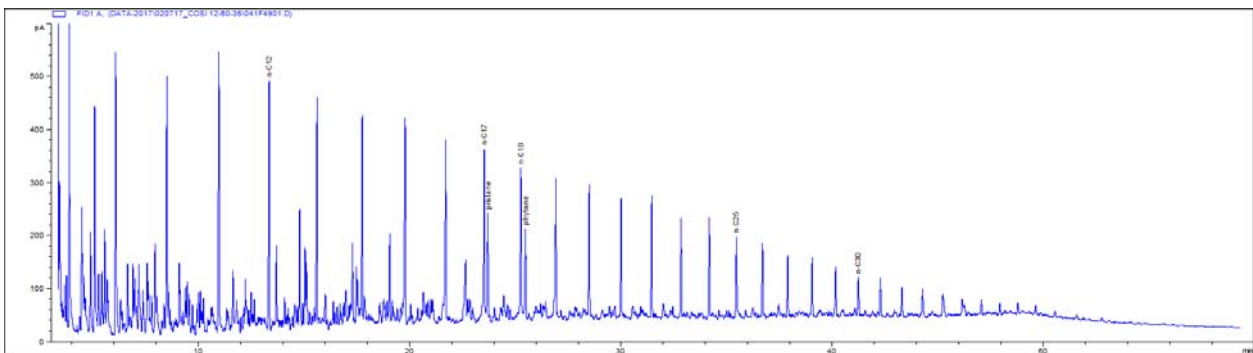
2003-0107 Heidrun Tilje



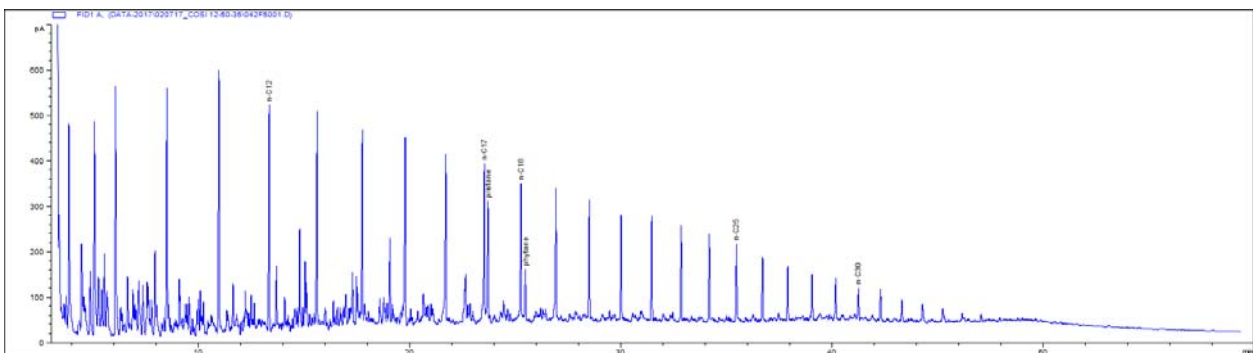
2003-0348 Heidrun Åre (RT navn er kun retningsgivende)



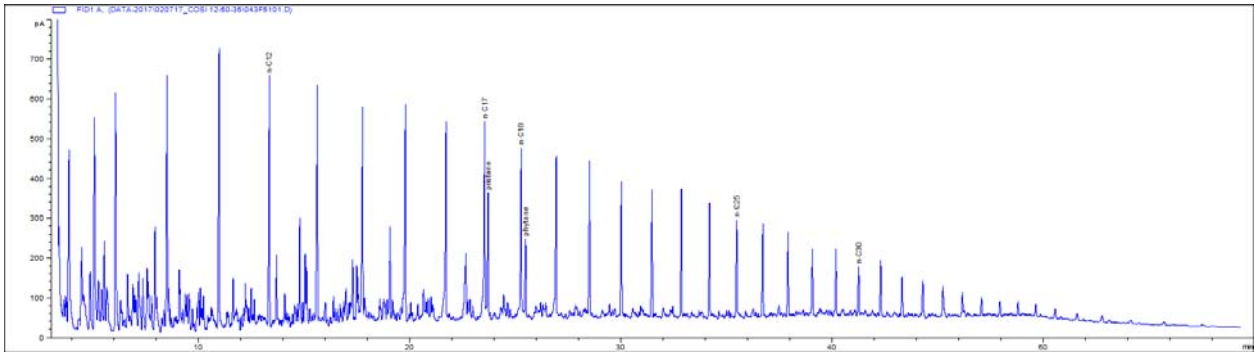
2003-1149 Tyrihans Nord



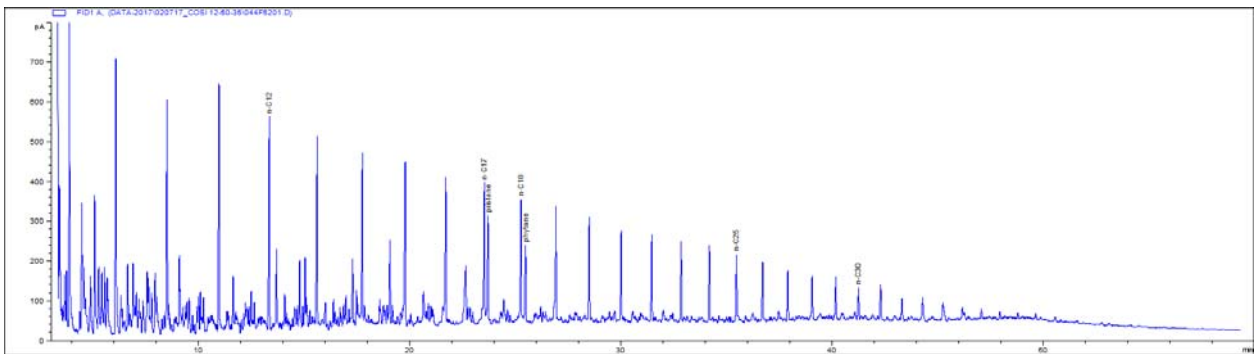
2003-1150 Tyrihans Sør



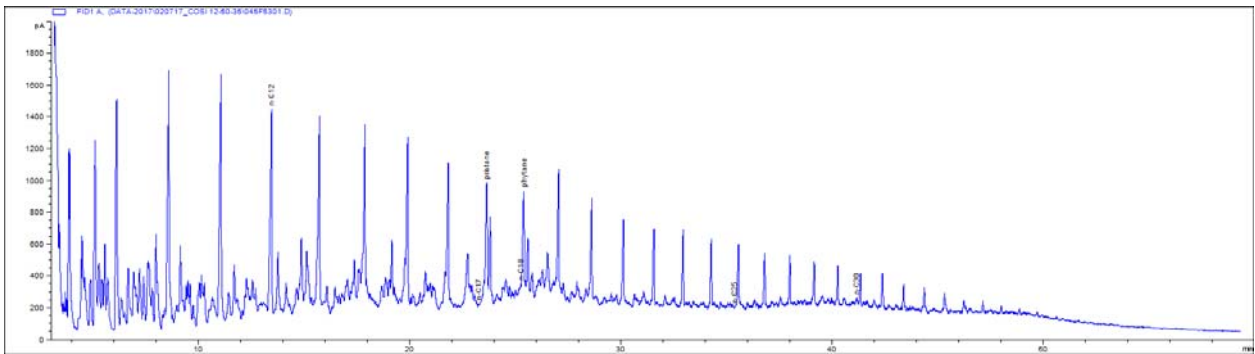
2003-1252 Oseberg Sør



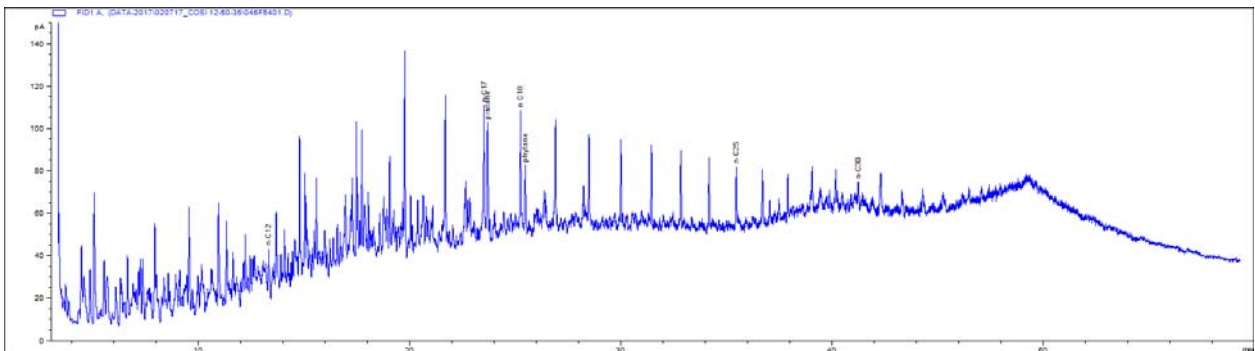
2003-2127 Varg



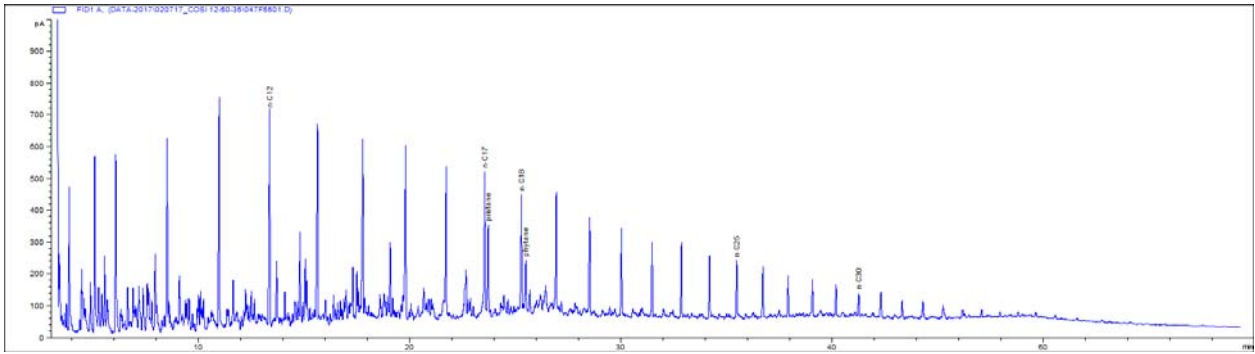
2003-2133 Oseberg Øst



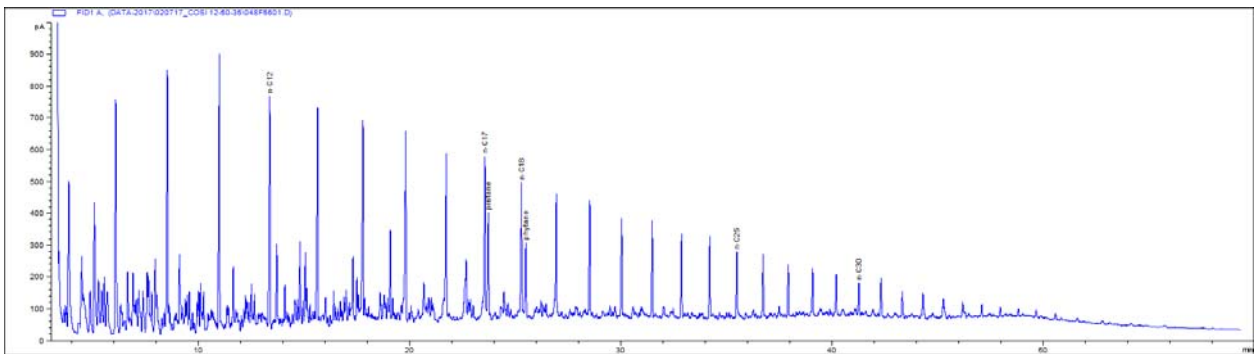
2003-2192 Oseberg C



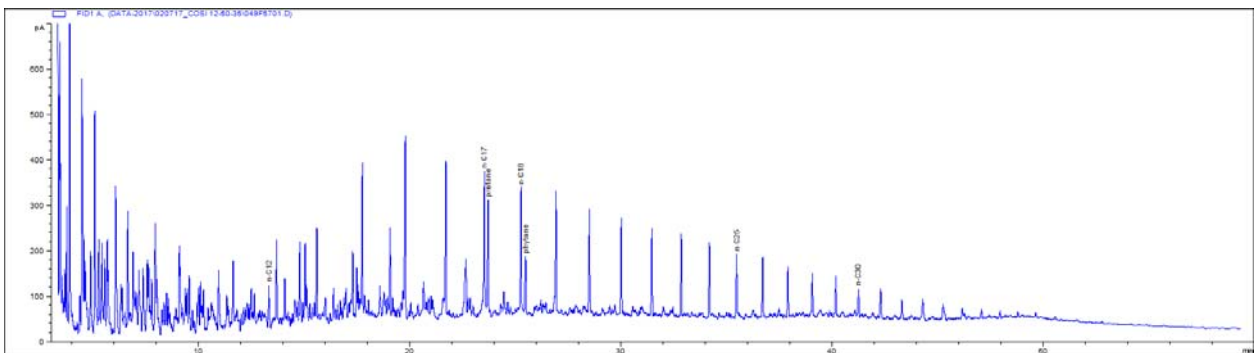
2003-2498 Grane



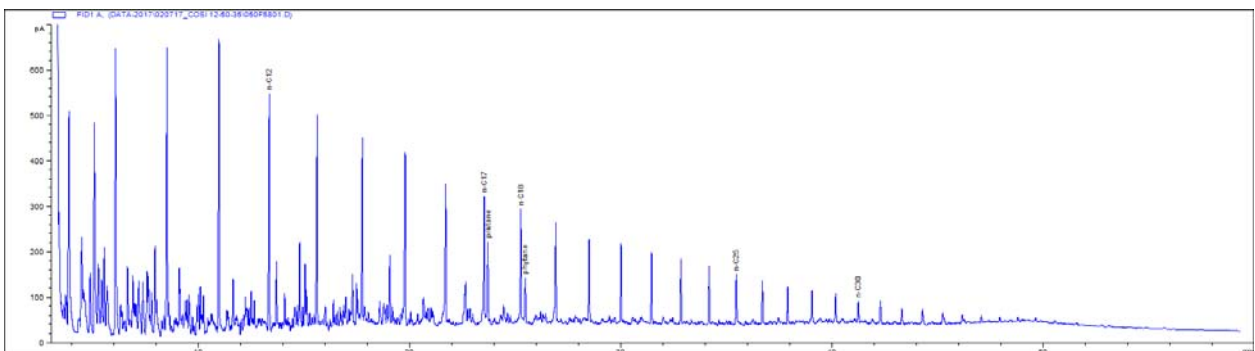
2003-2805 Oseberg A



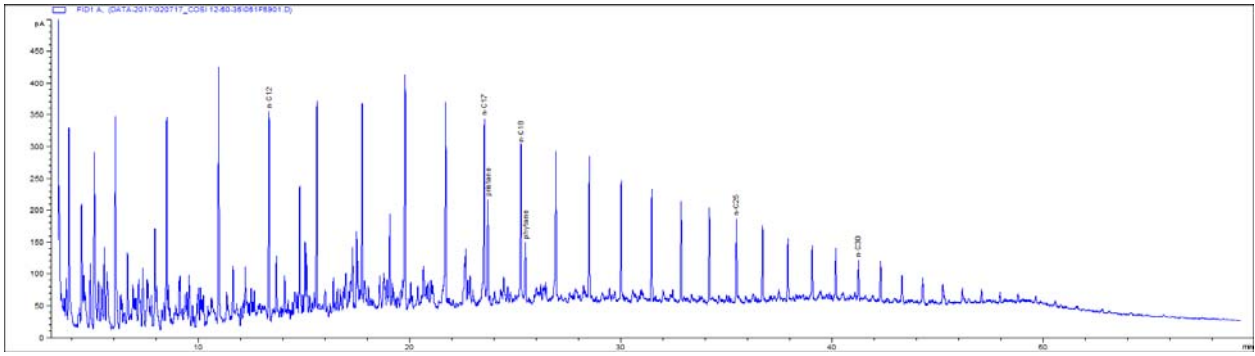
2004-0484 Brage



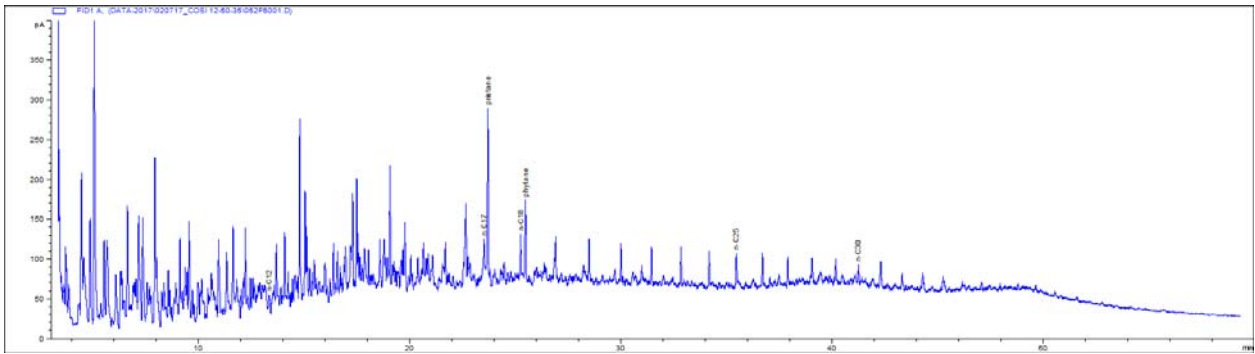
2004-0965 Draugen



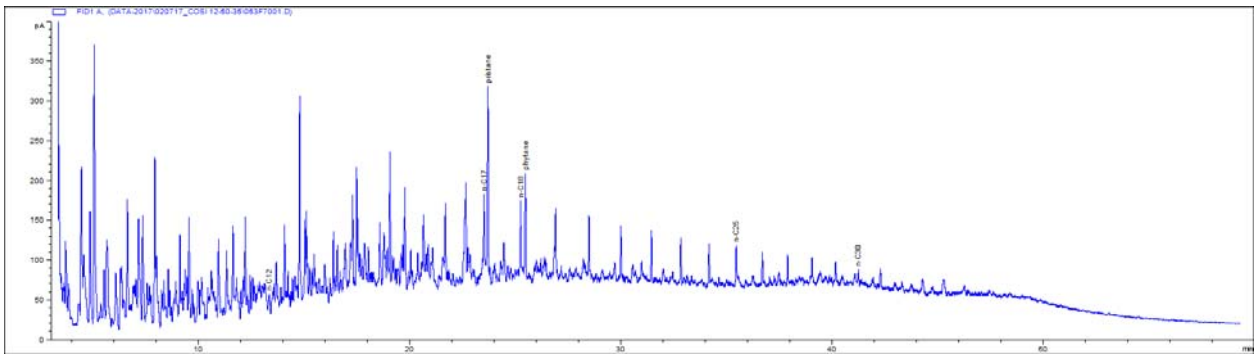
2004-1810 Oseberg Blend



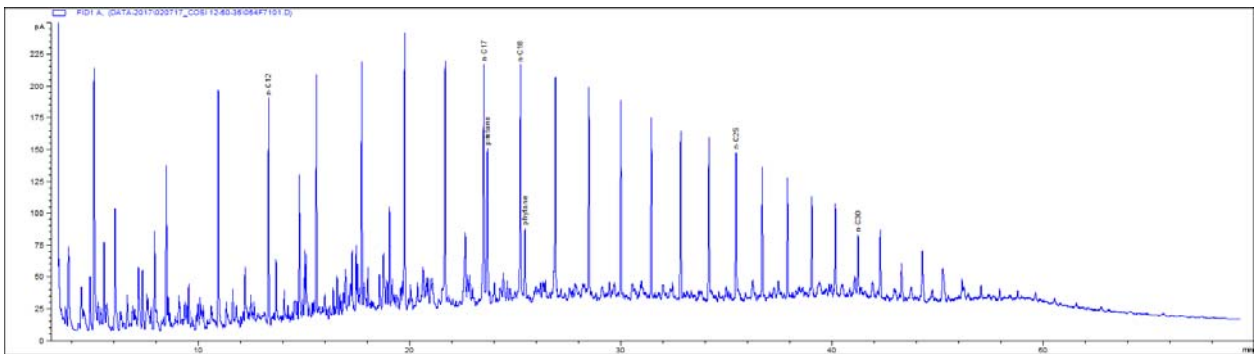
2004-2319 Balder



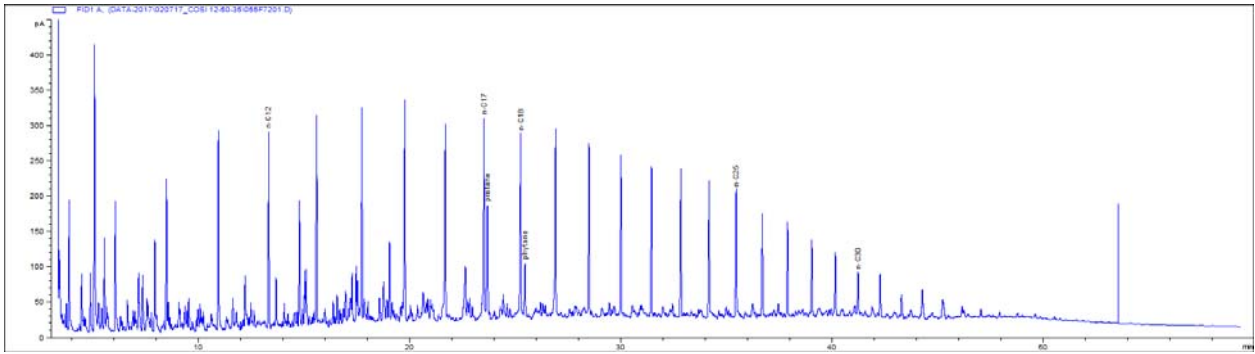
2005-0722 Troll B



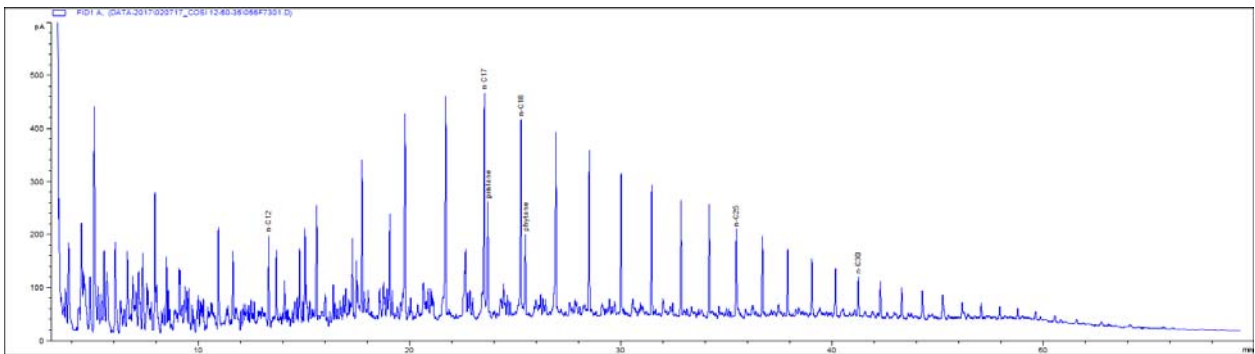
2005-0843 Troll B



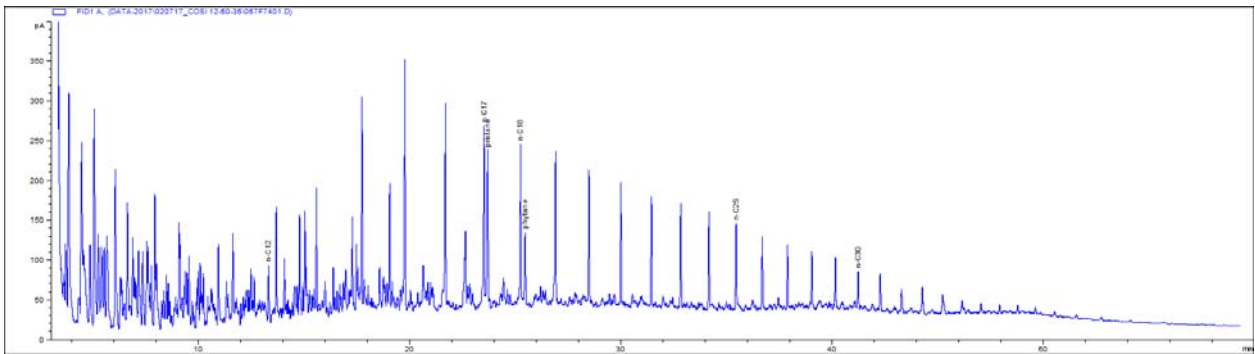
2006-0017 Norne 2



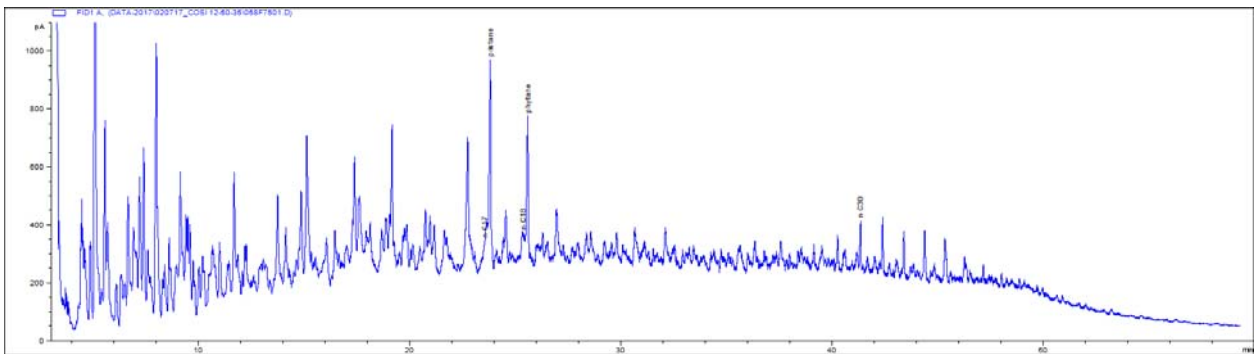
2007-0260 Norne



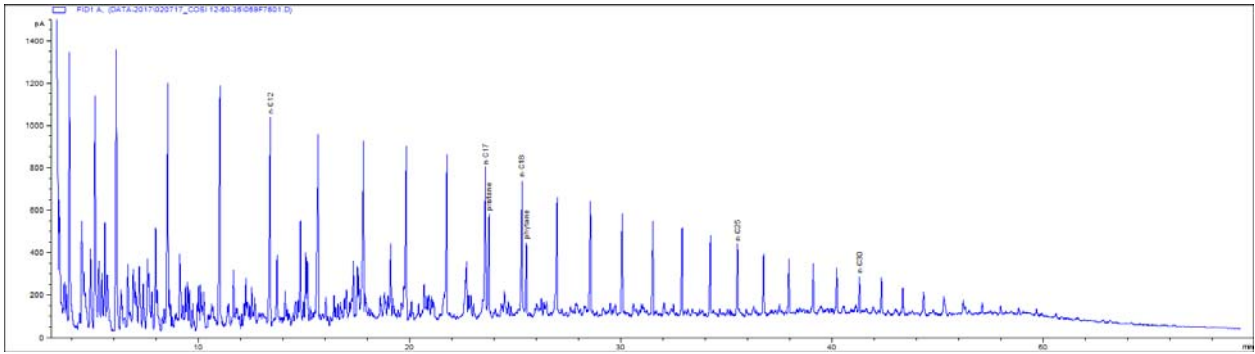
2007-0288 Alvheim Kneler



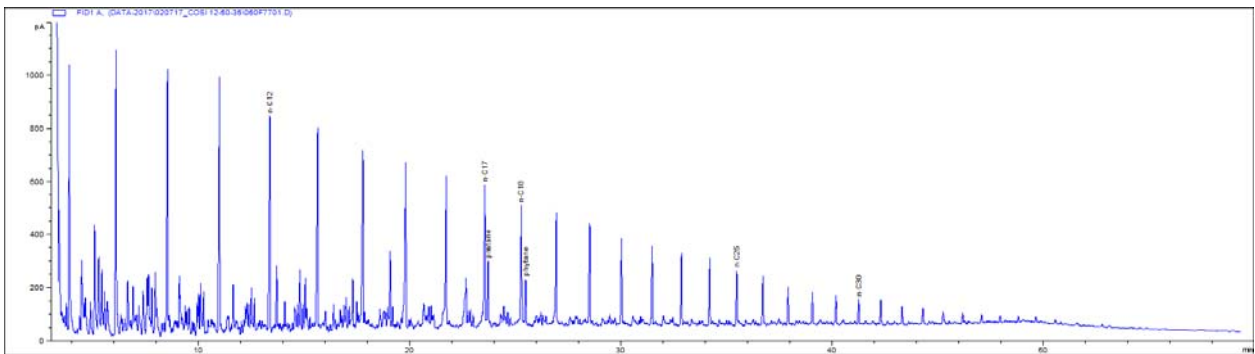
2007-0426 Draugen



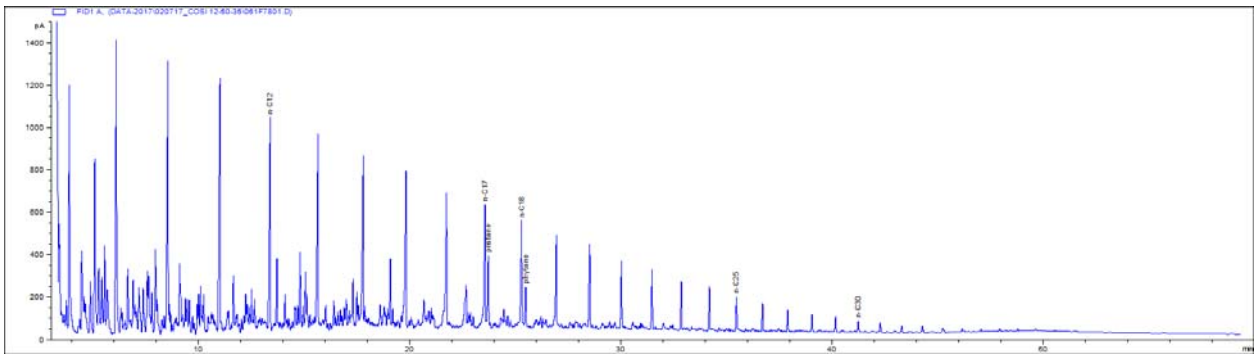
2007-0530 Alvheim Boa



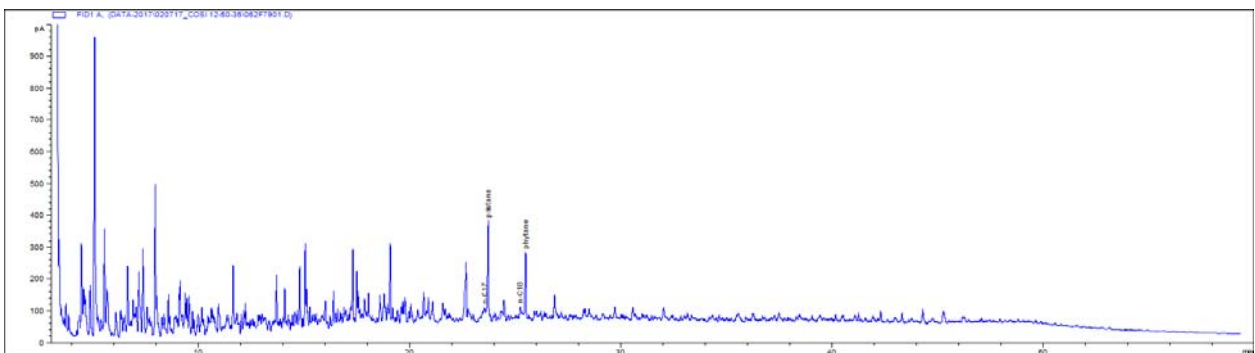
2008-0047 Statfjord



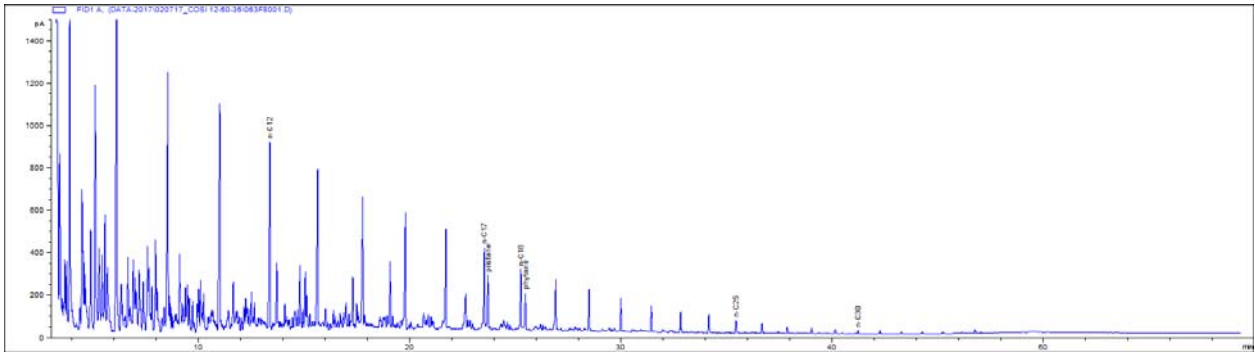
2008-0099 Blane



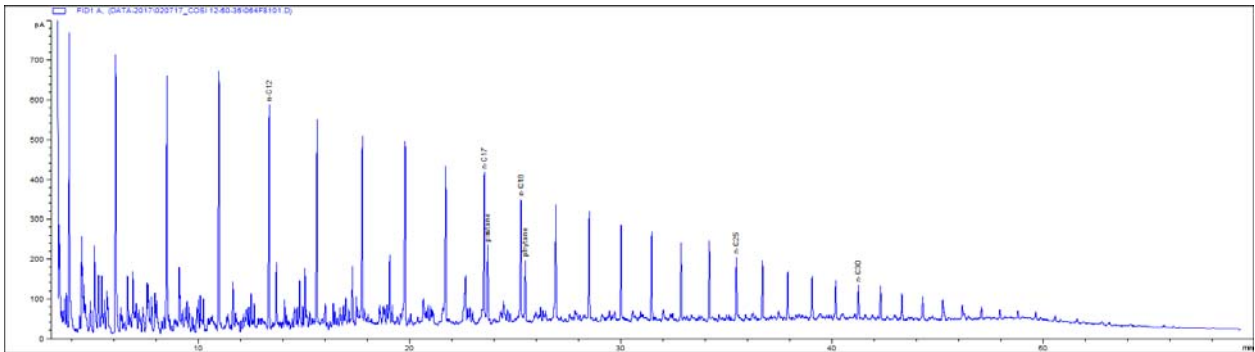
2008-0227 Visund



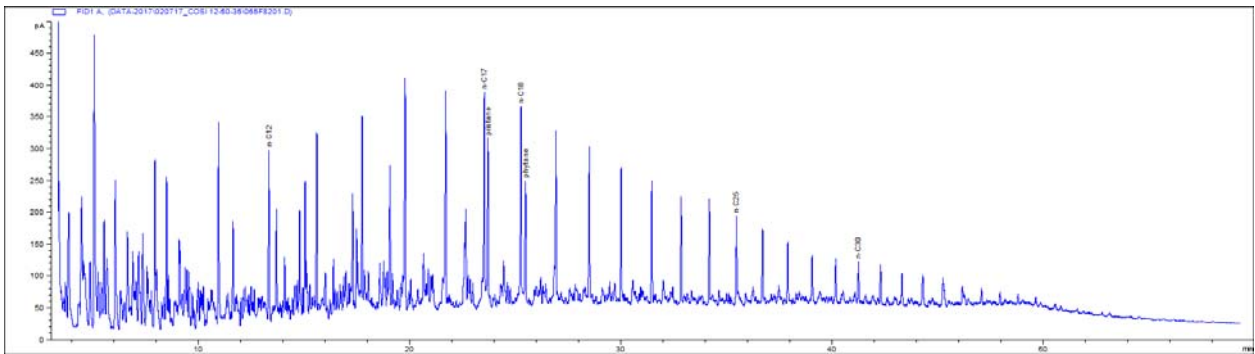
2008-0282 Alvheim



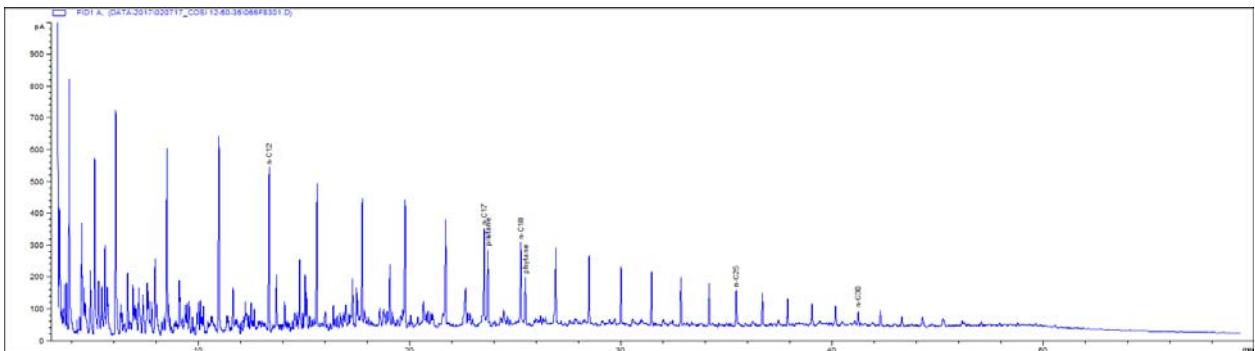
2008-0470 Rev



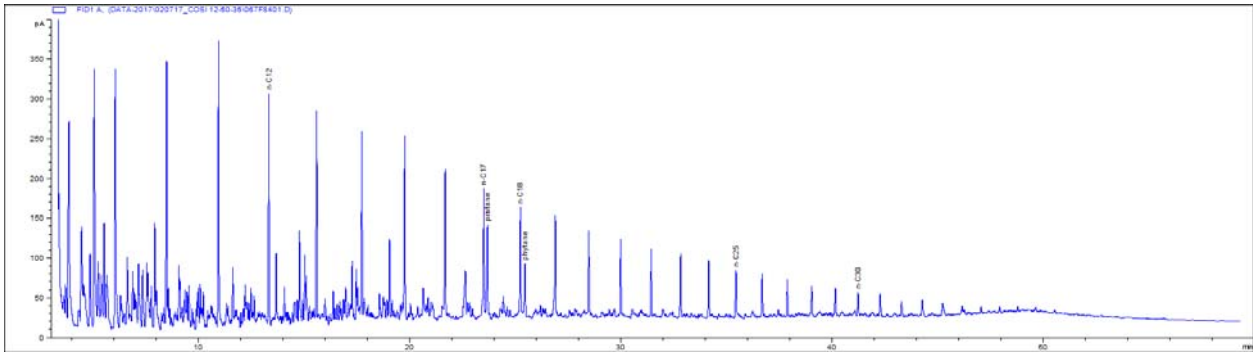
2009-0002 Alvheim



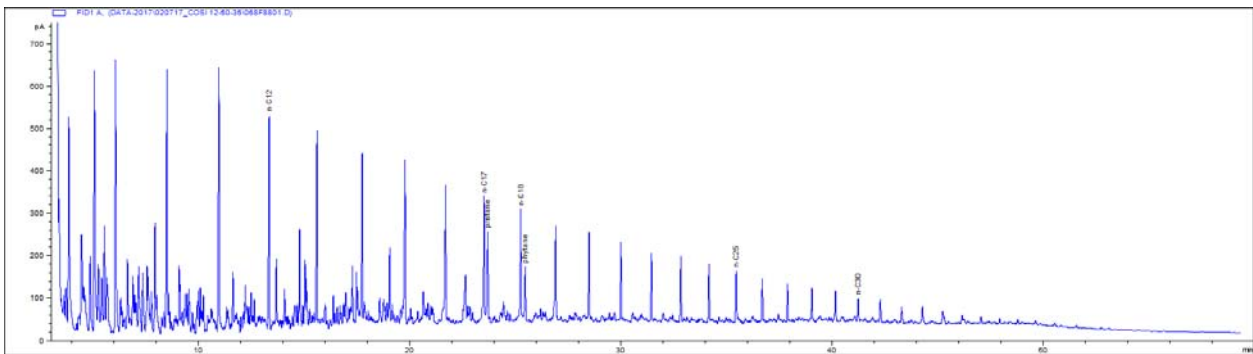
2009-0003 Alvheim Blend



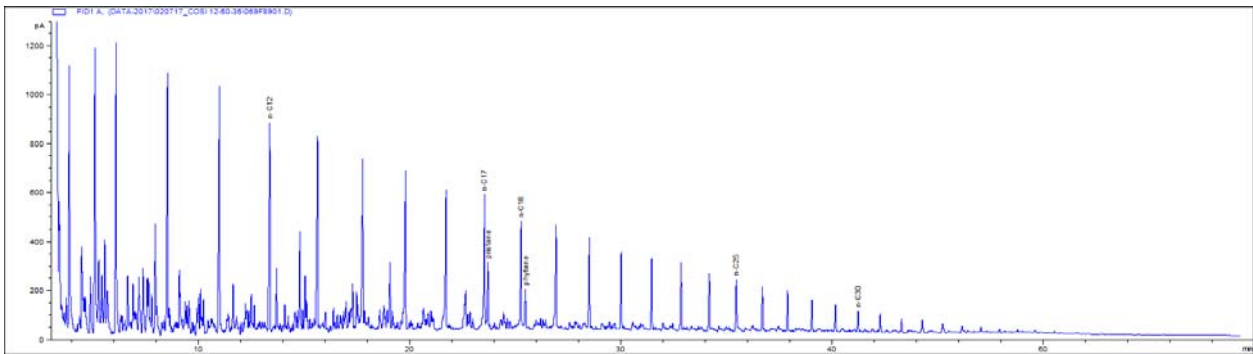
2009-0039 Gullfaks A



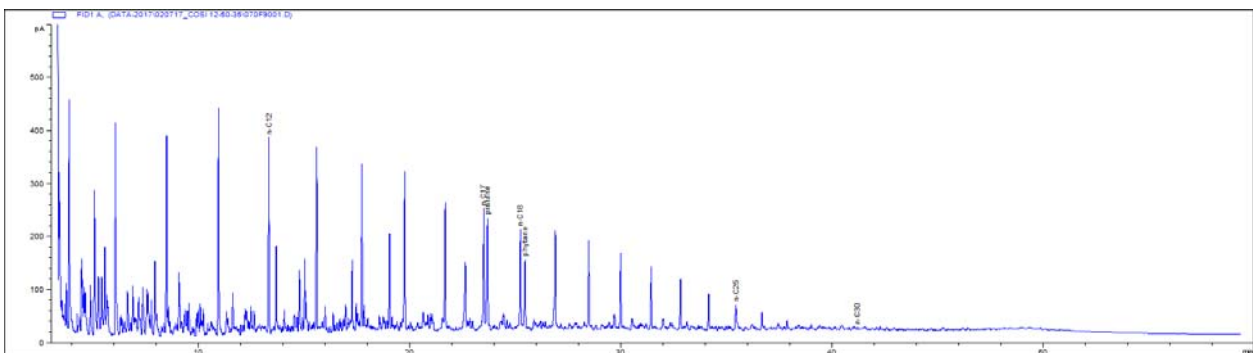
2009-0223 Gullfaks C



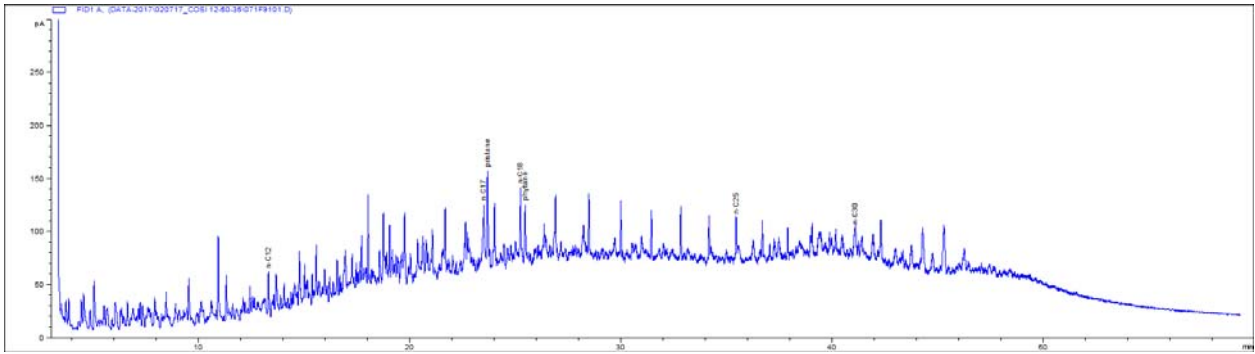
2009-0224 Gullfaks C



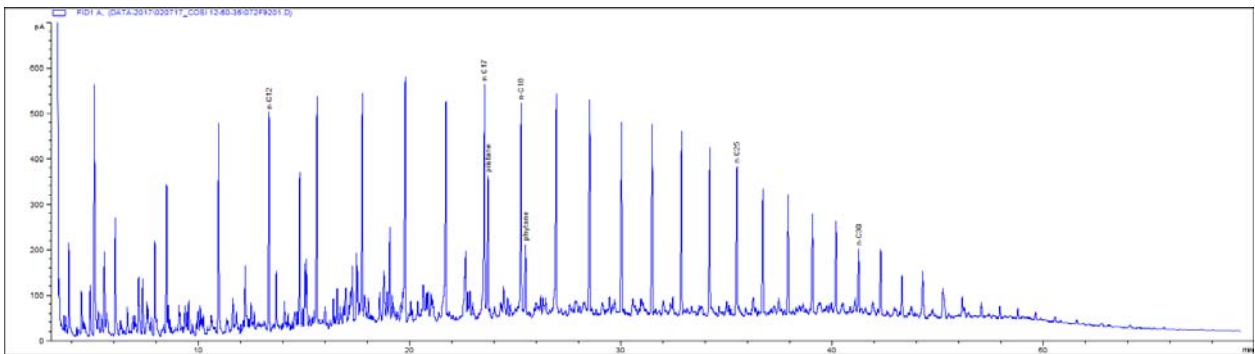
2009-0239 Kvitebjørn



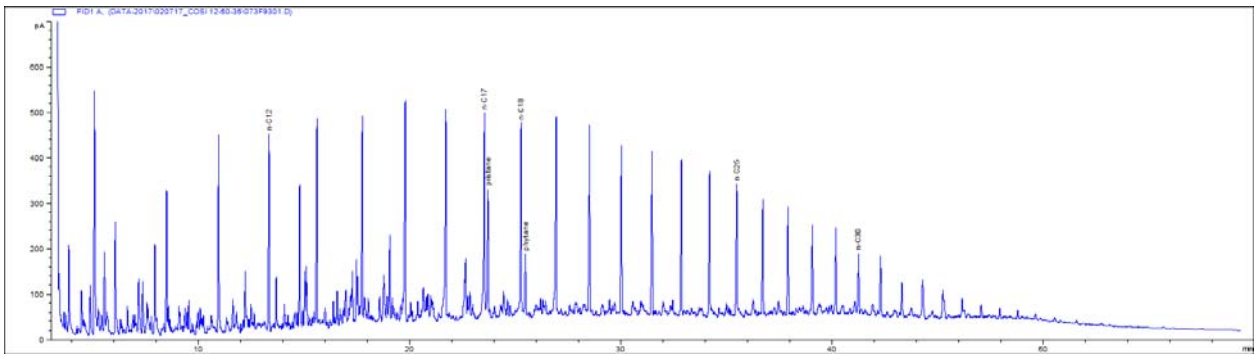
2009-0284 Kobbe



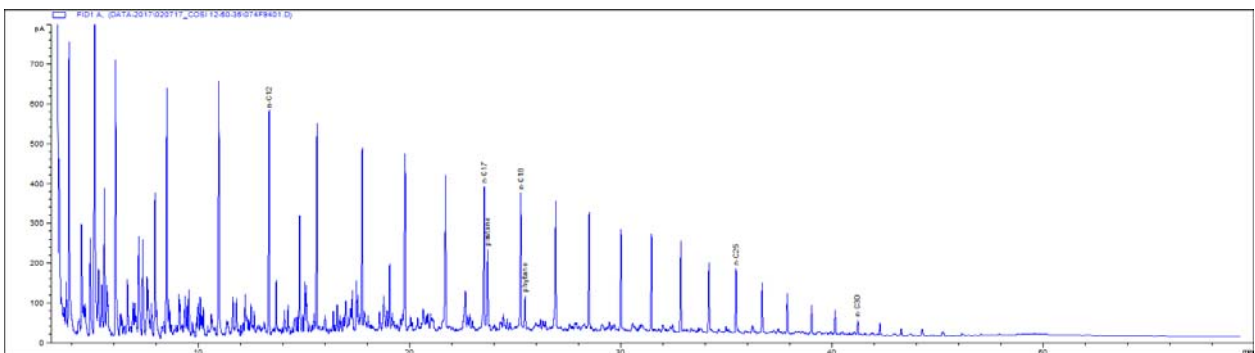
2009-0547 Svale



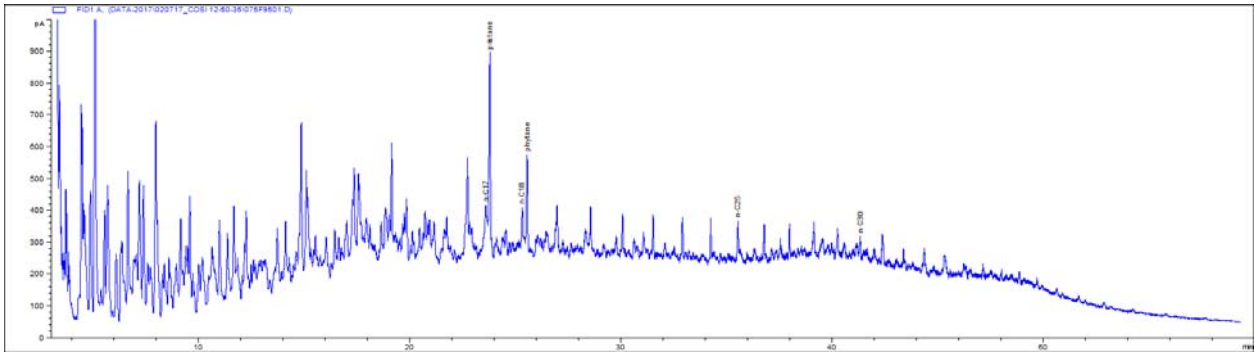
2009-0548 Stær



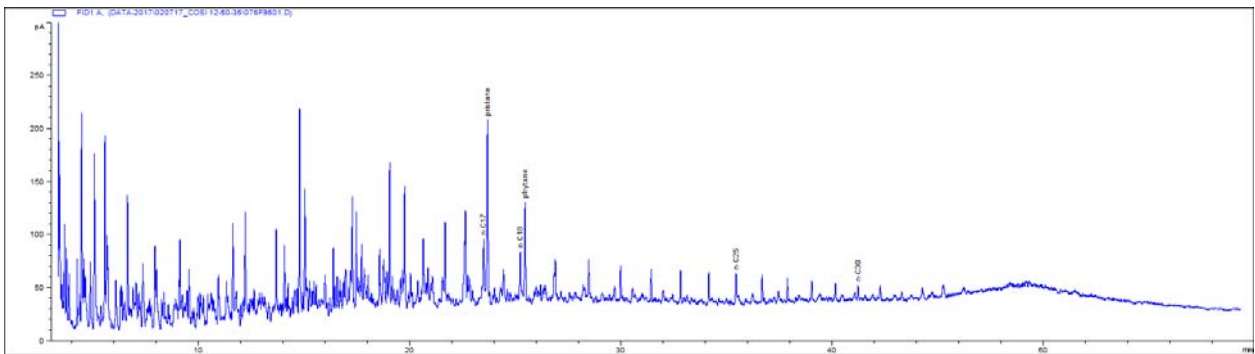
2009-0549 Norne Blend



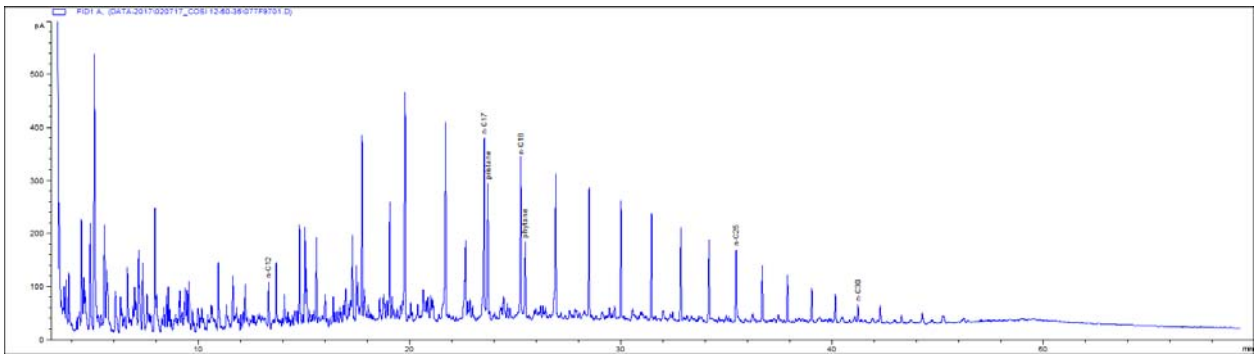
2009-0552 Alve



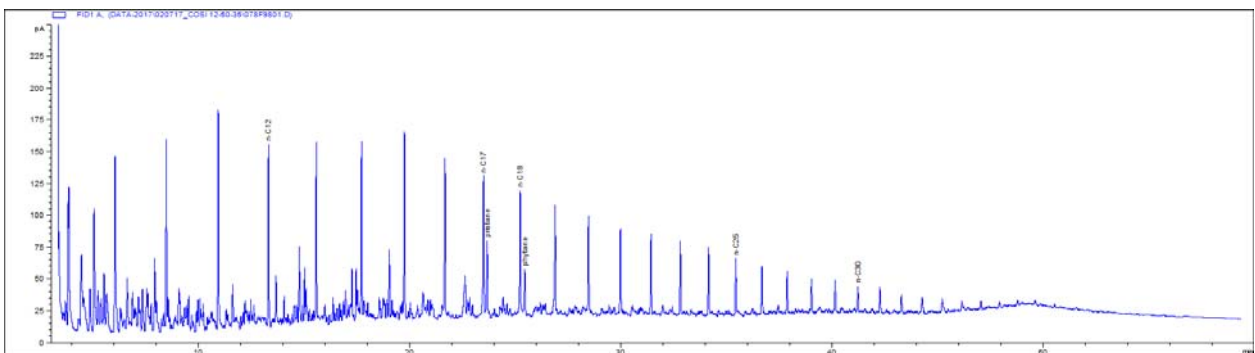
2009-0702 Troll



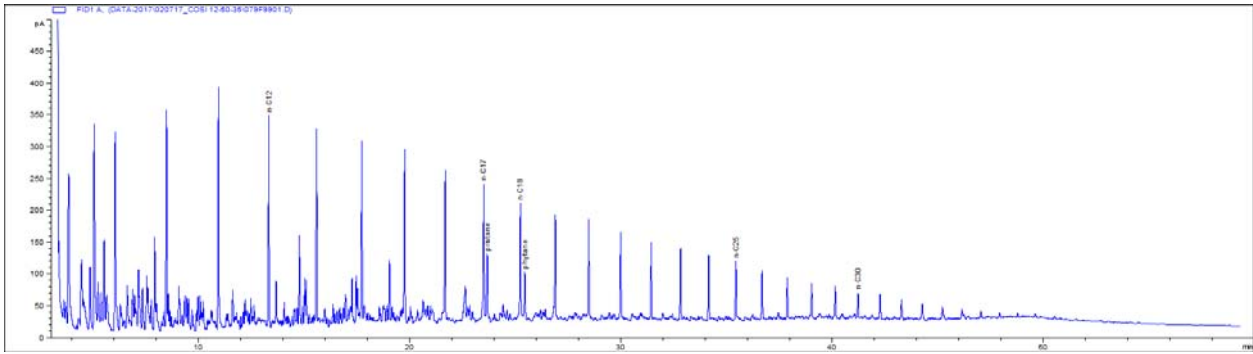
2009-0703 Volund



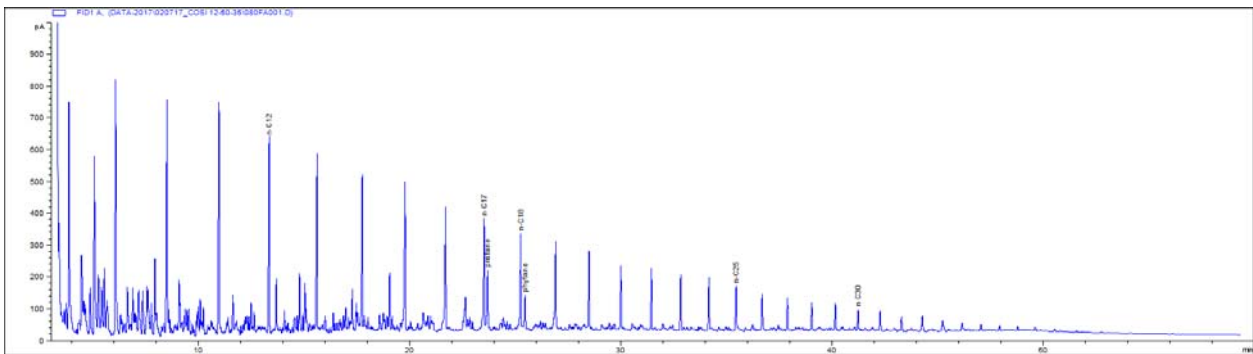
2010-0030 Realgrunnen



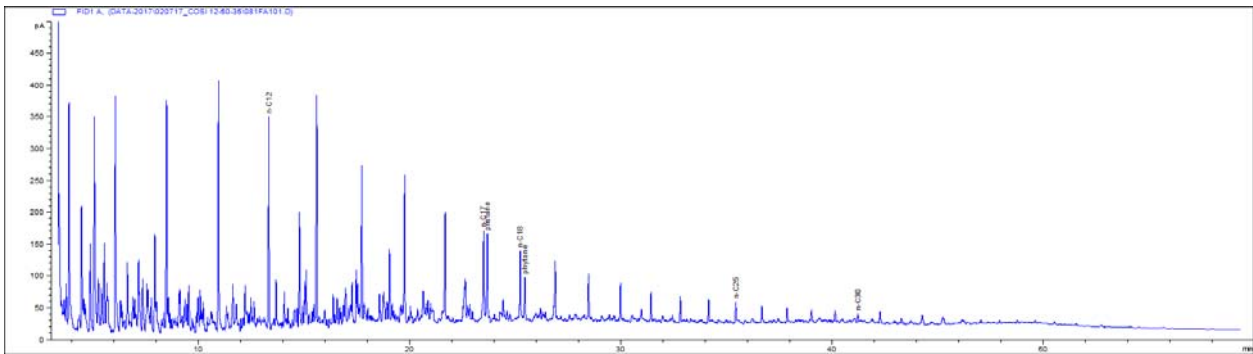
2010-0159 Balder



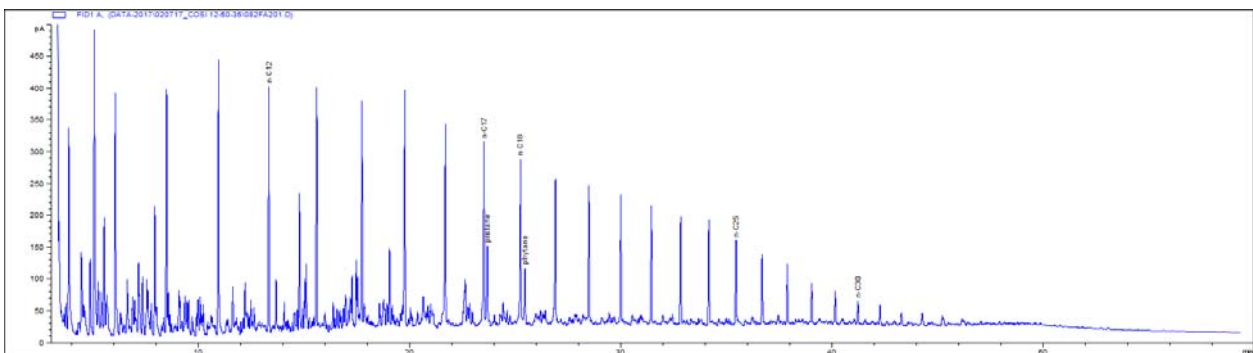
2010-0327 Luno



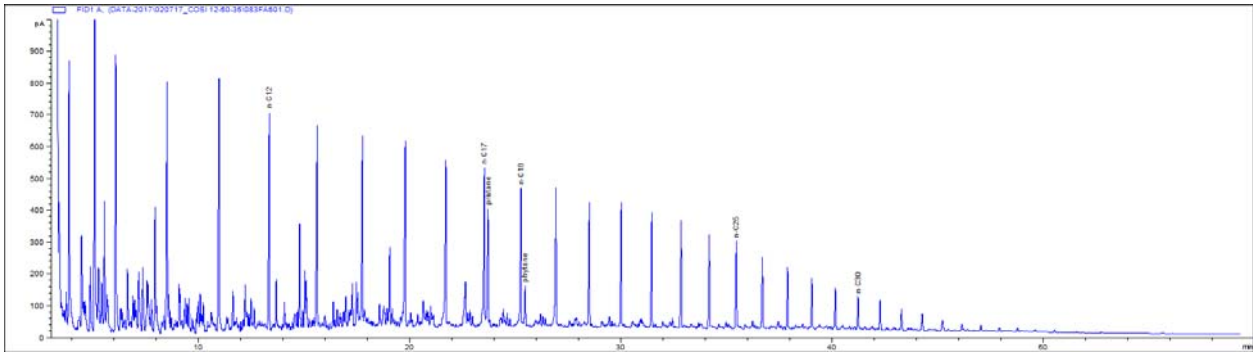
2010-0351 Jordbær



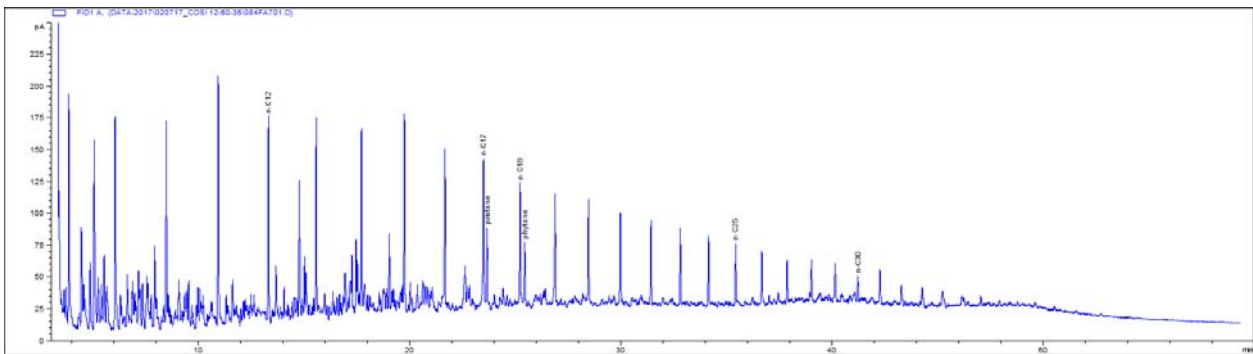
2010-0504 Gjøa



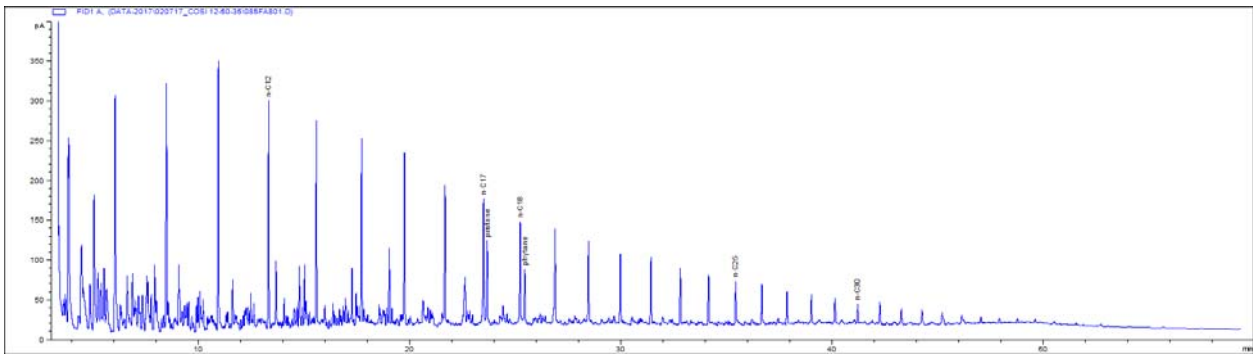
2011-0001 Draupne



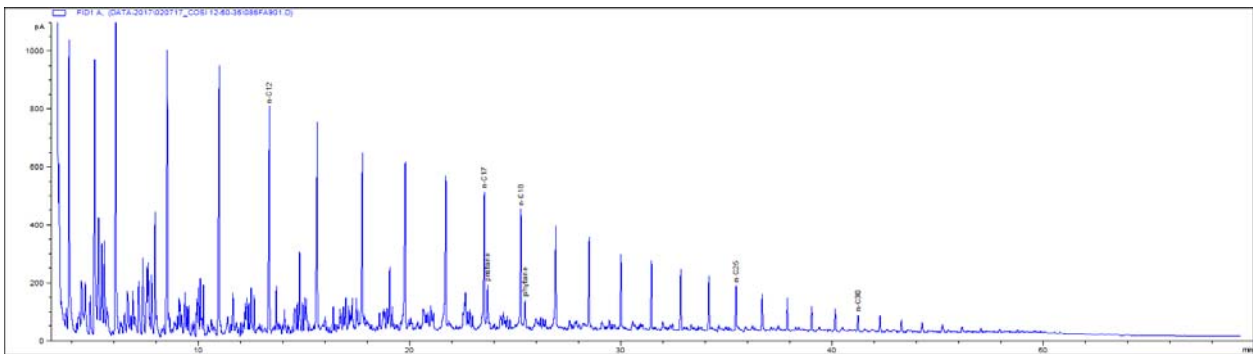
2011-0017 Trym



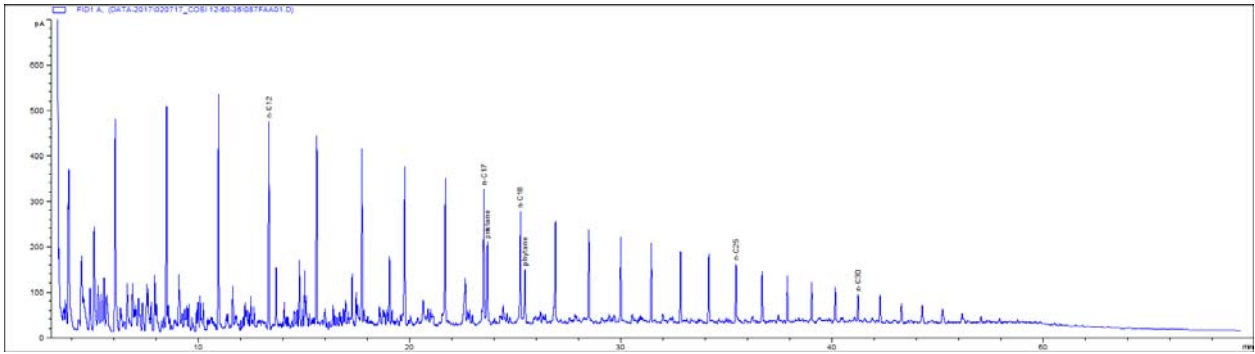
2011-0444 Avaldsnes



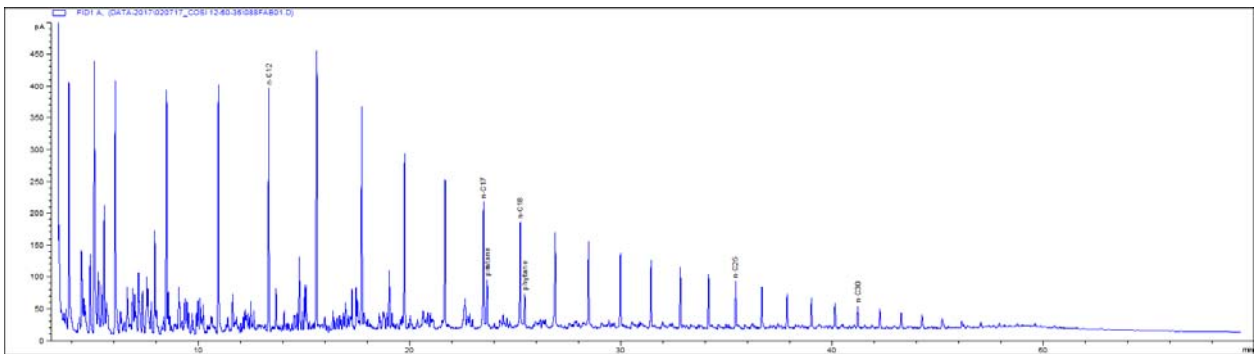
2011-0590 Veslefrikk



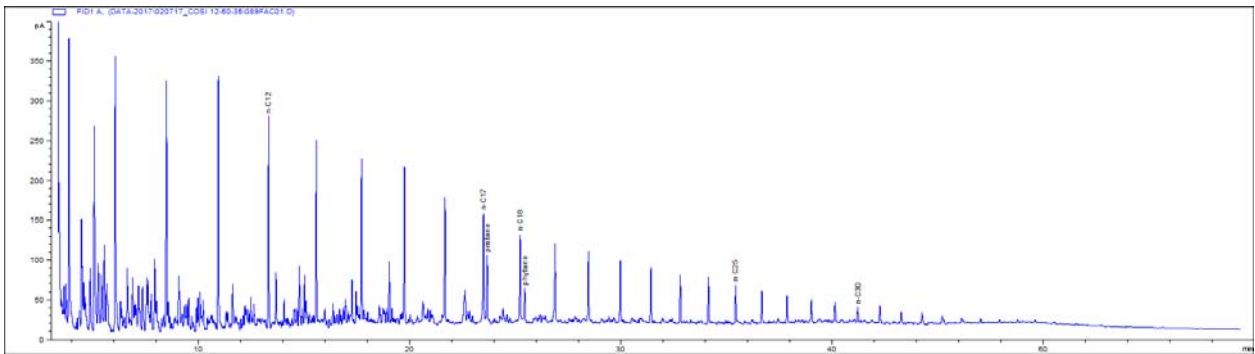
2011-0602 Oselvar



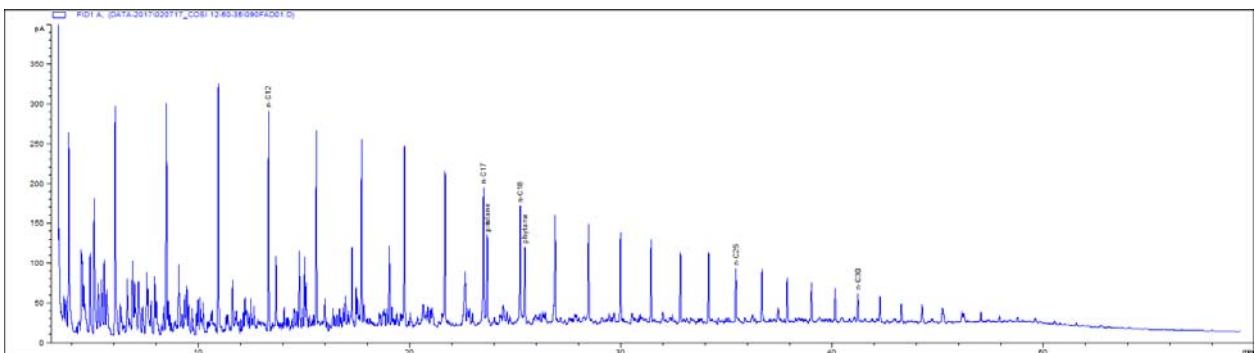
2012-0004 Veslefrikk



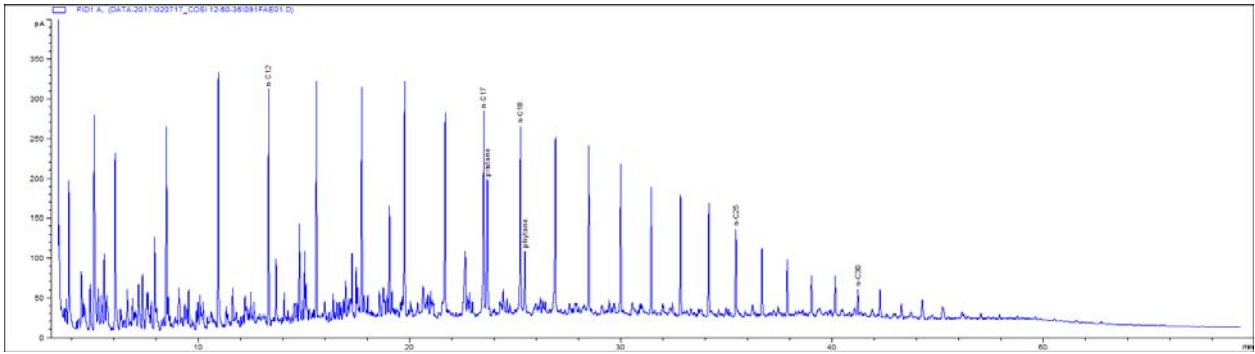
2012-0056 Gudrun



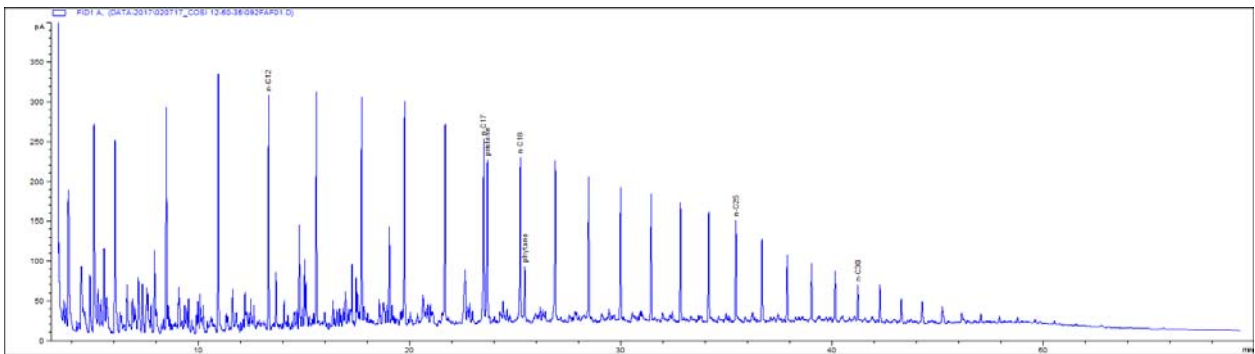
2012-0059 Oseberg Blend



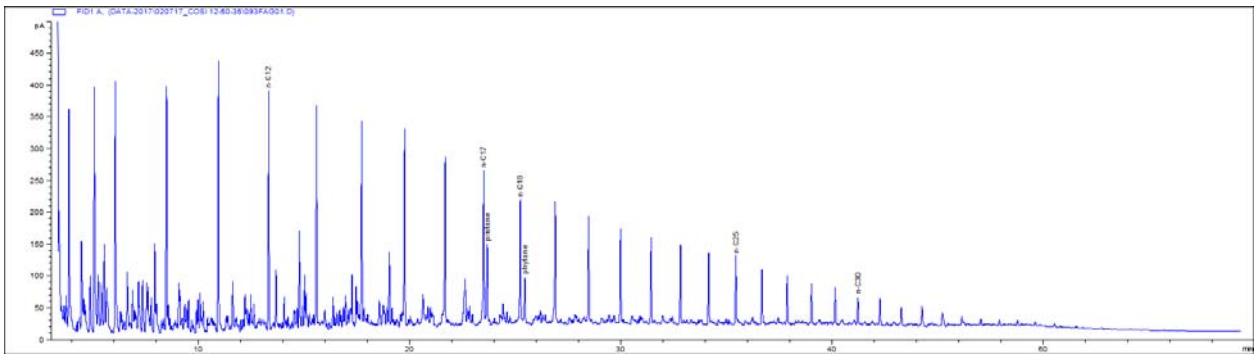
2012-0091 Maria



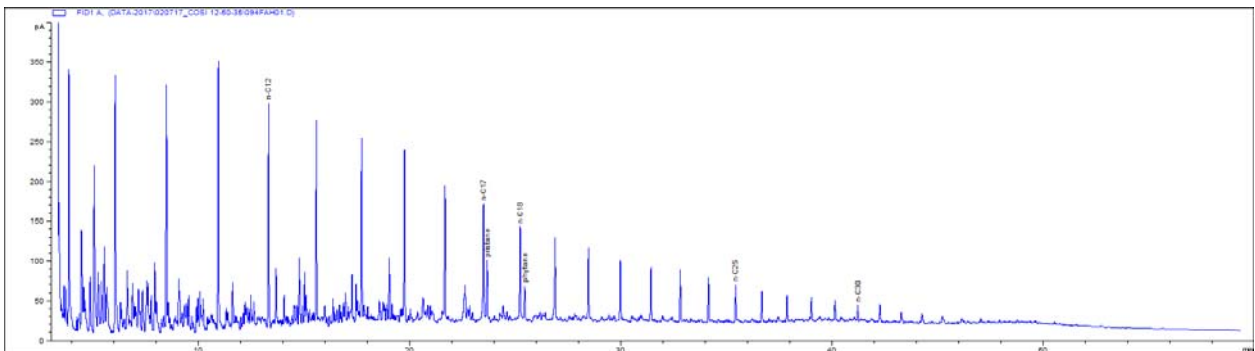
2012-0243 Havis



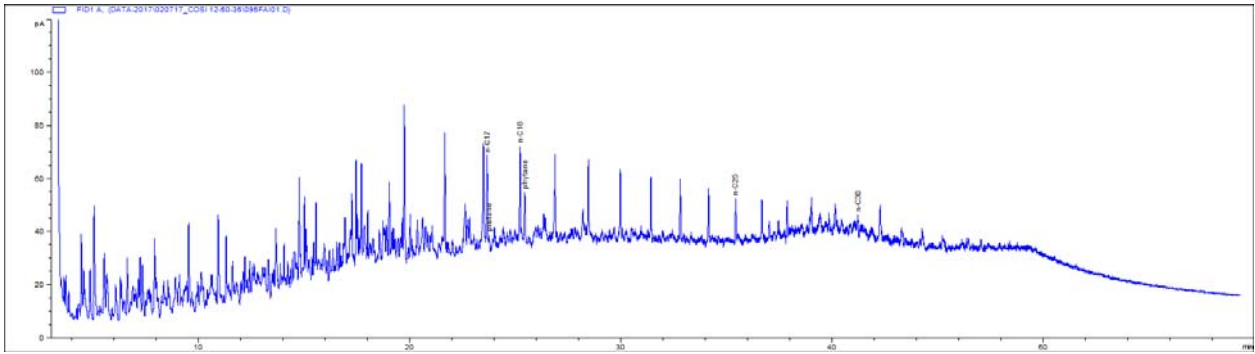
2012-0245 Oseberg Sør



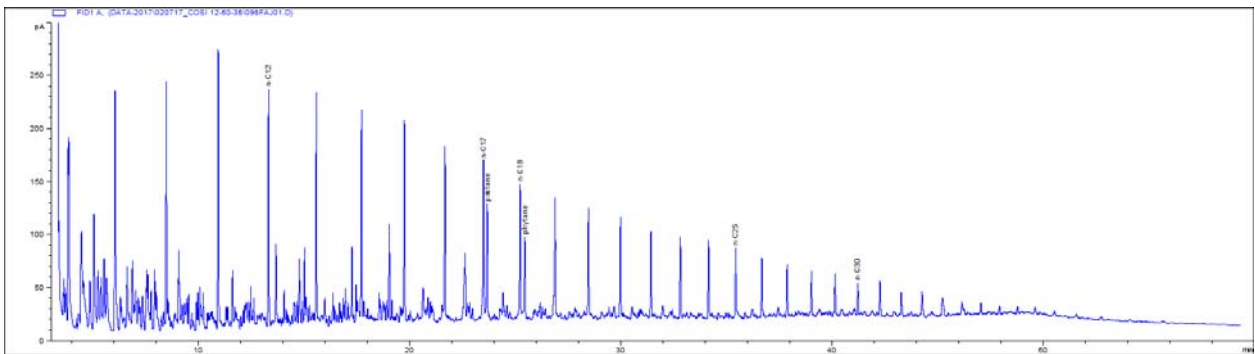
2012-0246 Brage



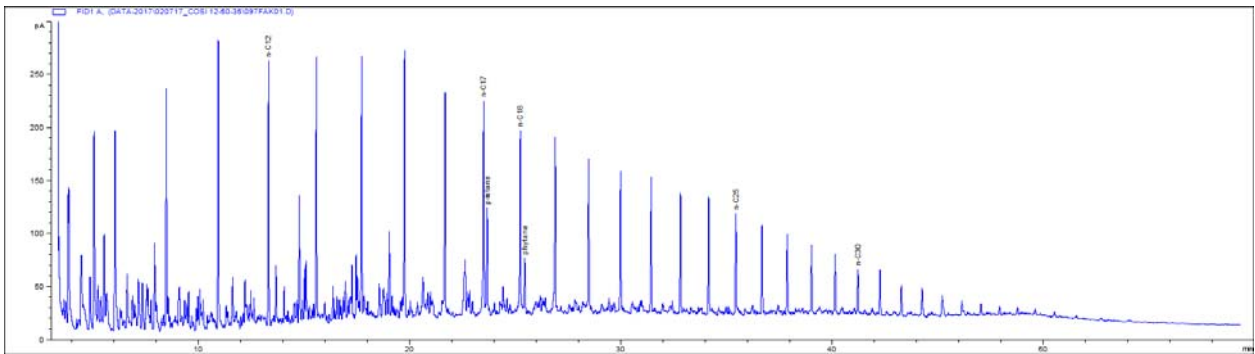
2012-0247 Oseberg C



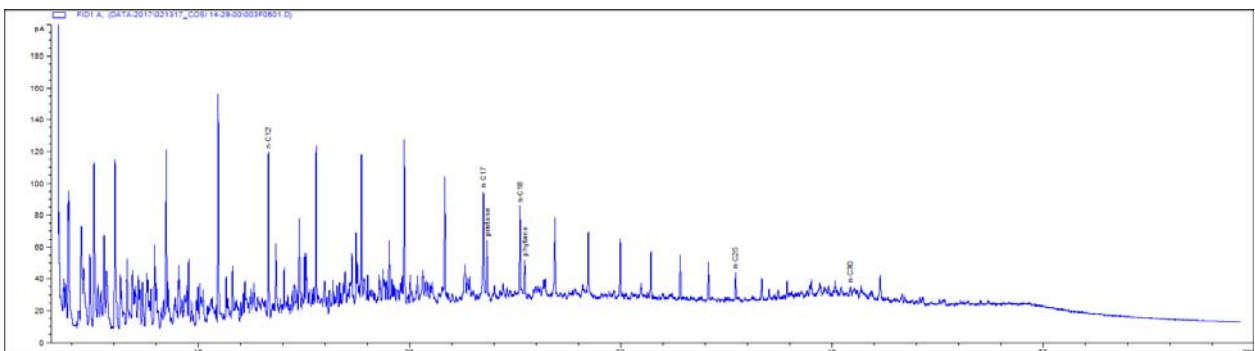
2012-0331 Grane



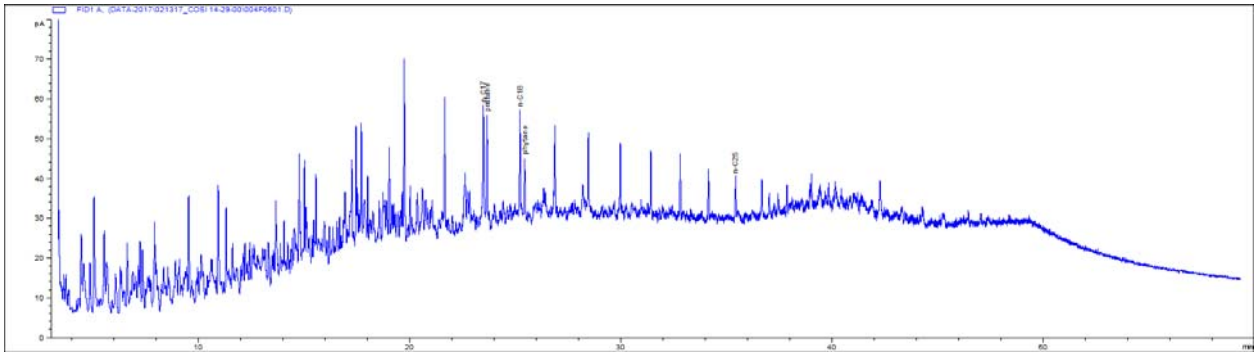
2012-0333 Oseberg Øst



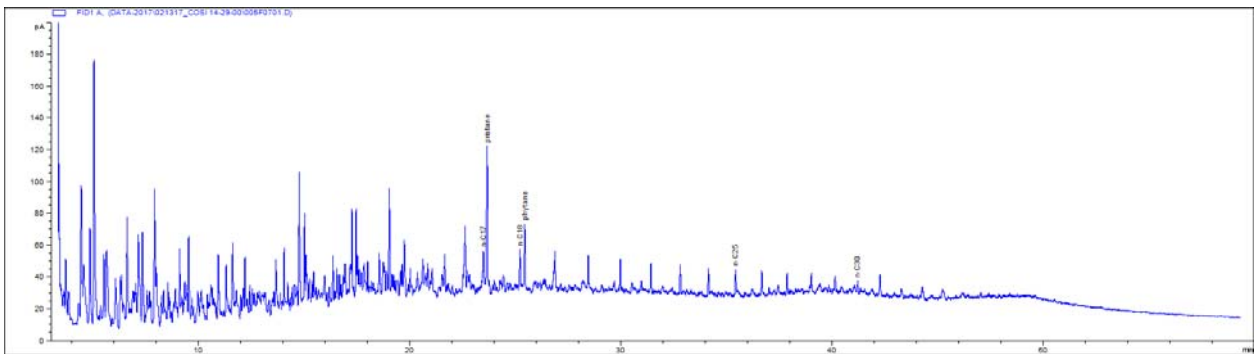
2012-0340 Fram



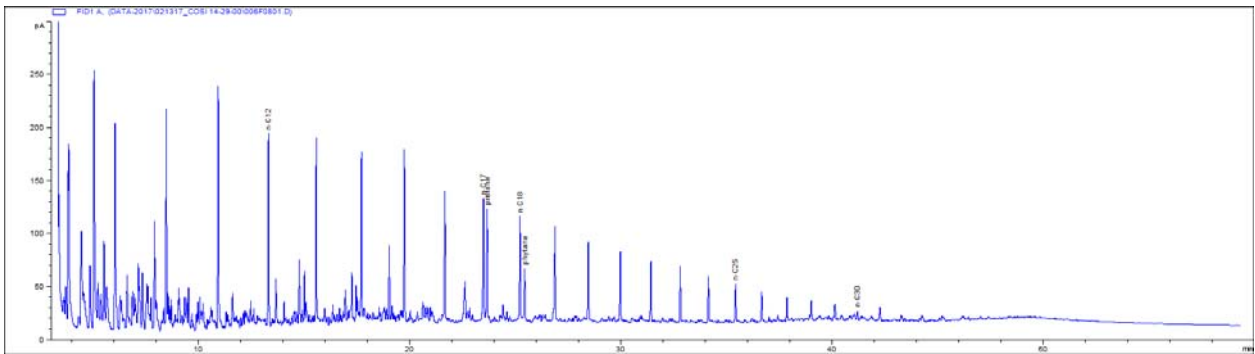
2012-0341 Oseberg A



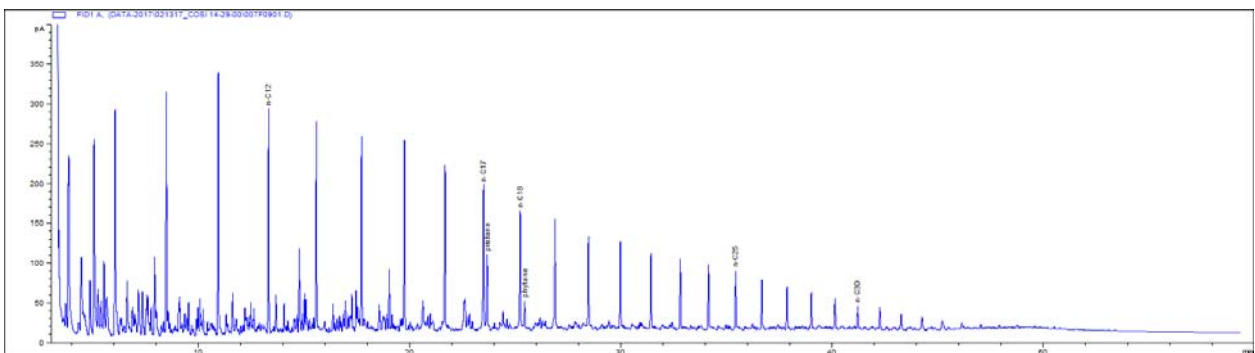
2012-0556 Grane



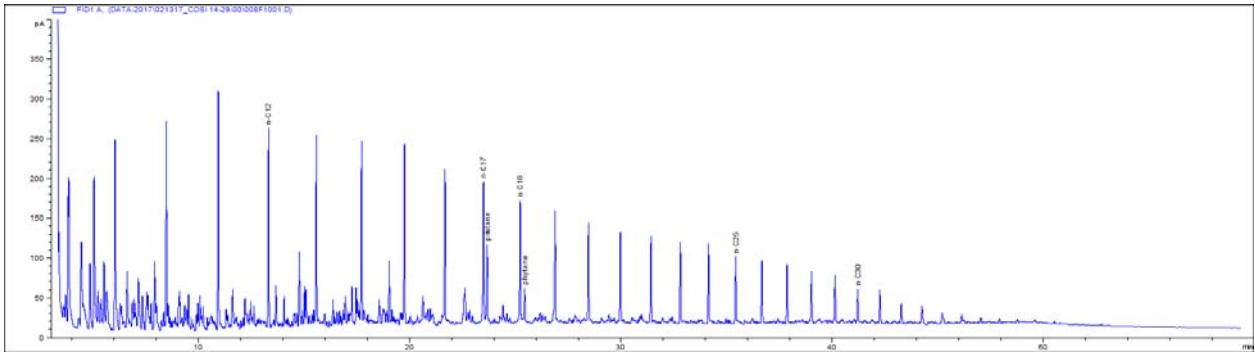
2013-0409 Troll B



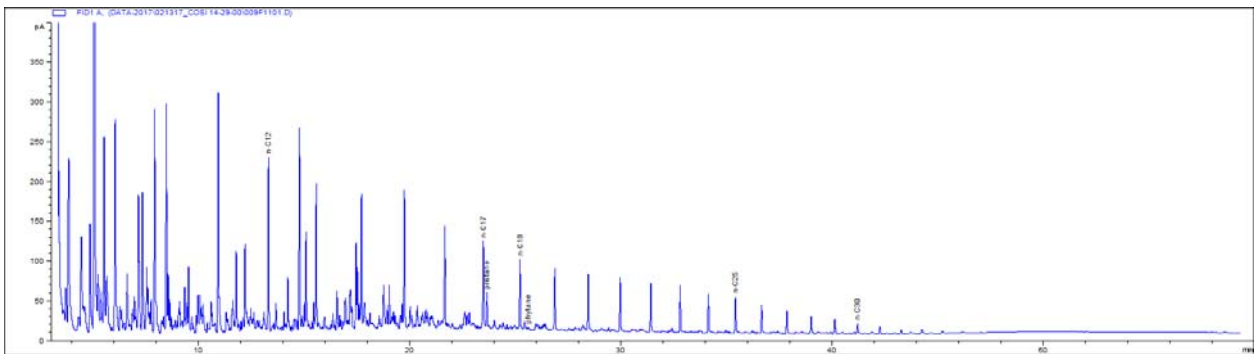
2013-0580 Luno II



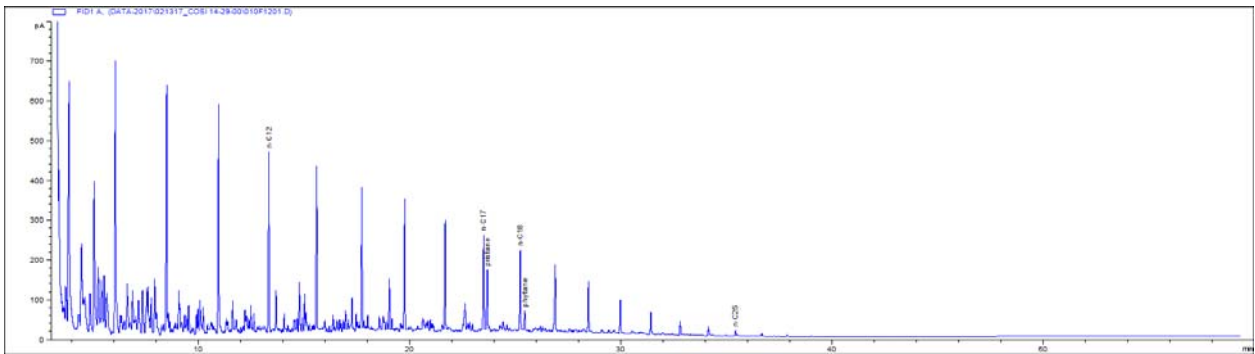
2013-0582 Vale



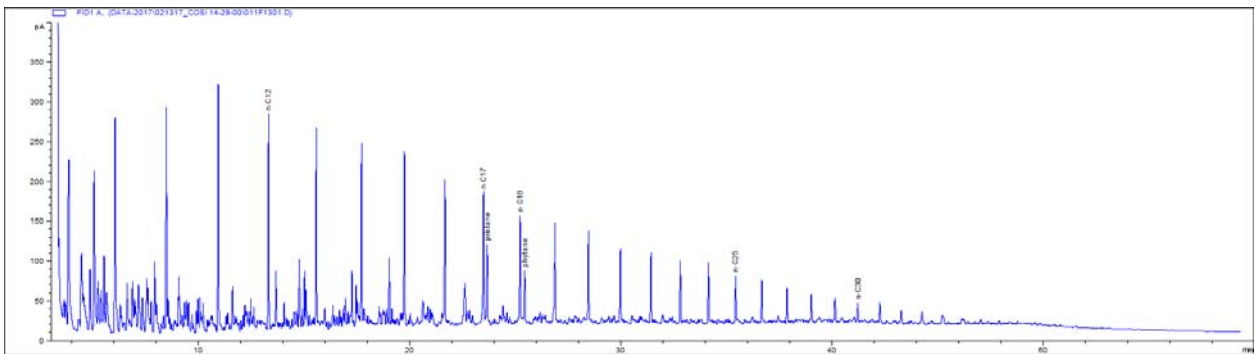
2013-0595 Skarfjell



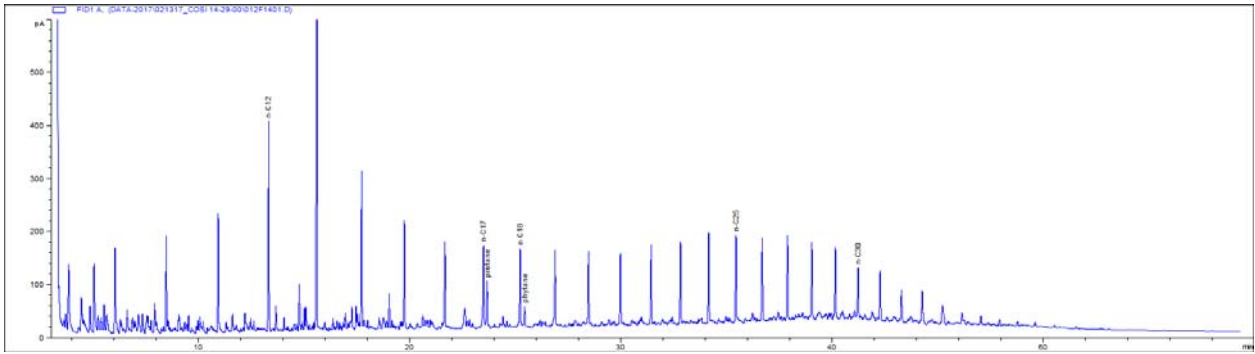
2013-0833 Skarv



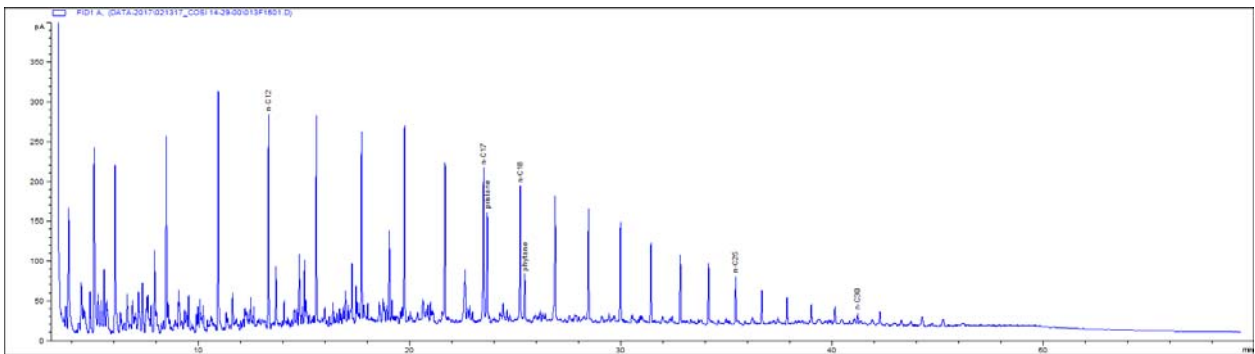
2014-0076 Marul



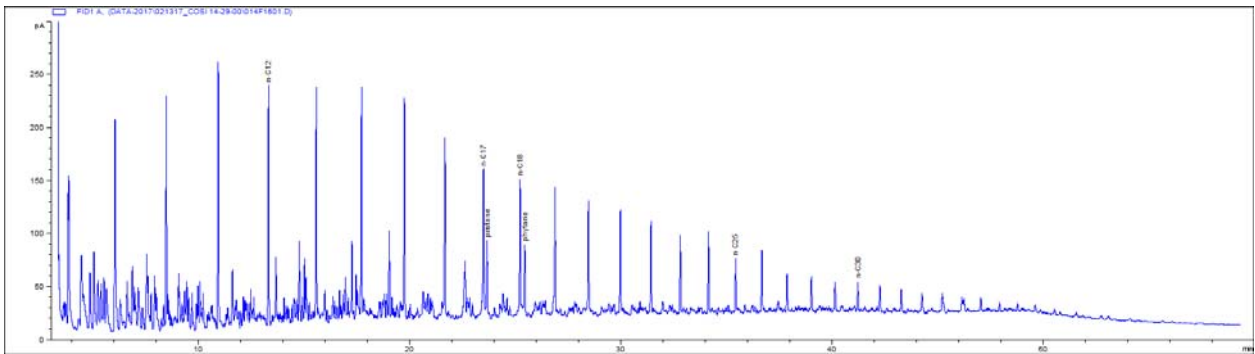
2014-0081 Statfjord



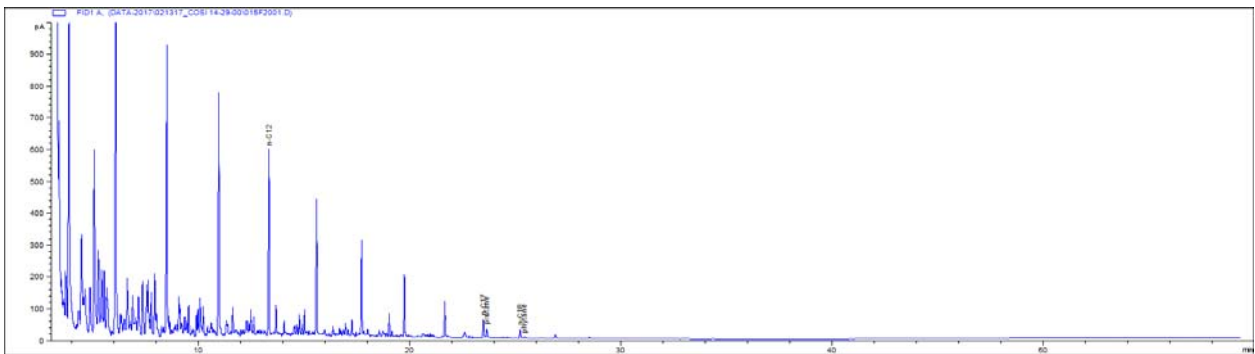
2014-0094 Pil



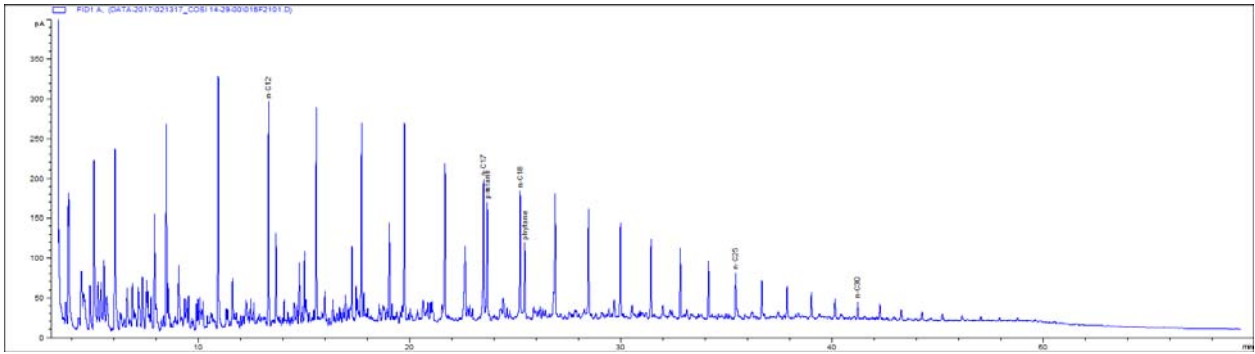
2014-0116 Drivis



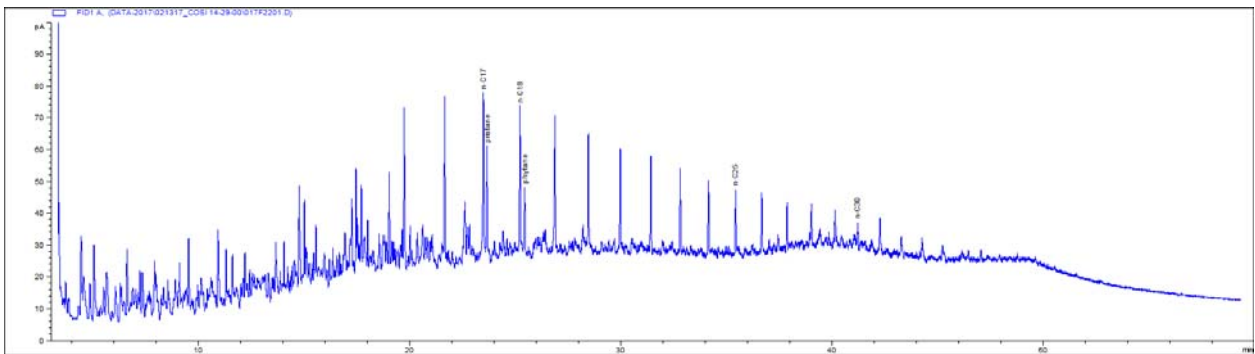
2014-0336 Brynhild



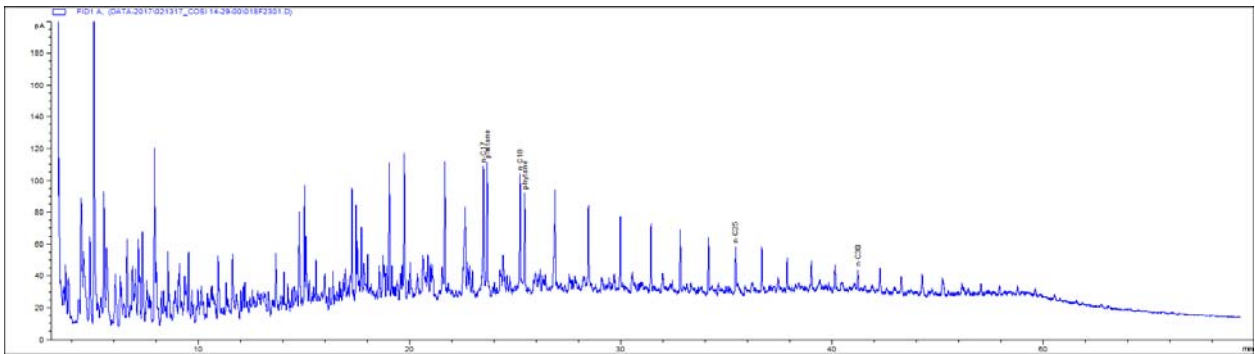
2014-0571 Ormen Lange



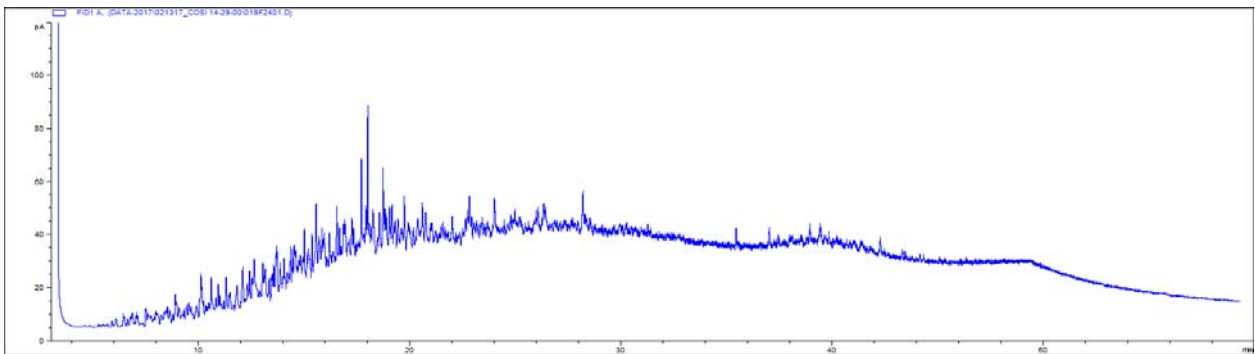
2015-0029 Alta



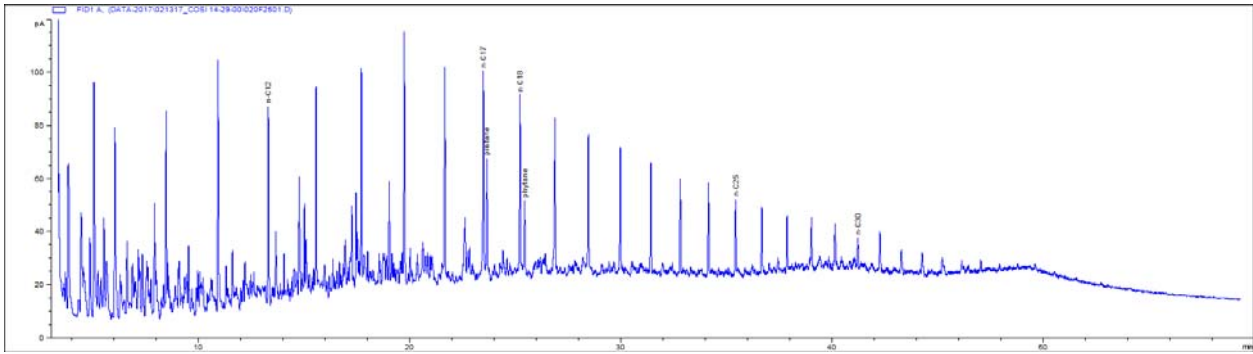
2015-0061 Grane



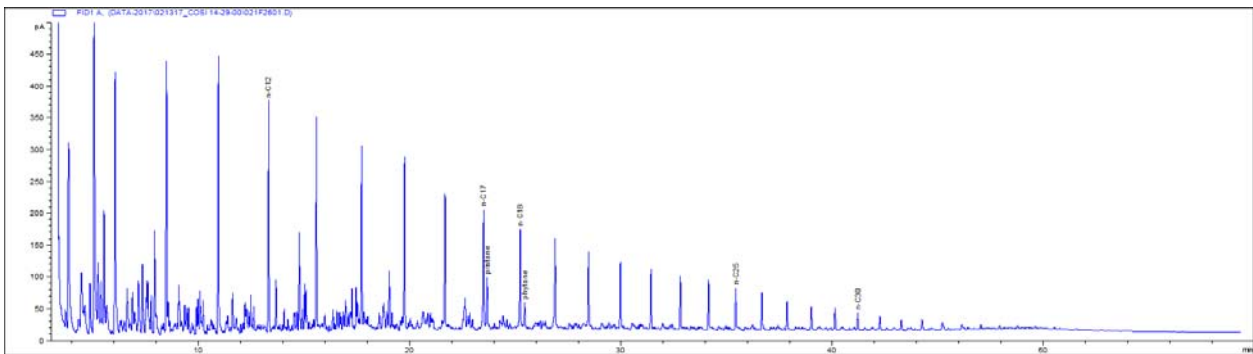
2015-0063 Bøyla



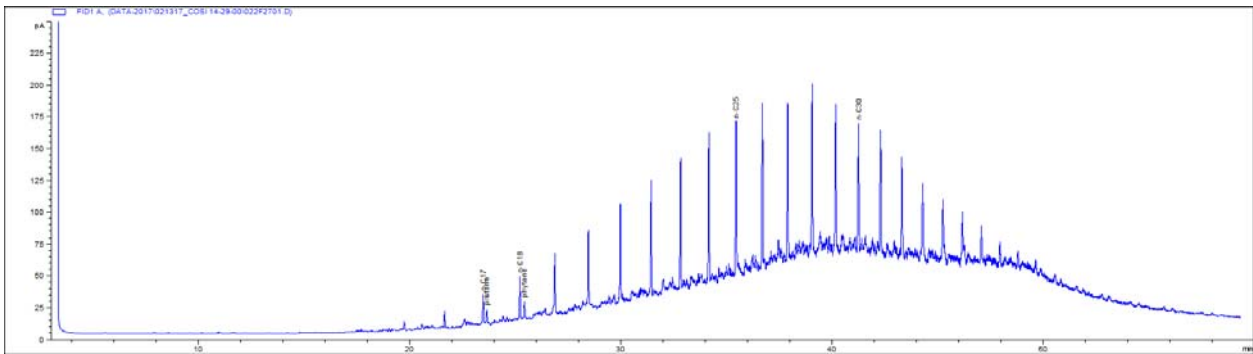
2015-0546 Martin Linge



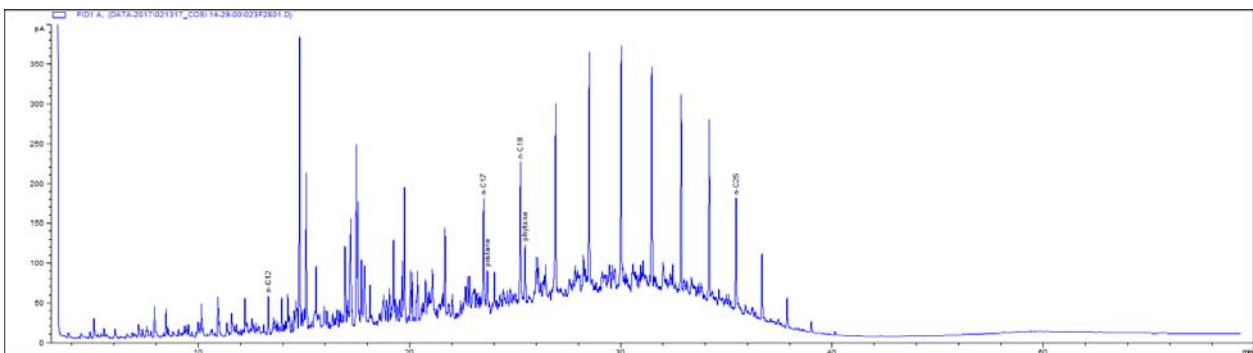
MC-2016-84 Grane Blend



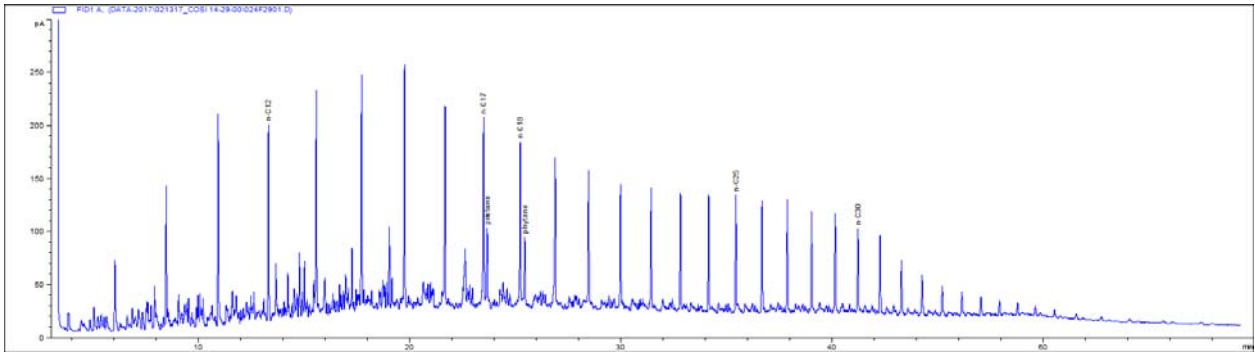
MC-2016-194 Martin Linge kondensat



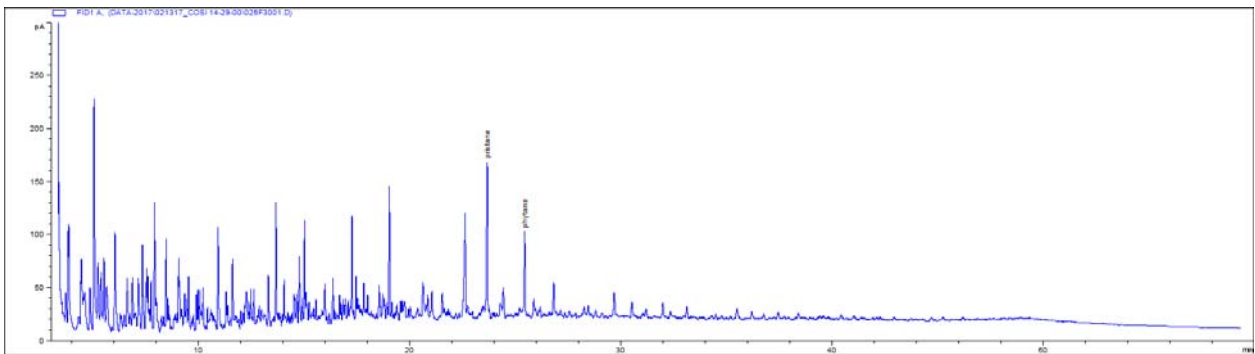
2016-0231 HDME



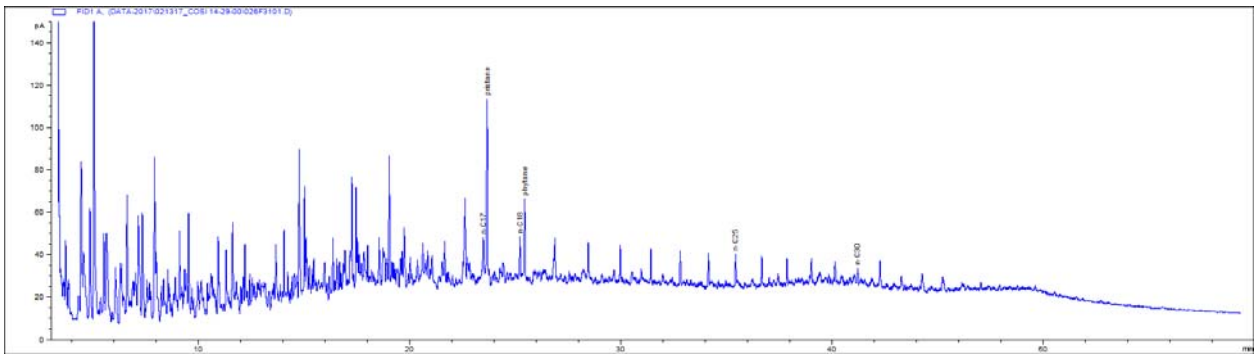
2016-0232 DMA



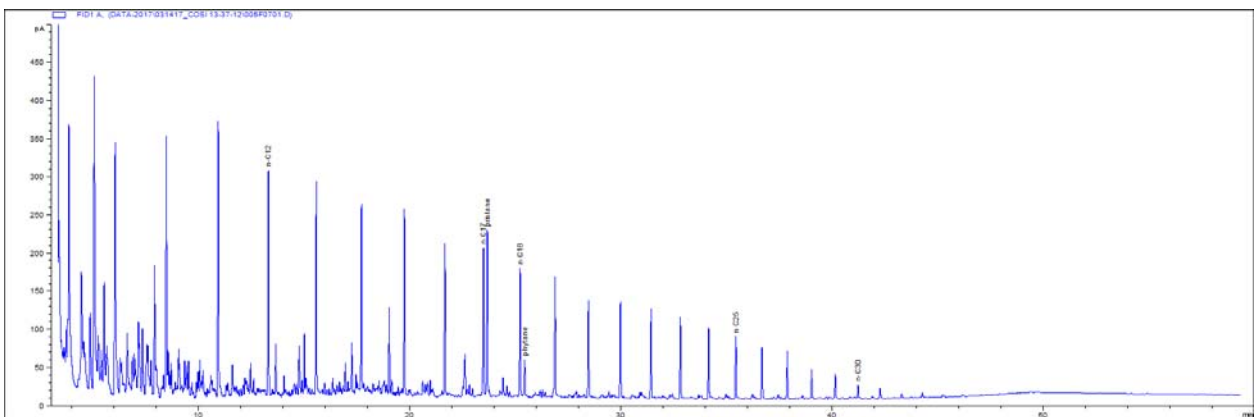
2016-0233 ULSFO



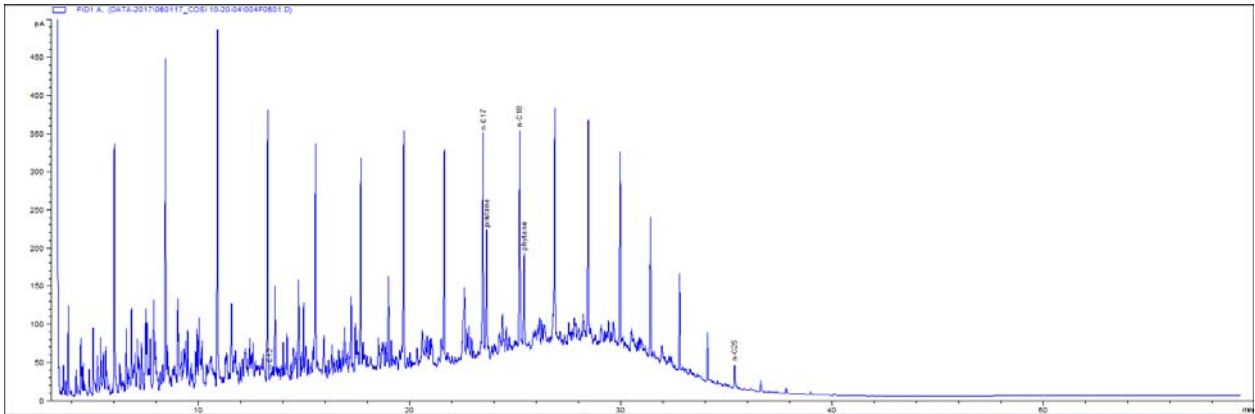
MC-2016-320 Wisting



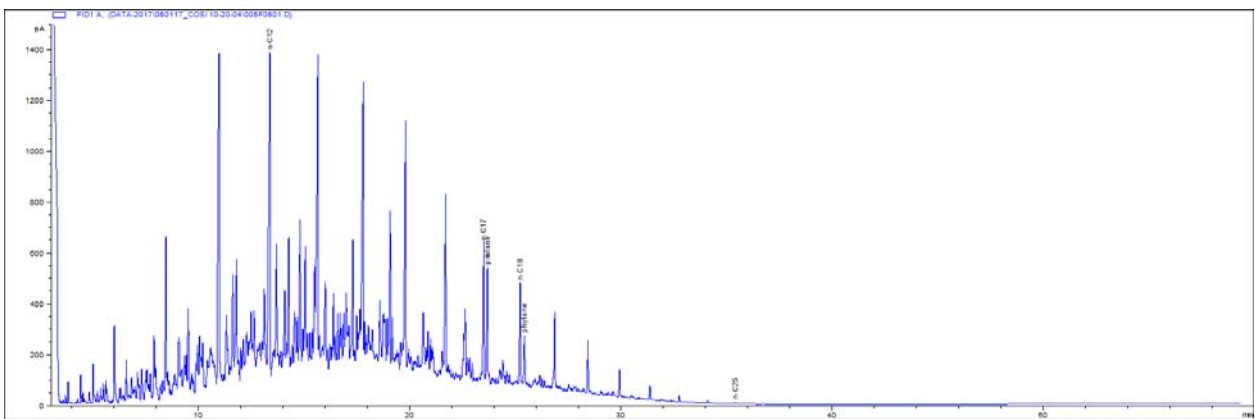
MC-2016-360 Troll (NTNU)



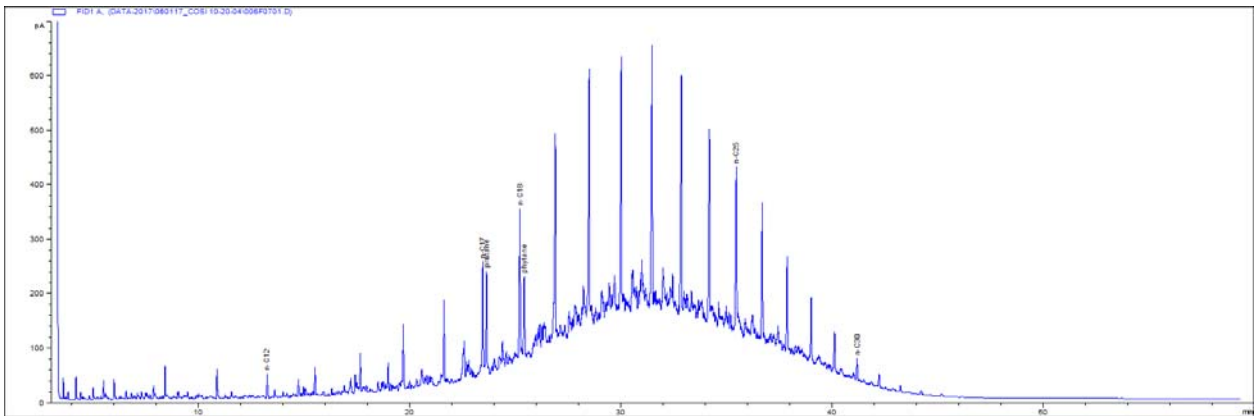
2017-113-C1 Sigyn



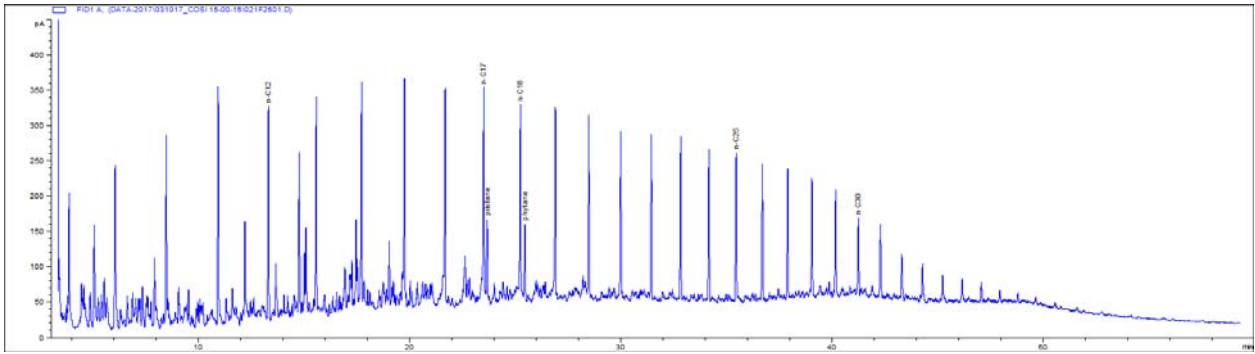
2014-0551



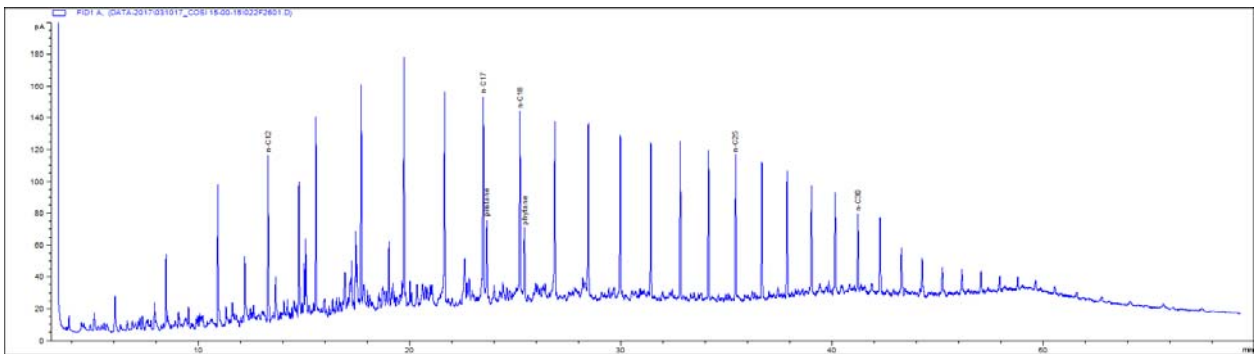
2014-0552



2014-0553



SINTEF-MIX

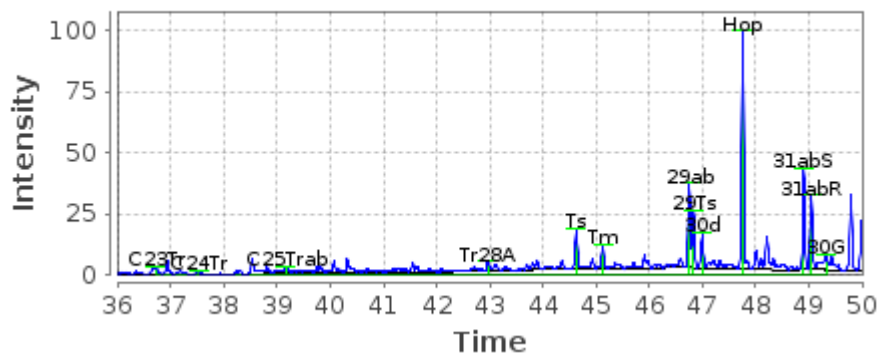


SINTEF-MIX ny

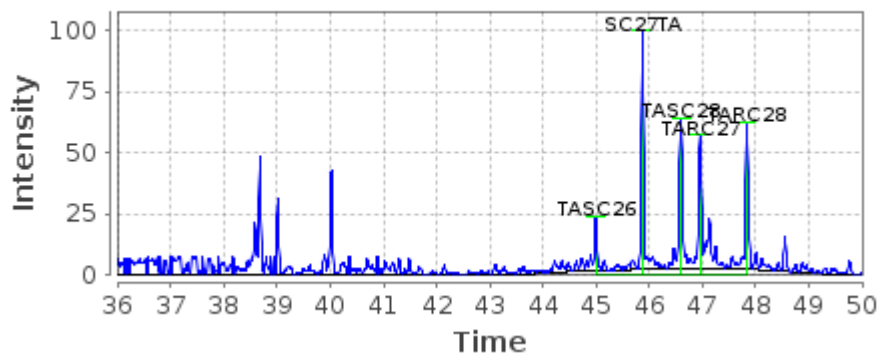
C Vedlegg C: Ionekromatogram fra GC/MS

H3958 Yme

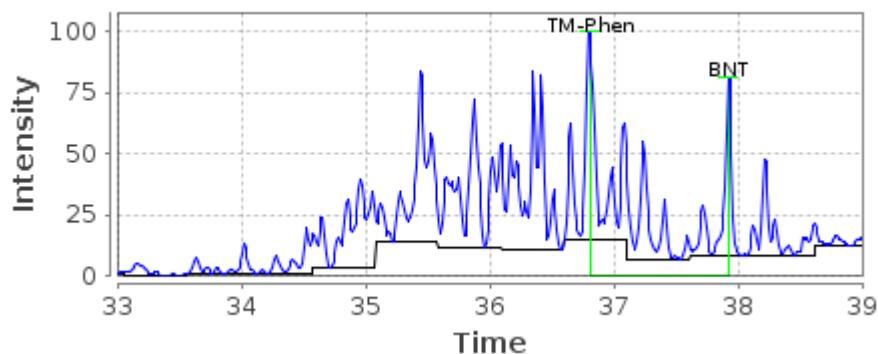
M/Z 191, No-1-18.1



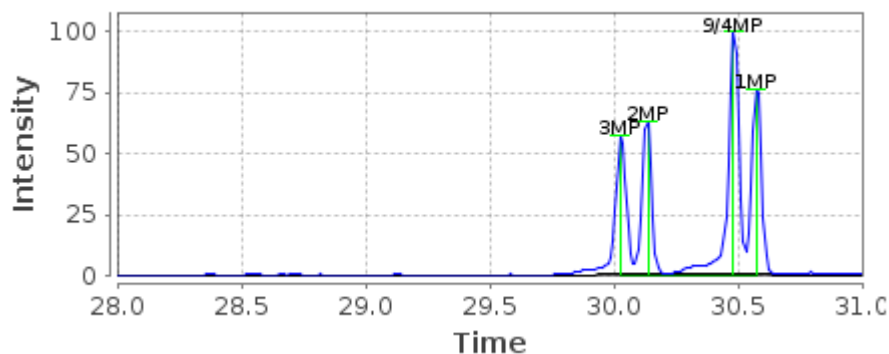
M/Z 231, No-1-18.1



M/Z 234, No-1-18.1

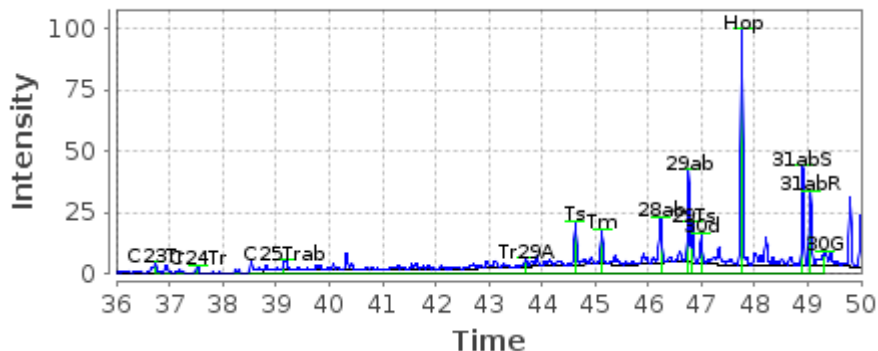


M/Z 192, No-1-18.1

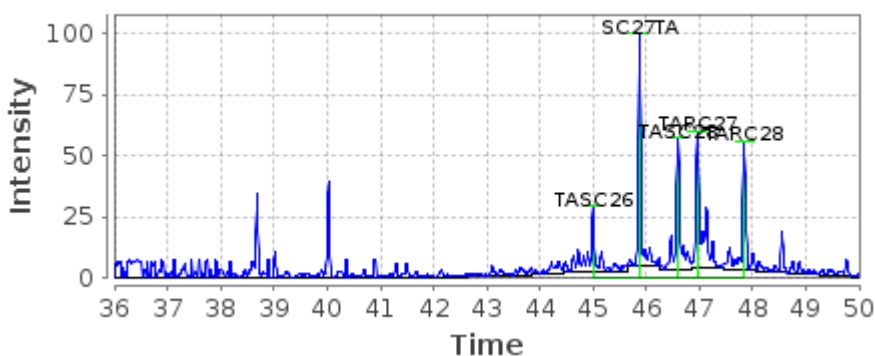


H4363 Tordis

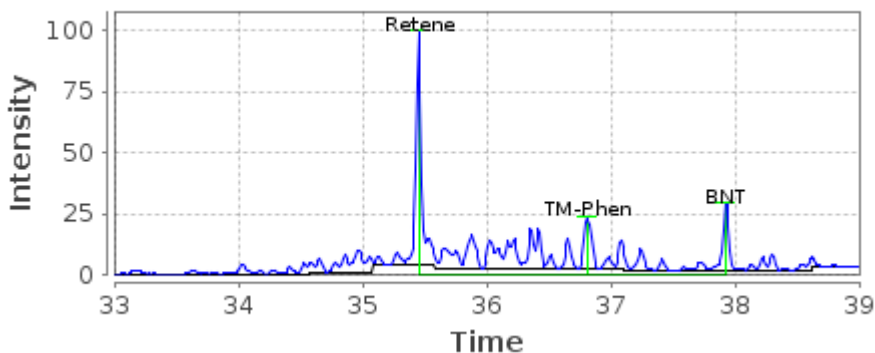
M/Z 191, No-1-18.3



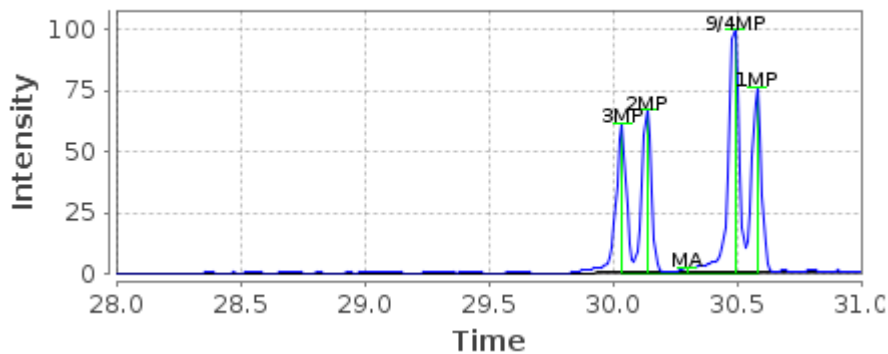
M/Z 231, No-1-18.3



M/Z 234, No-1-18.3

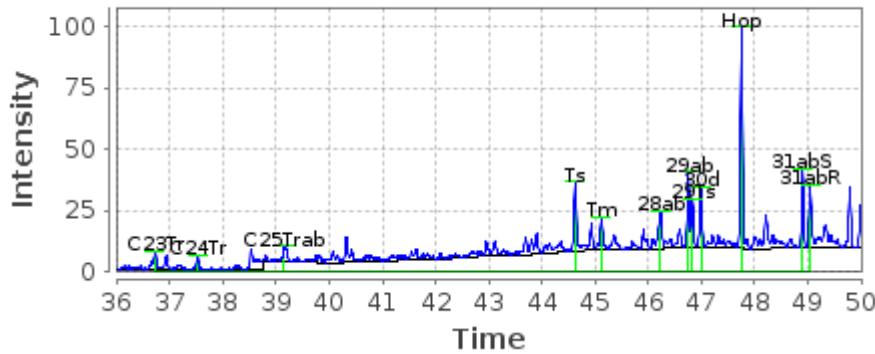


M/Z 192, No-1-18.3

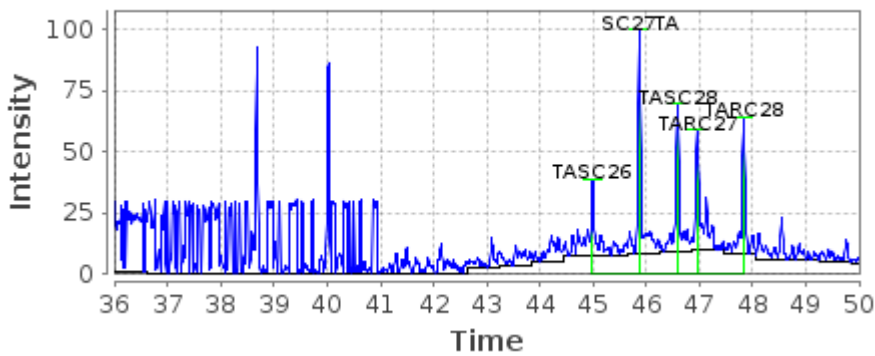


1997-0006 Njård

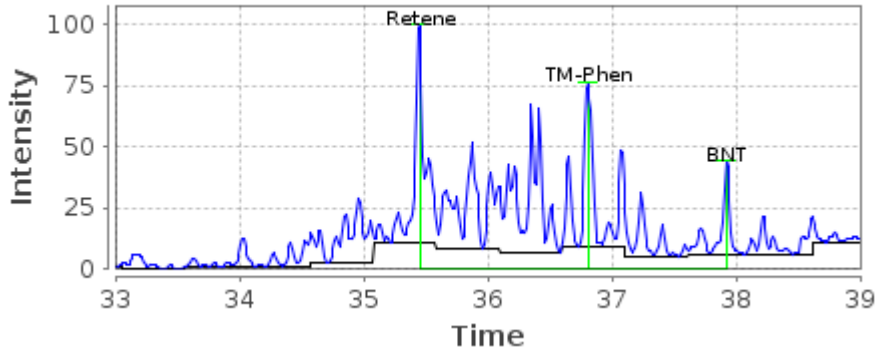
M/Z 191, No-1-18.5



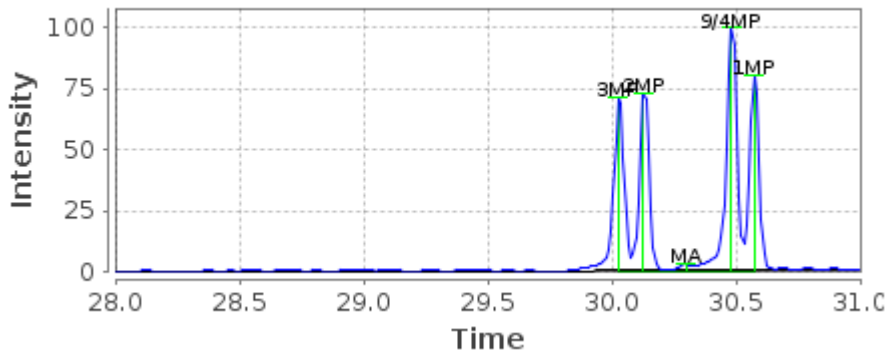
M/Z 231, No-1-18.5



M/Z 234, No-1-18.5

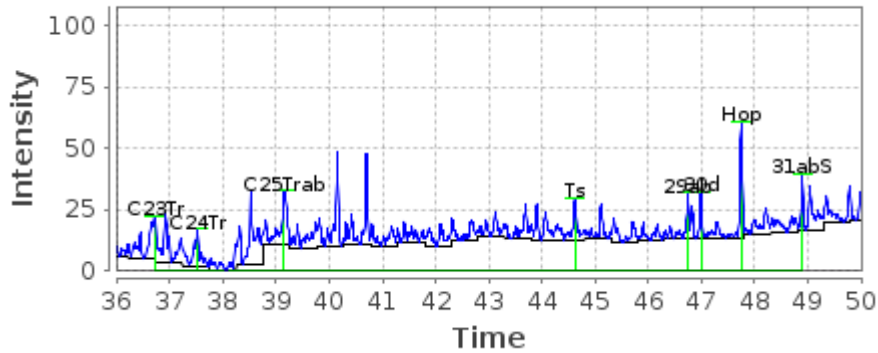


M/Z 192, No-1-18.5

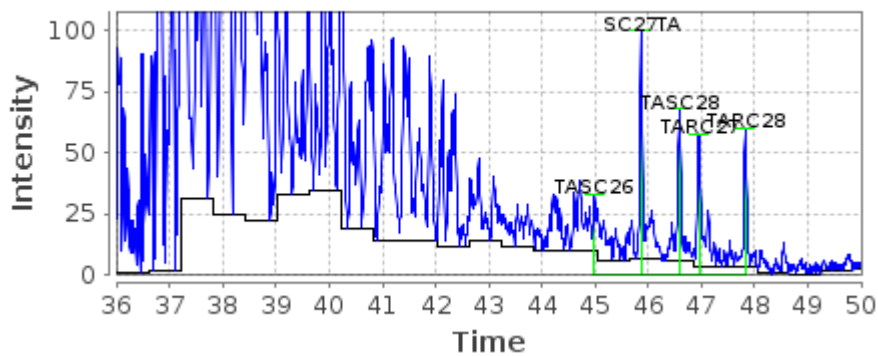


1997-0016 Kristin

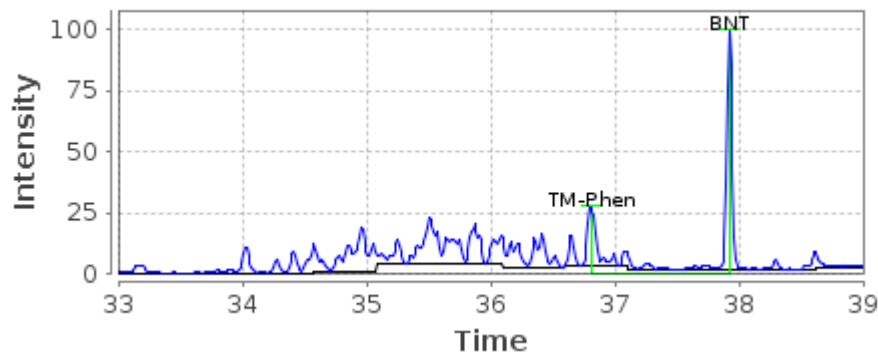
M/Z 191, No-1-18.7



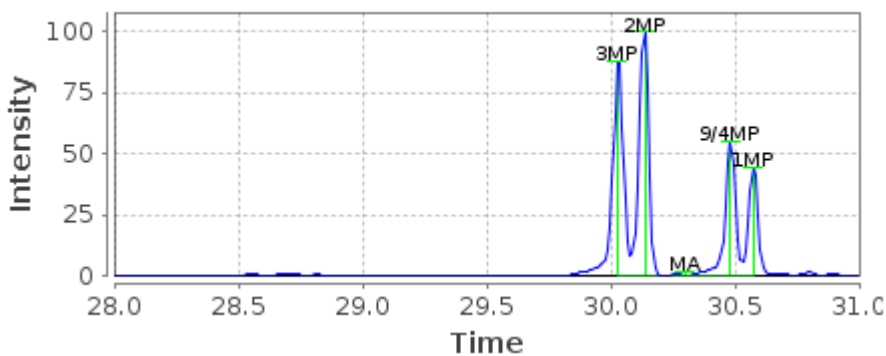
M/Z 231, No-1-18.7



M/Z 234, No-1-18.7

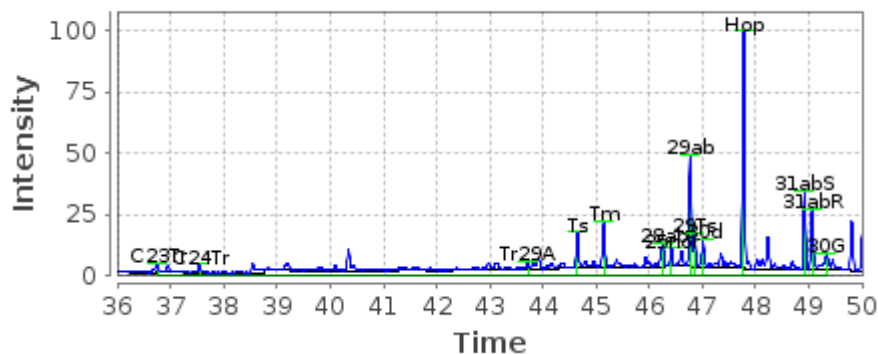


M/Z 192, No-1-18.7

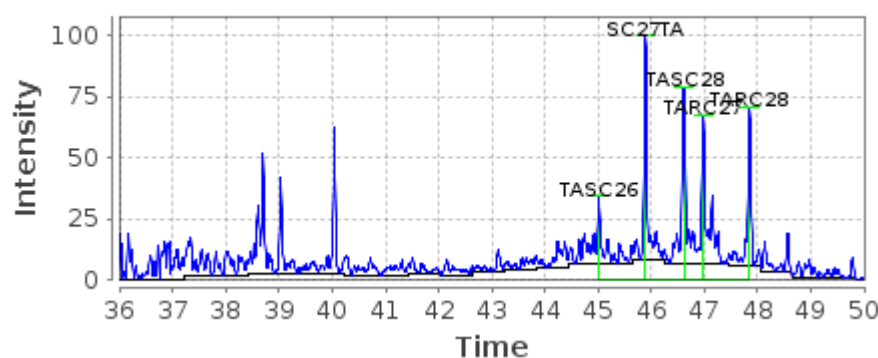


1997-0276 Norne

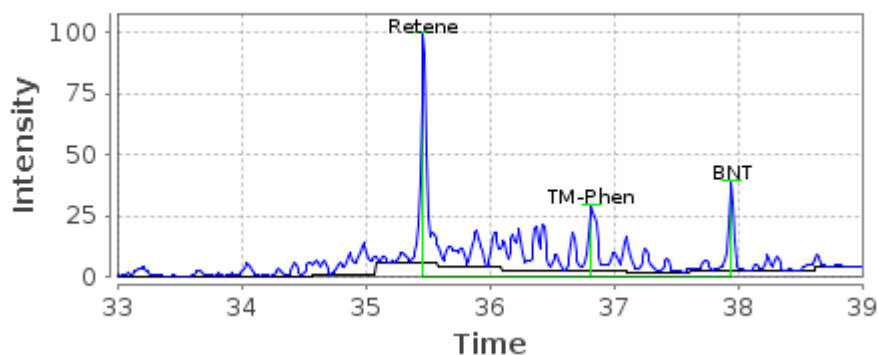
M/Z 191, No-1-18.9



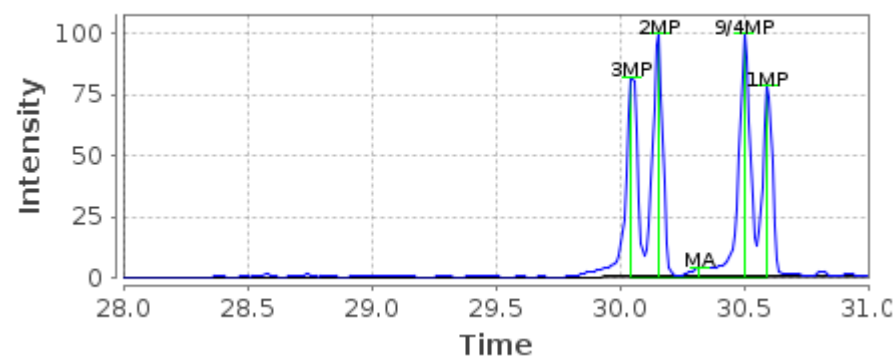
M/Z 231, No-1-18.9



M/Z 234, No-1-18.9

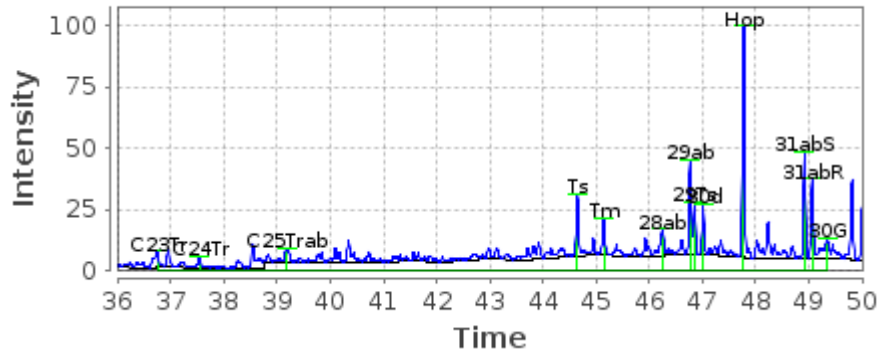


M/Z 192, No-1-18.9

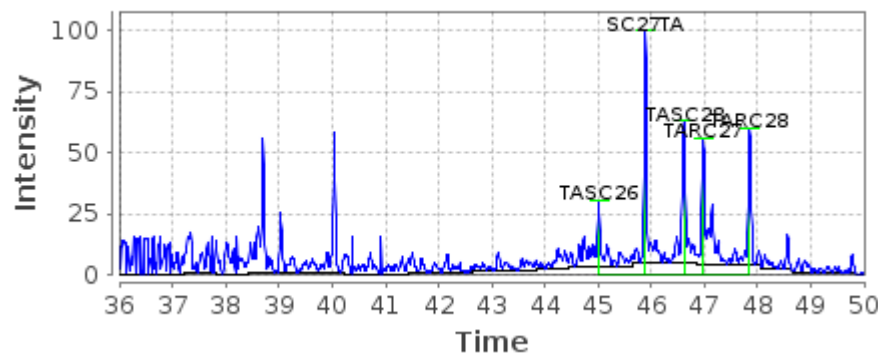


1998-0038 Elli South

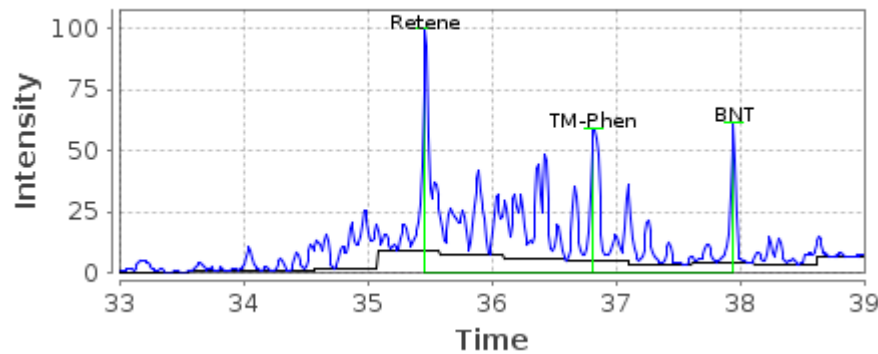
M/Z 191, No-1-18.11



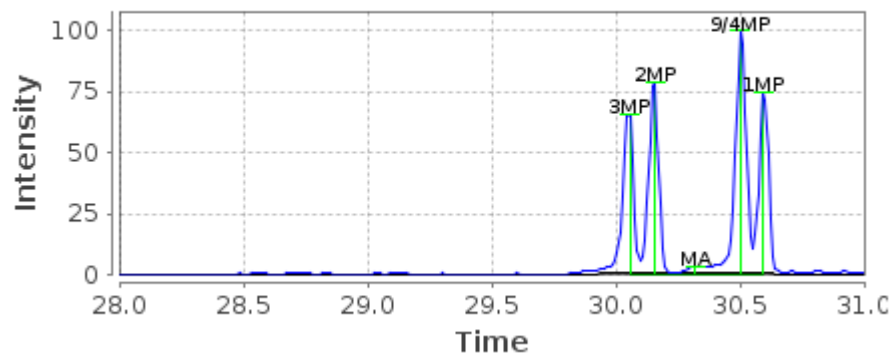
M/Z 231, No-1-18.11



M/Z 234, No-1-18.11

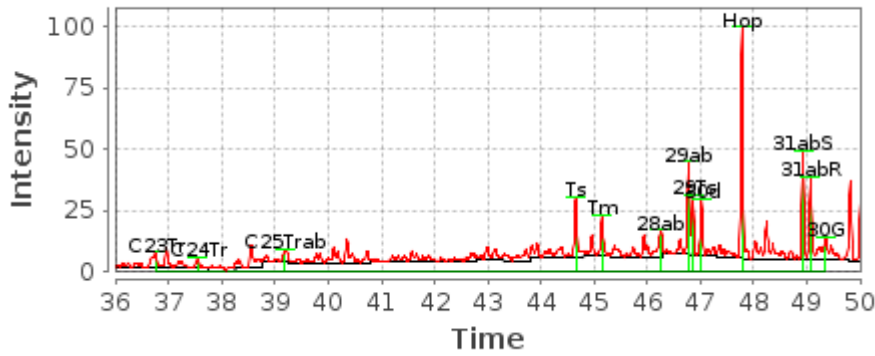


M/Z 192, No-1-18.11

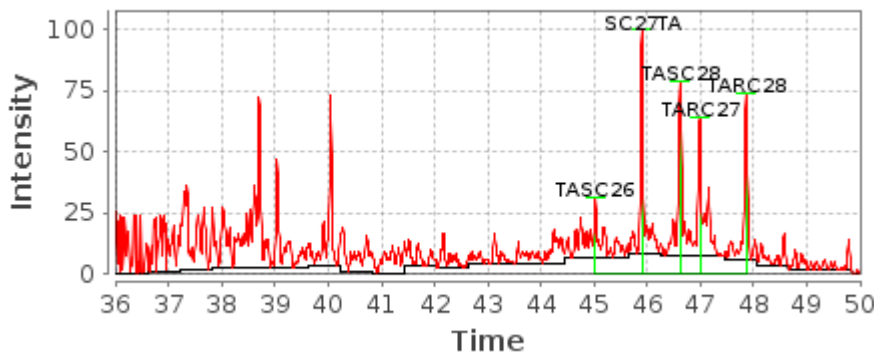


1998-0039 Tau

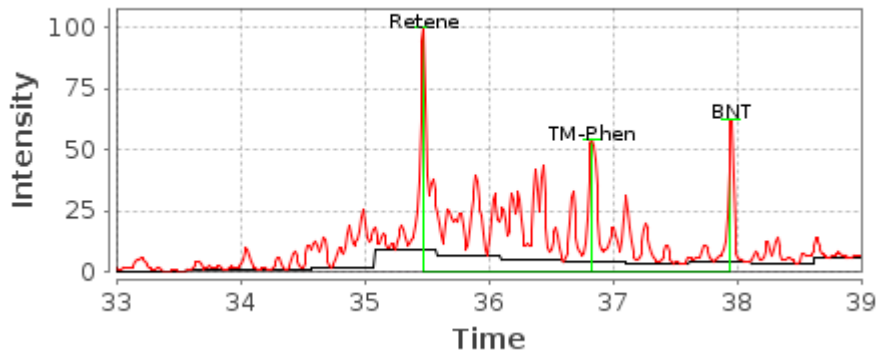
M/Z 191, No-1-18.13



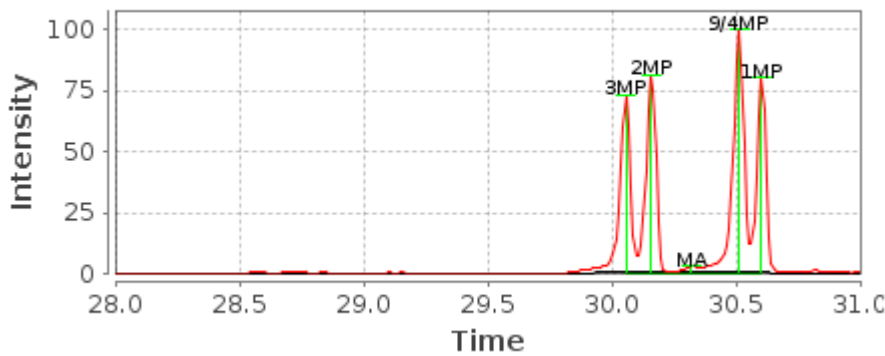
M/Z 231, No-1-18.13



M/Z 234, No-1-18.13

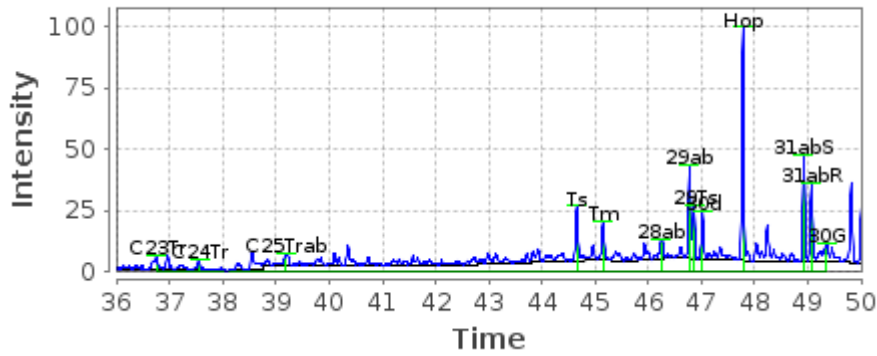


M/Z 192, No-1-18.13

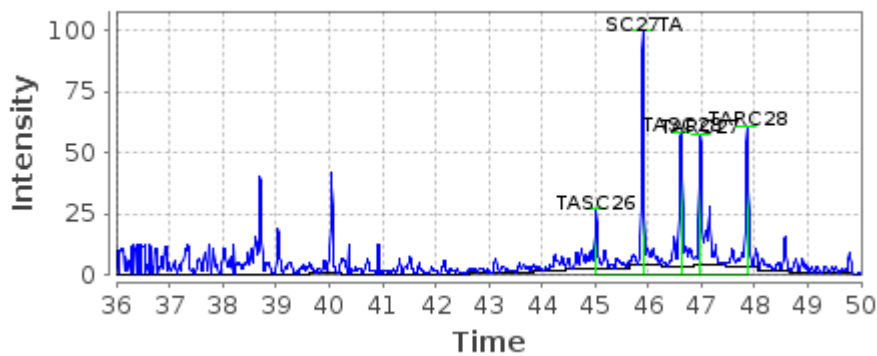


1998-0040 Elli

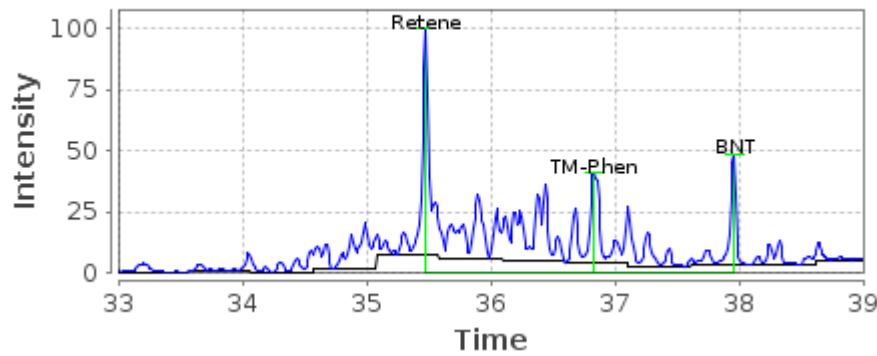
M/Z 191, No-1-18.15



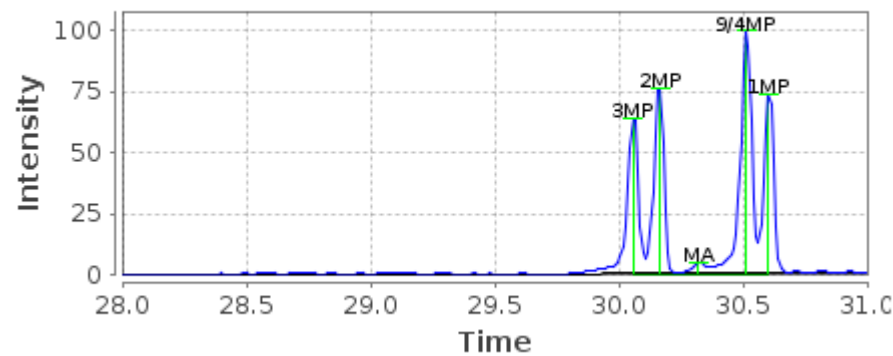
M/Z 231, No-1-18.15



M/Z 234, No-1-18.15

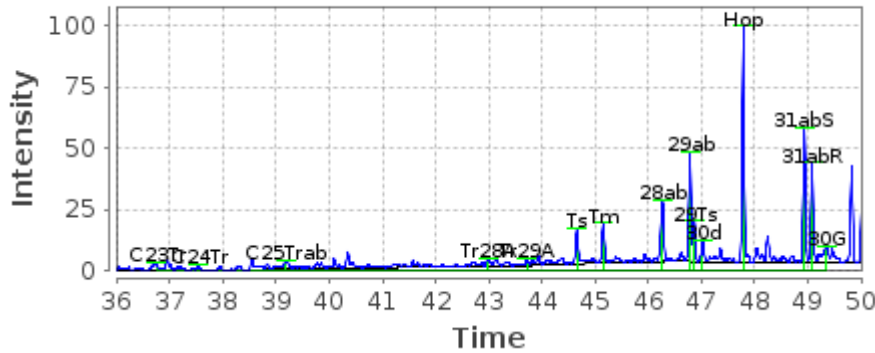


M/Z 192, No-1-18.15

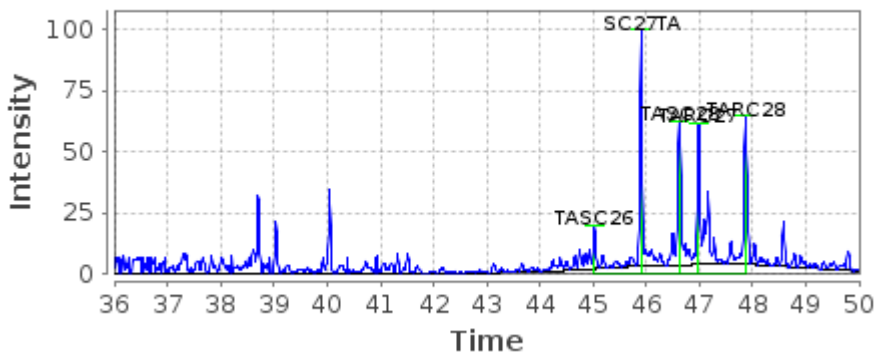


1998-0047 Sleipner vest

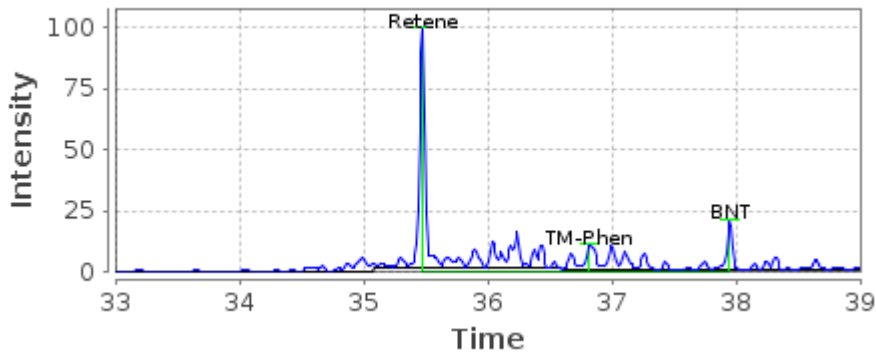
M/Z 191, No-1-18.17



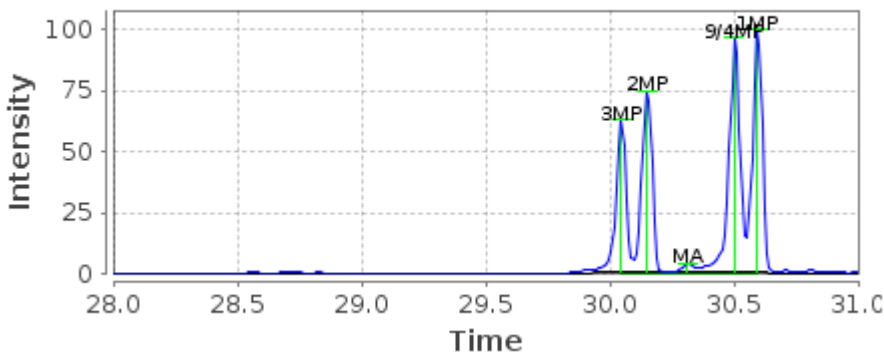
M/Z 231, No-1-18.17



M/Z 234, No-1-18.17

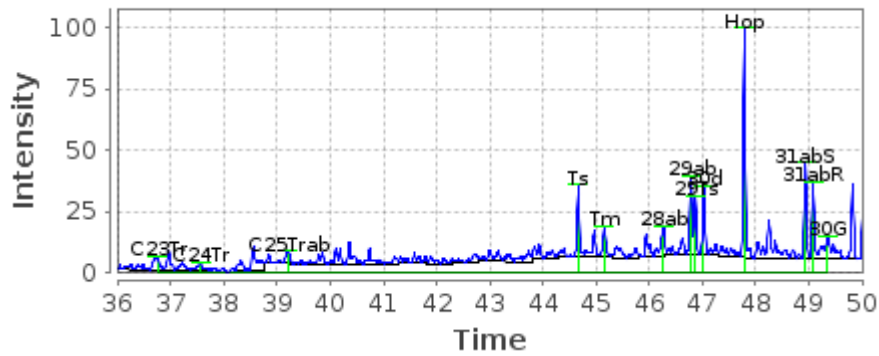


M/Z 192, No-1-18.17

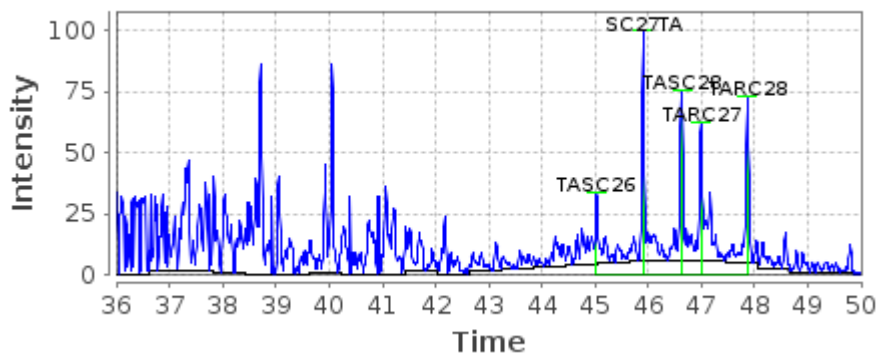


1998-0116 Fram

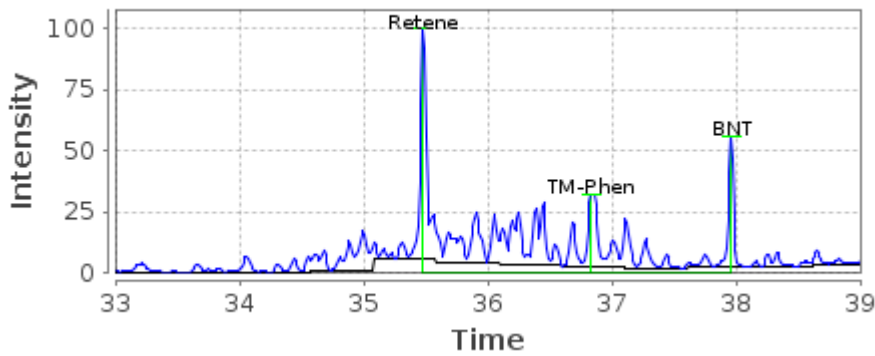
M/Z 191, No-1-18.19



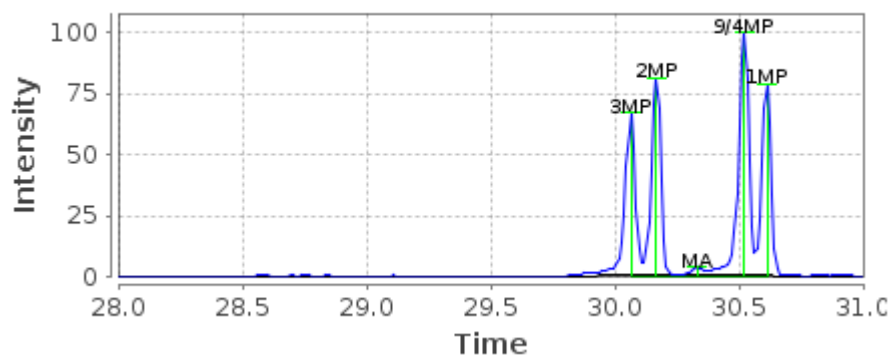
M/Z 231, No-1-18.19



M/Z 234, No-1-18.19

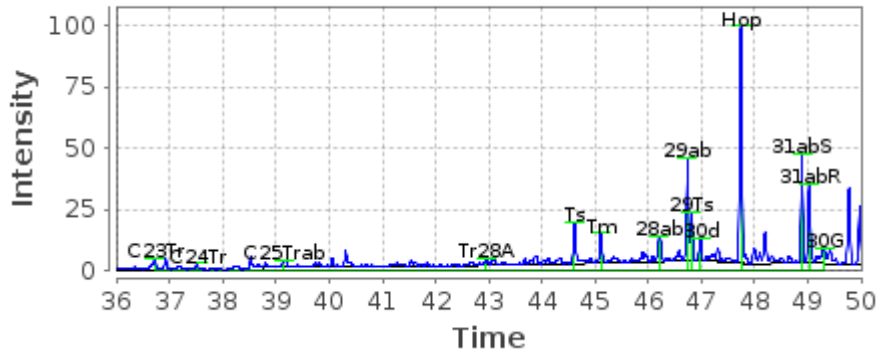


M/Z 192, No-1-18.19

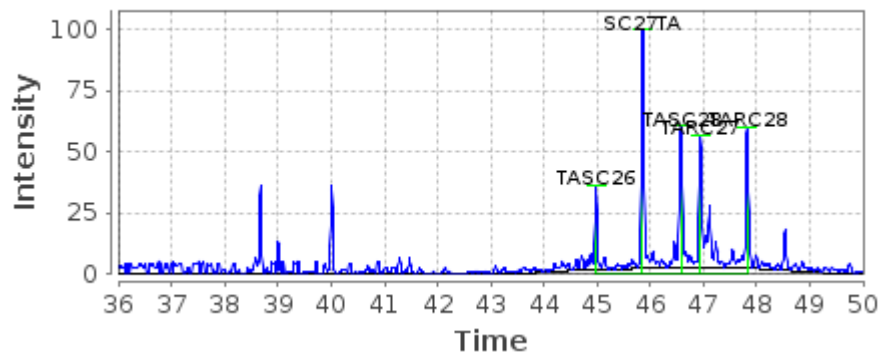


1998-0122

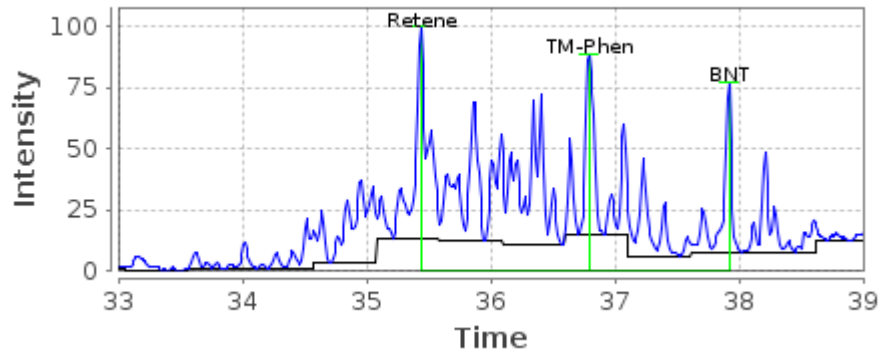
M/Z 191, No-1-18.21



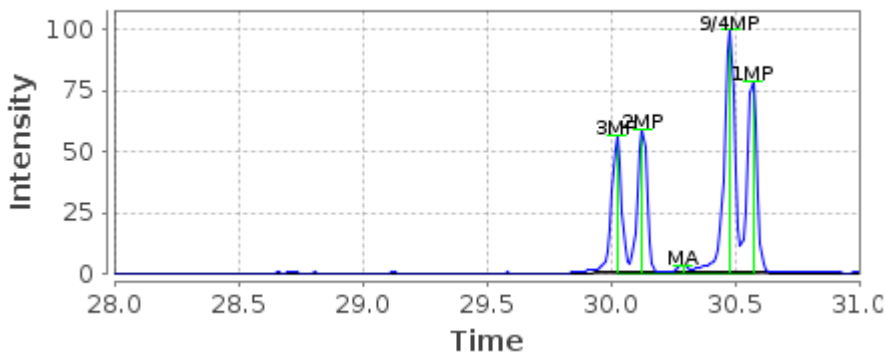
M/Z 231, No-1-18.21



M/Z 234, No-1-18.21

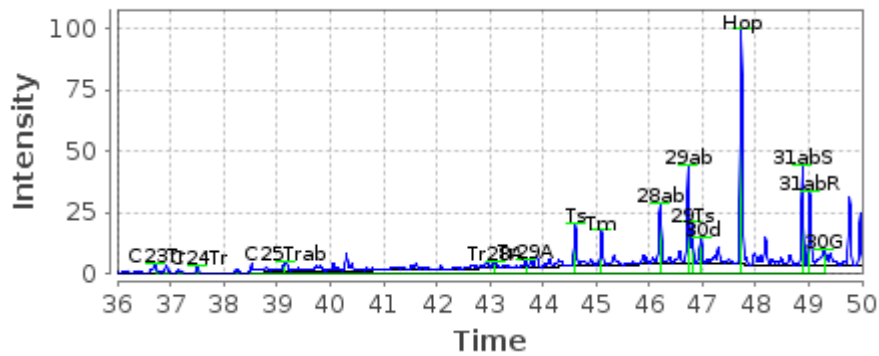


M/Z 192, No-1-18.21

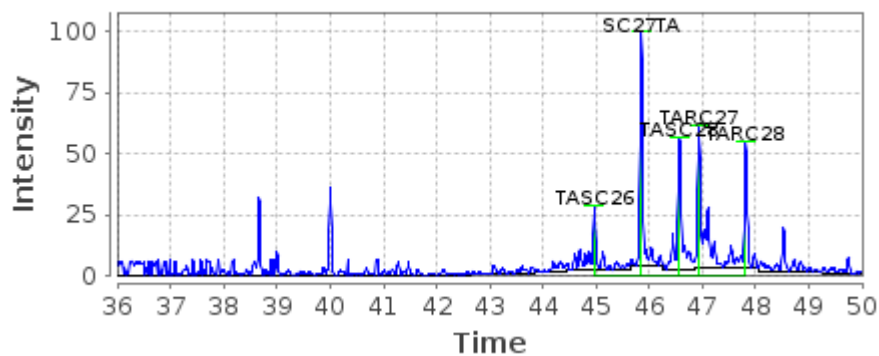


1998-0170 Statfjord

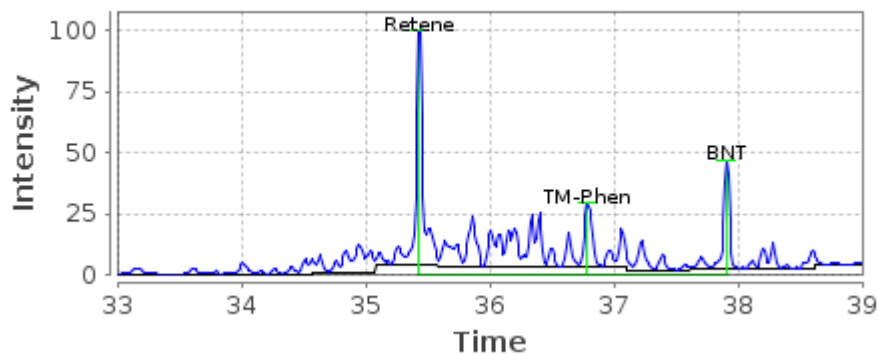
M/Z 191, No-1-18.22



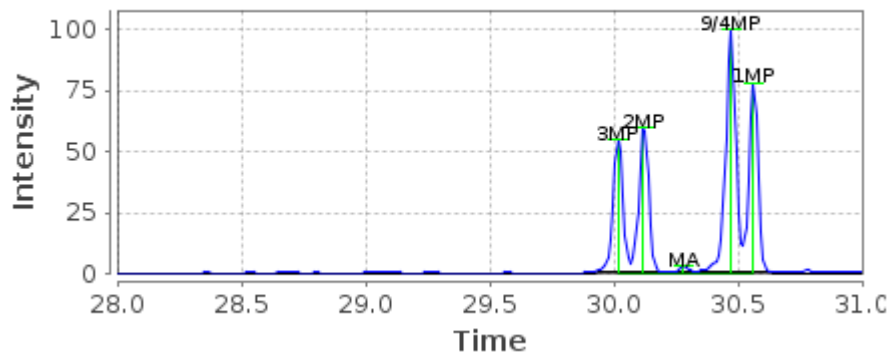
M/Z 231, No-1-18.22



M/Z 234, No-1-18.22

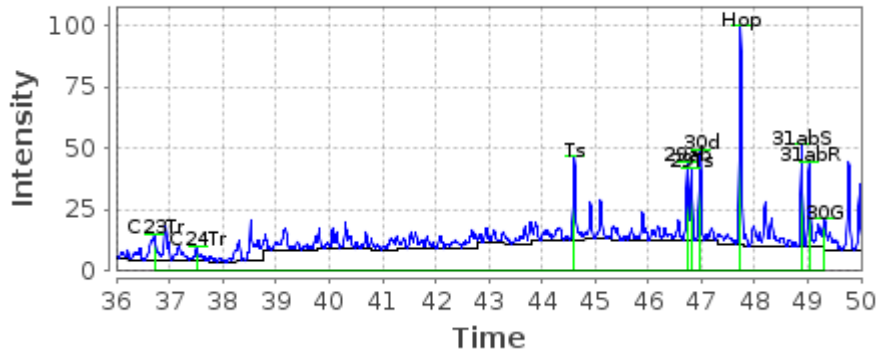


M/Z 192, No-1-18.22

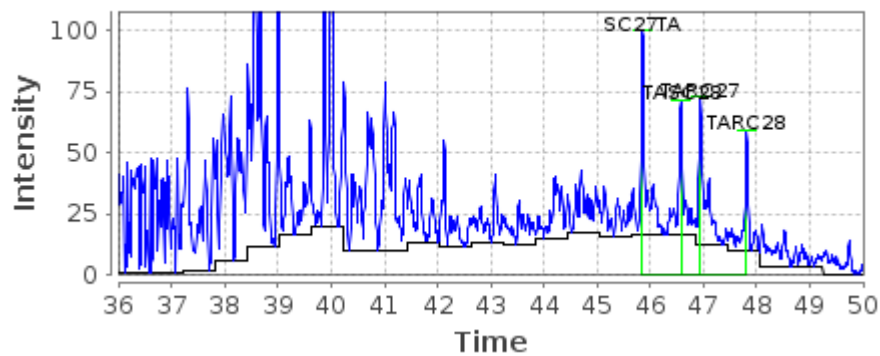


1999-002 Ula

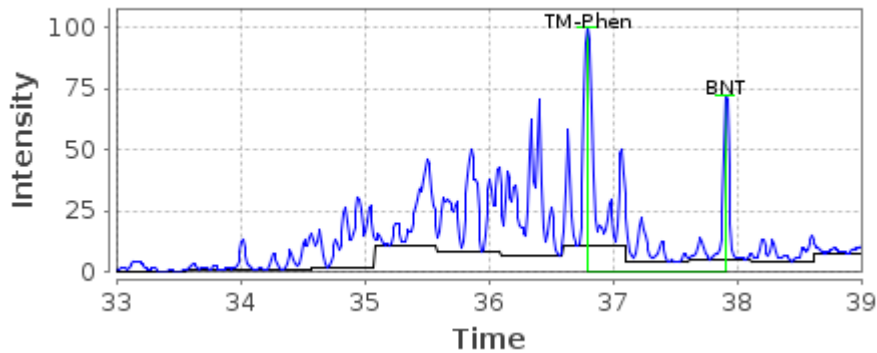
M/Z 191, No-1-18.24



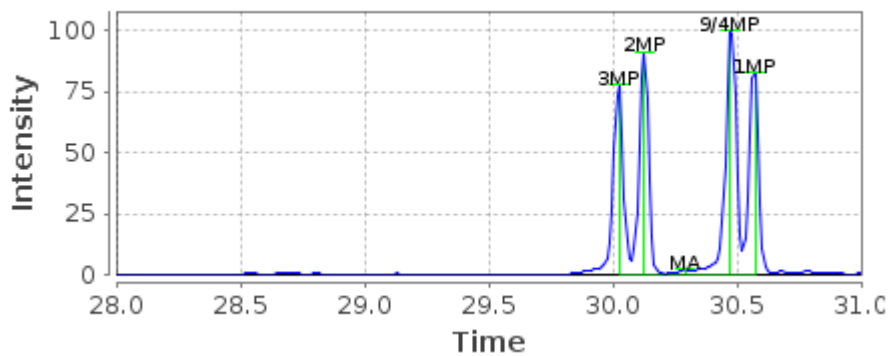
M/Z 231, No-1-18.24



M/Z 234, No-1-18.24

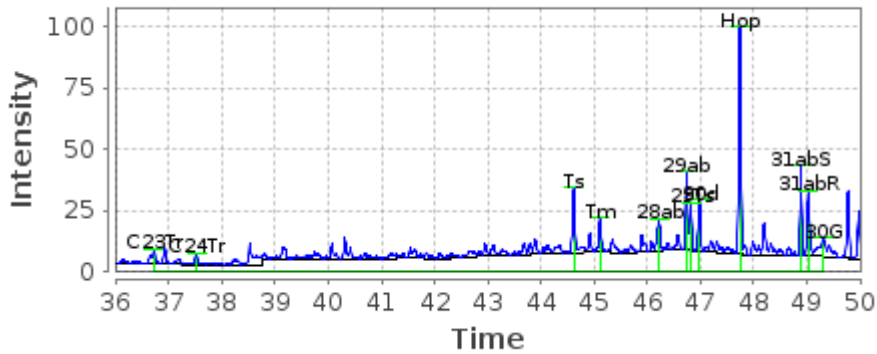


M/Z 192, No-1-18.24

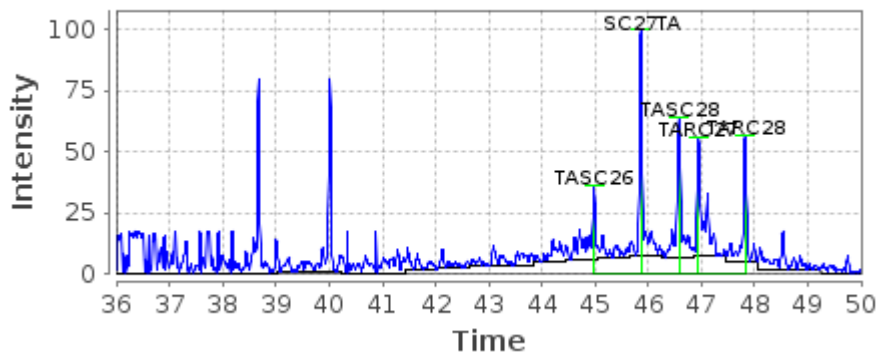


1997-0027 Visund

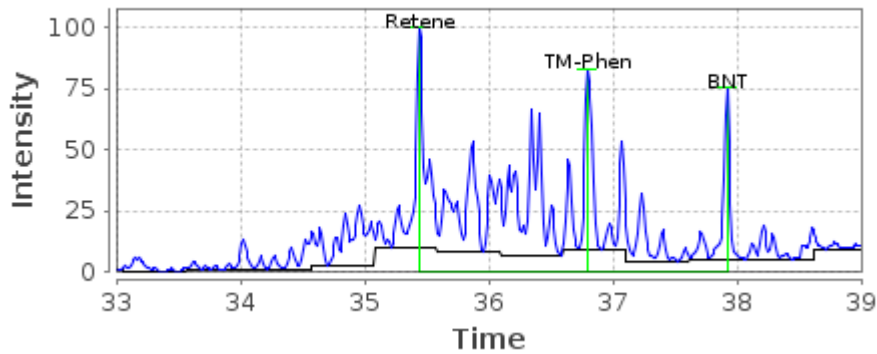
M/Z 191, No-1-18.25



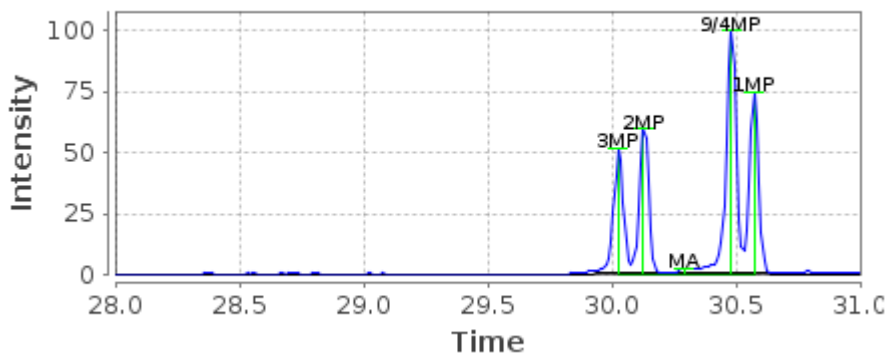
M/Z 231, No-1-18.25



M/Z 234, No-1-18.25

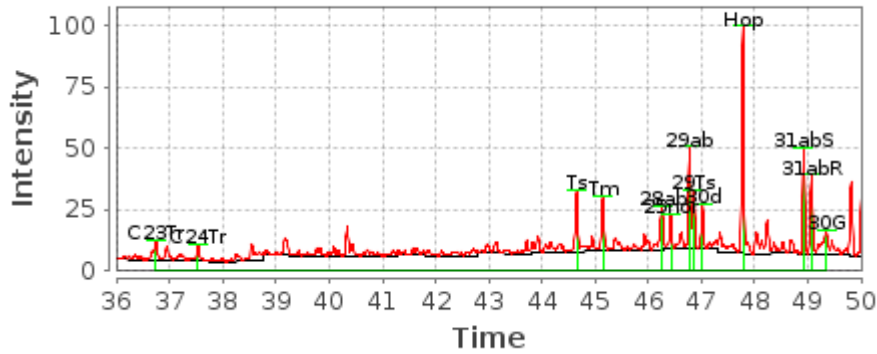


M/Z 192, No-1-18.25

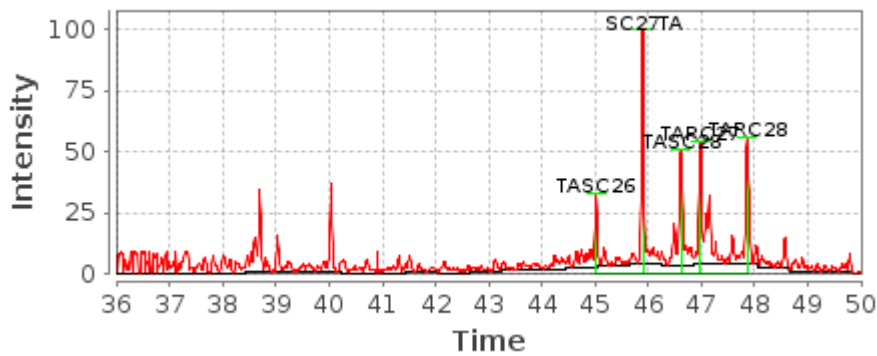


2004-2319 Balder

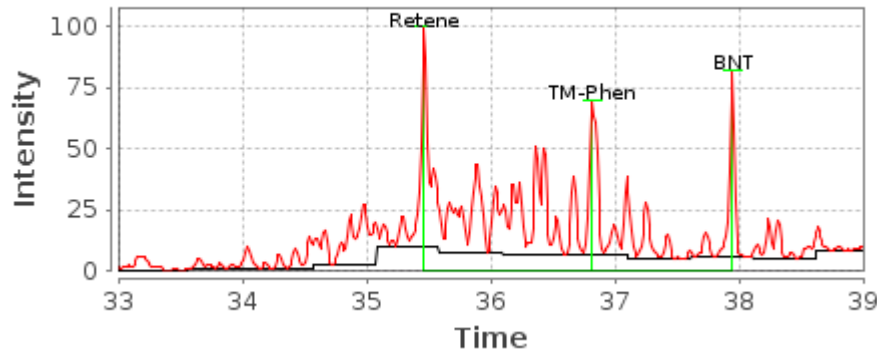
M/Z 191, No-1-18.61



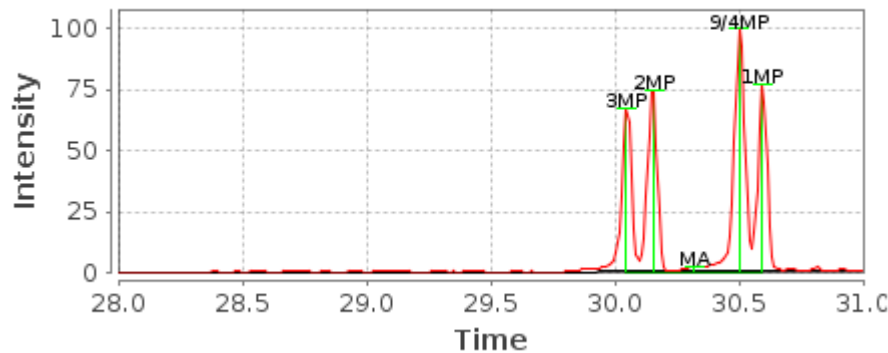
M/Z 231, No-1-18.61



M/Z 234, No-1-18.61

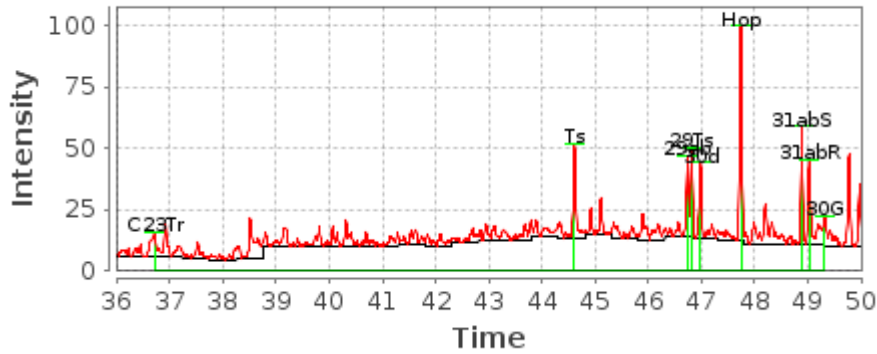


M/Z 192, No-1-18.61

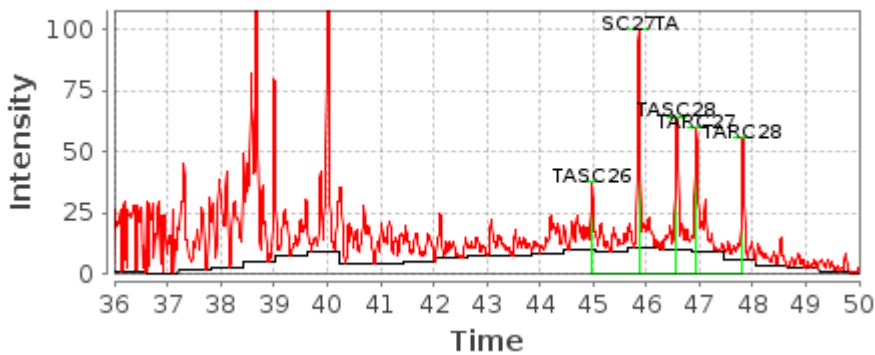


2000-0614 Tor

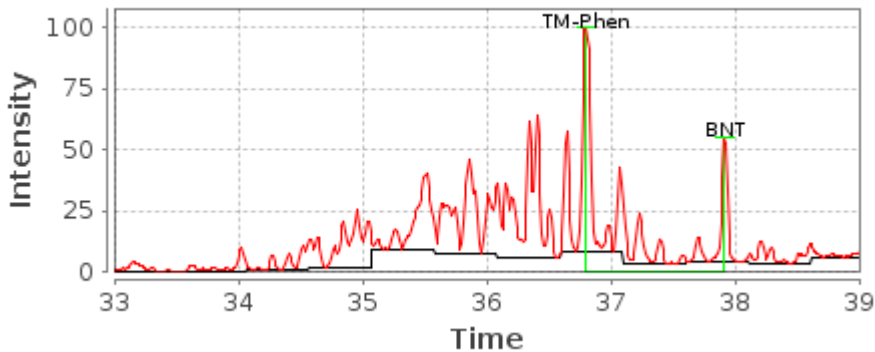
M/Z 191, No-1-18.35



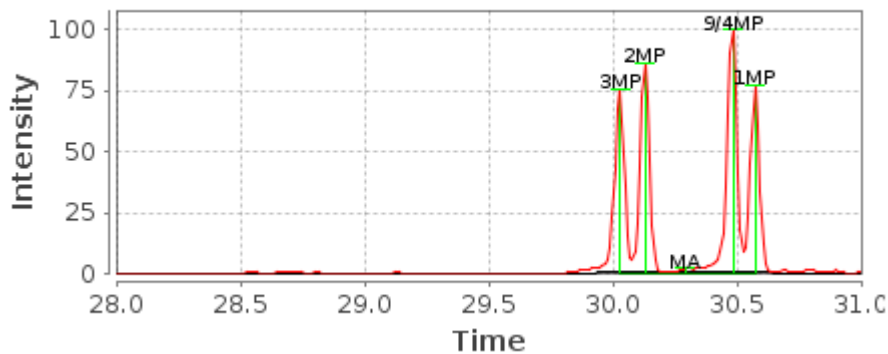
M/Z 231, No-1-18.35



M/Z 234, No-1-18.35

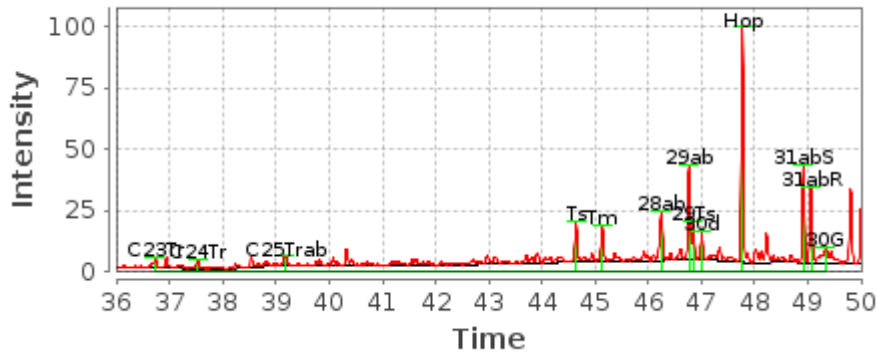


M/Z 192, No-1-18.35

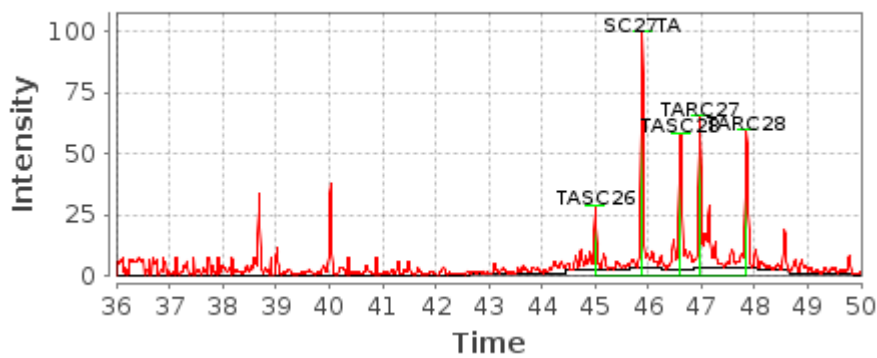


2002-0068 Vigdis

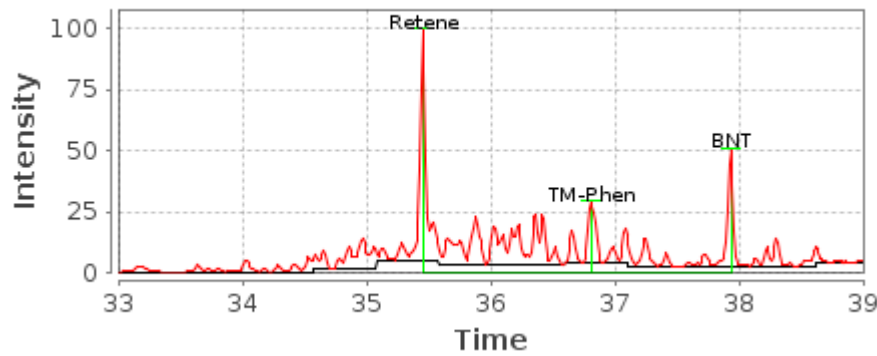
M/Z 191, No-1-18.44



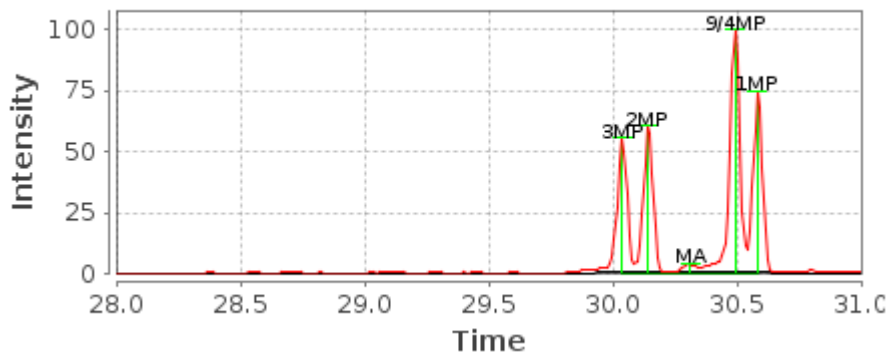
M/Z 231, No-1-18.44



M/Z 234, No-1-18.44

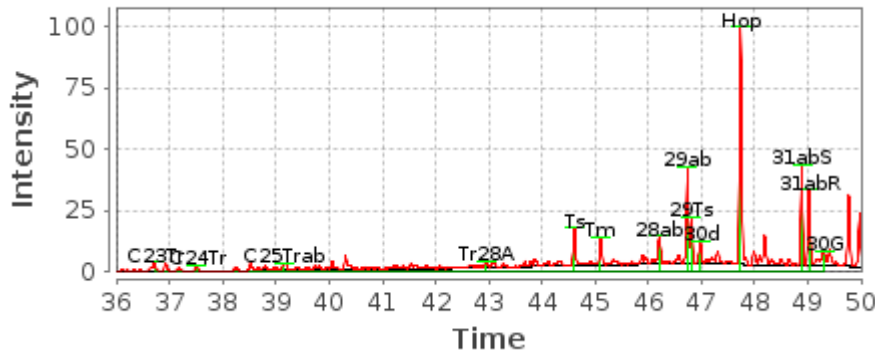


M/Z 192, No-1-18.44

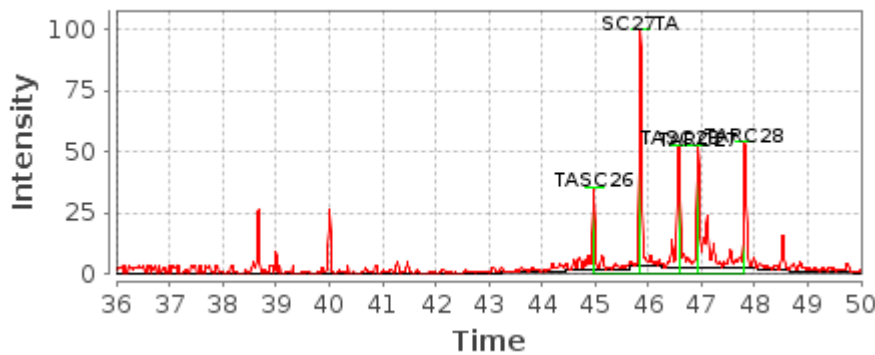


1999-0337 Siri

M/Z 191, No-1-18.26



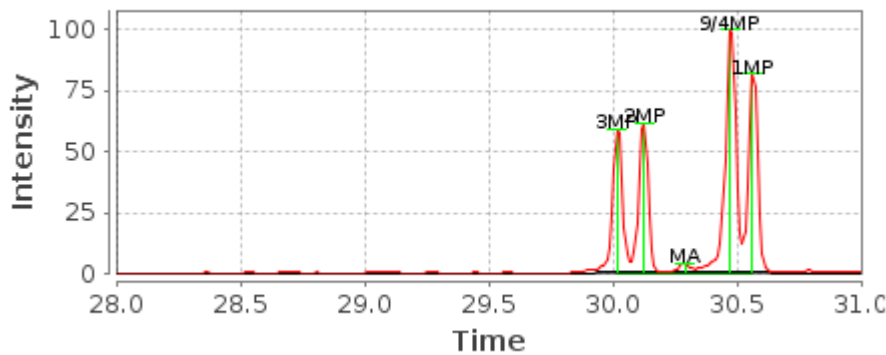
M/Z 231, No-1-18.26



M/Z 234, No-1-18.26

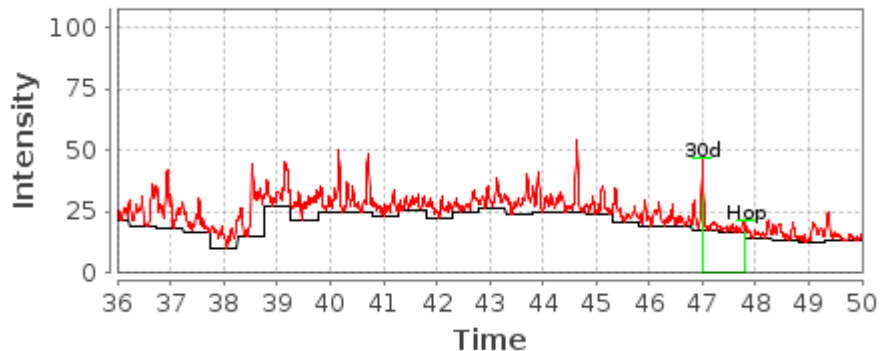


M/Z 192, No-1-18.26

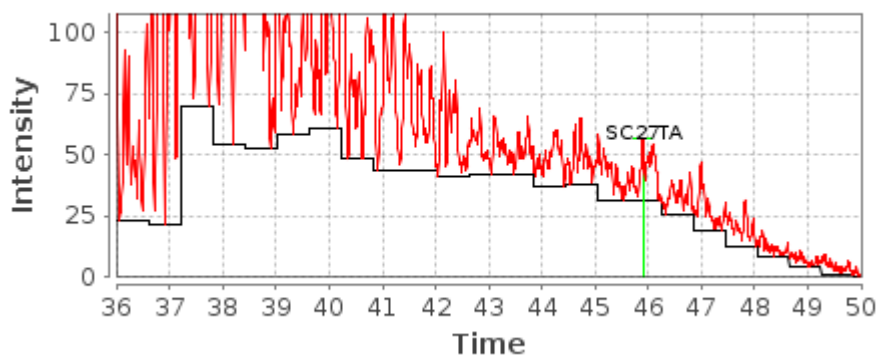


2009-0239 Kvitebjørn

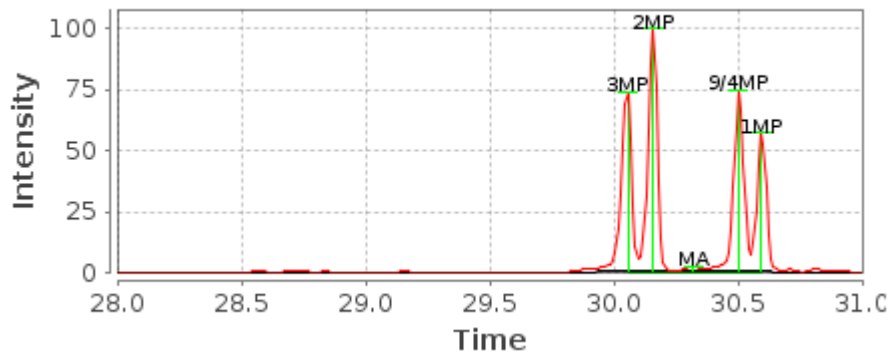
M/Z 191, No-1-18.80



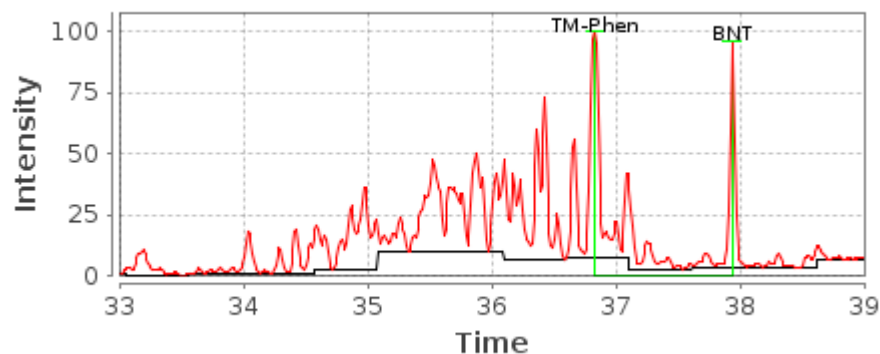
M/Z 231, No-1-18.80



M/Z 192, No-1-18.80

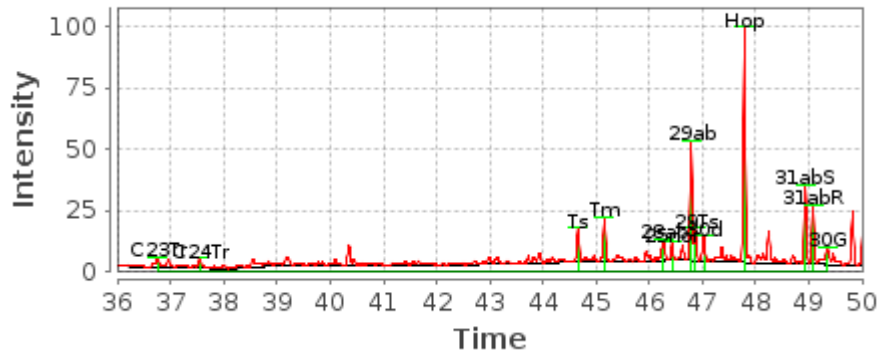


M/Z 234, No-1-18.80

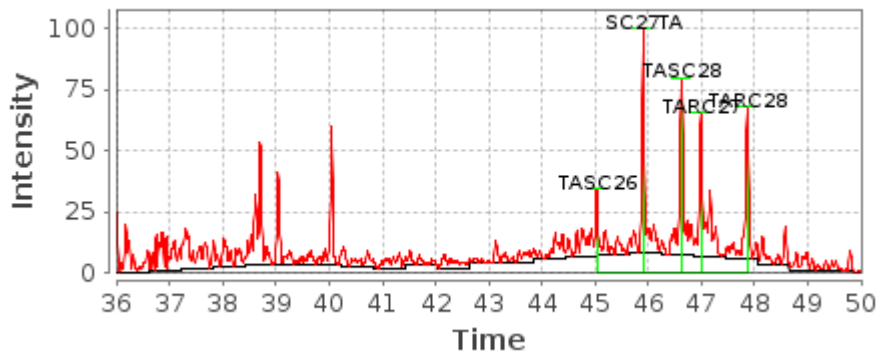


2009-0548 Stær

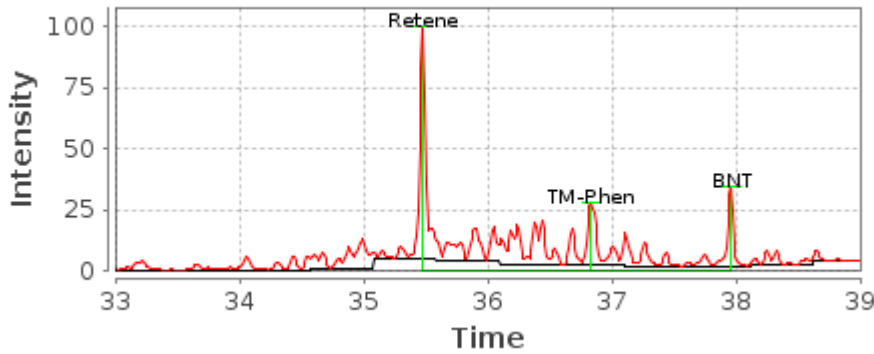
M/Z 191, No-1-18.84



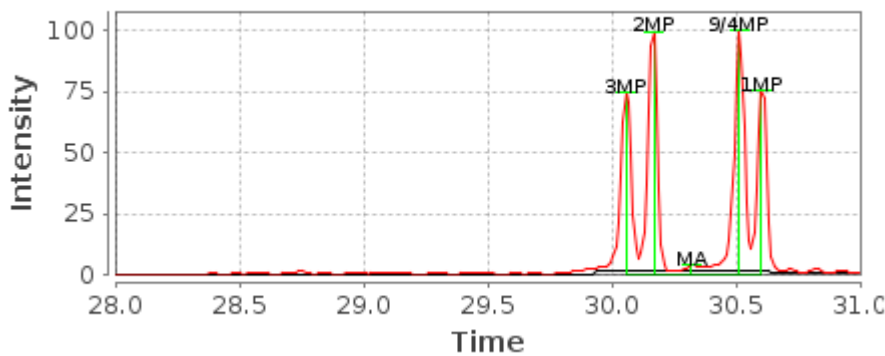
M/Z 231, No-1-18.84



M/Z 234, No-1-18.84

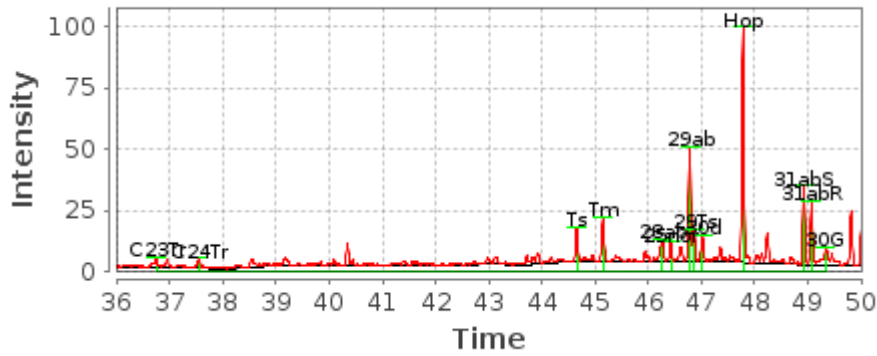


M/Z 192, No-1-18.84

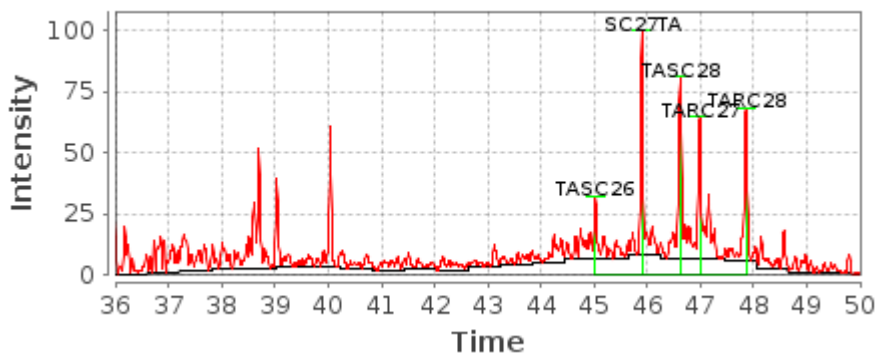


2009-0549 Norne blend

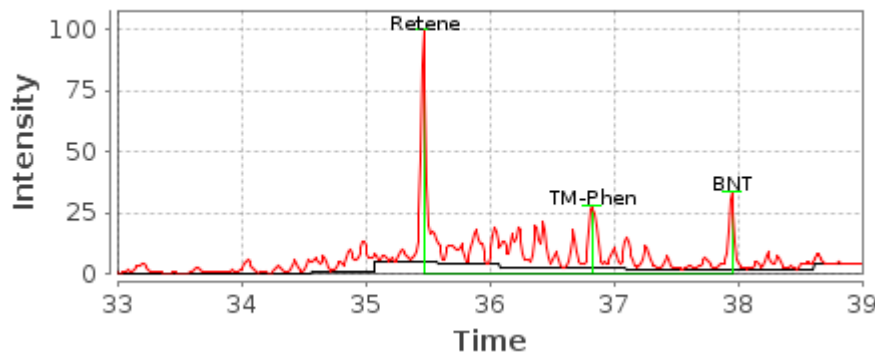
M/Z 191, No-1-18.86



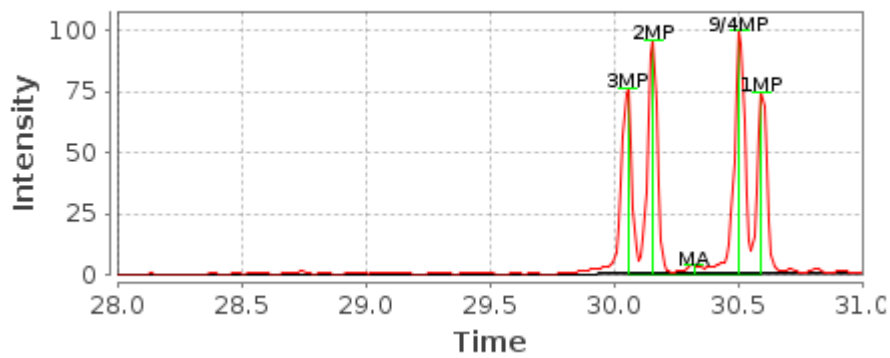
M/Z 231, No-1-18.86



M/Z 234, No-1-18.86

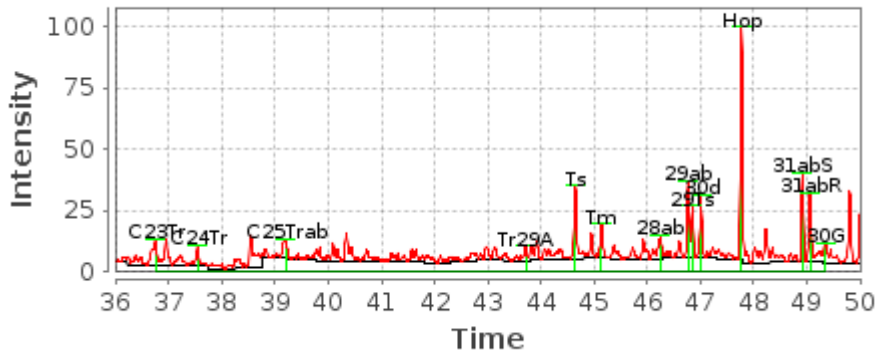


M/Z 192, No-1-18.86

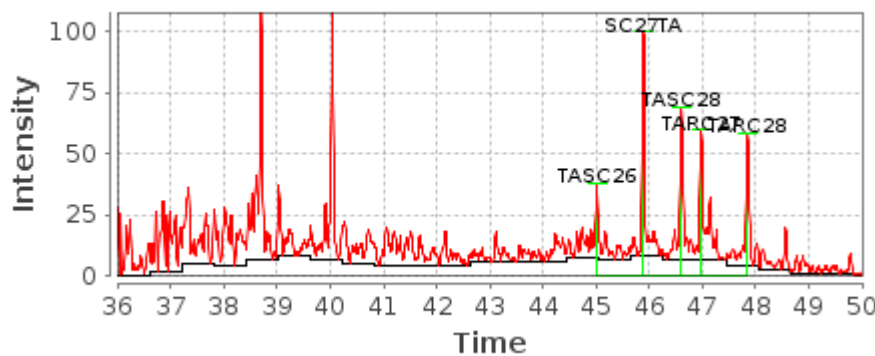


2008-0227 Visund

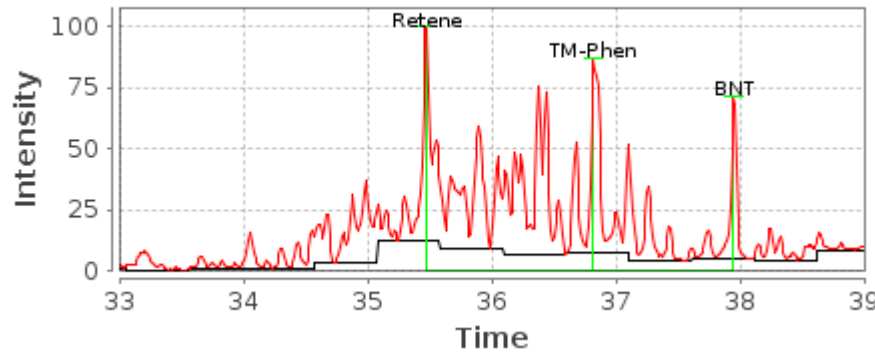
M/Z 191, No-1-18.71



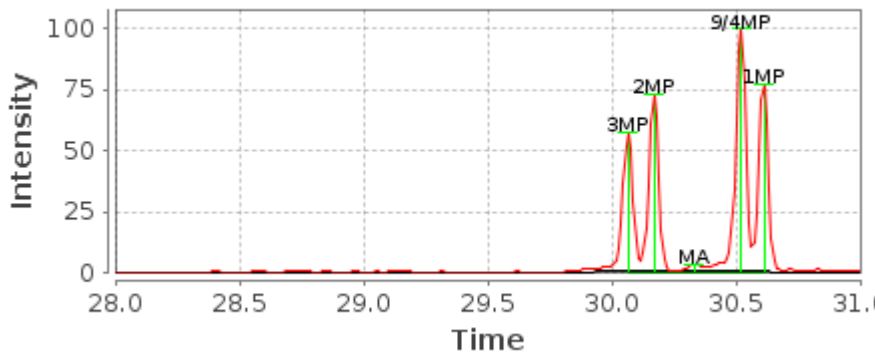
M/Z 231, No-1-18.71



M/Z 234, No-1-18.71

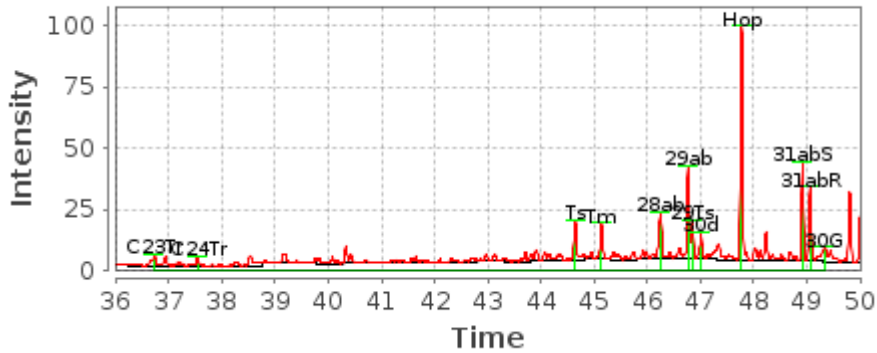


M/Z 192, No-1-18.71

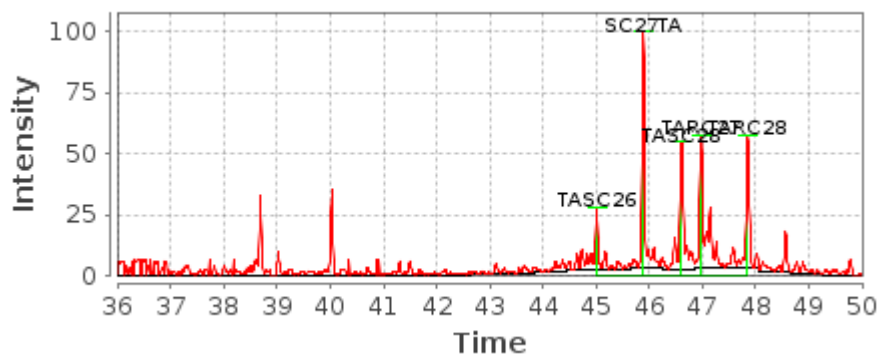


2009-0039 Gullfaks A

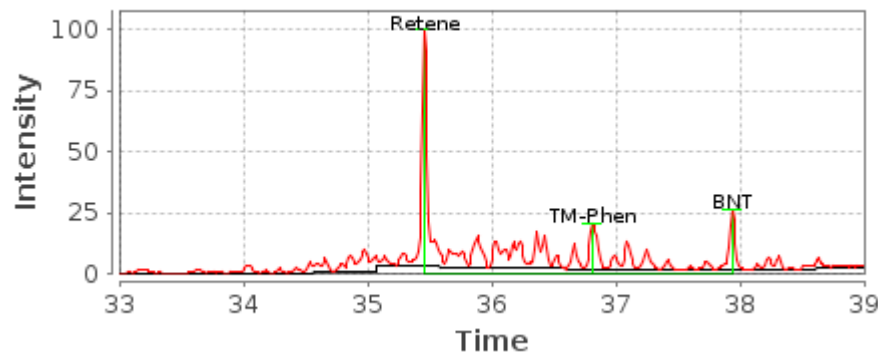
M/Z 191, No-1-18.77



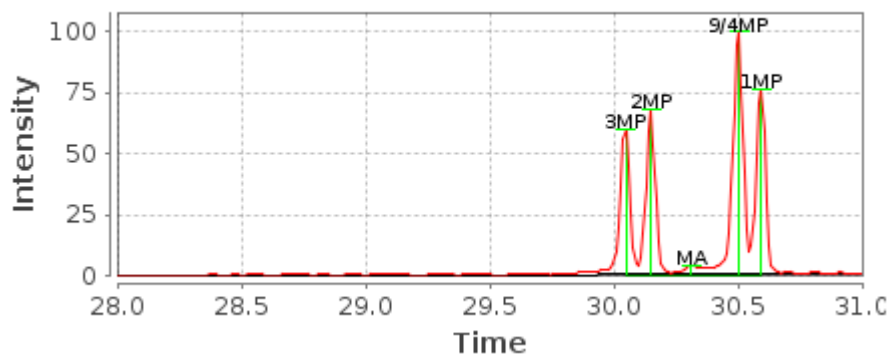
M/Z 231, No-1-18.77



M/Z 234, No-1-18.77

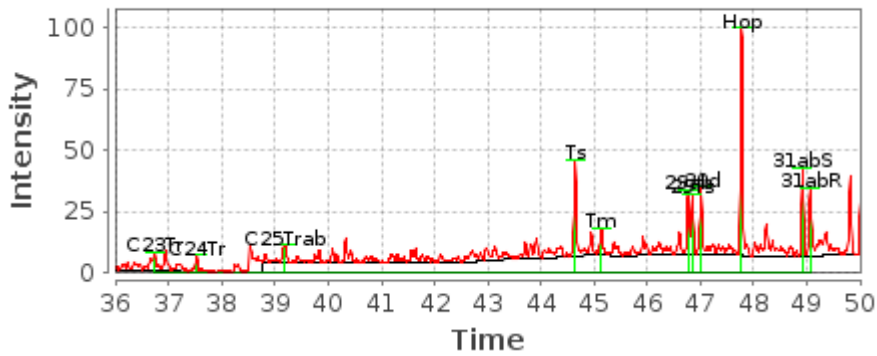


M/Z 192, No-1-18.77

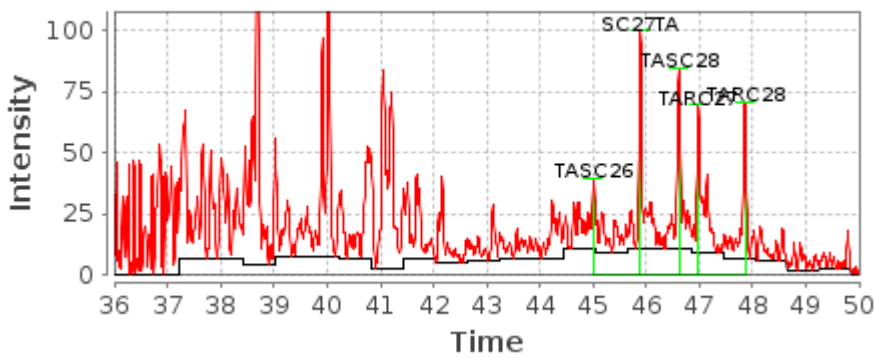


2012-0056 Gudrun

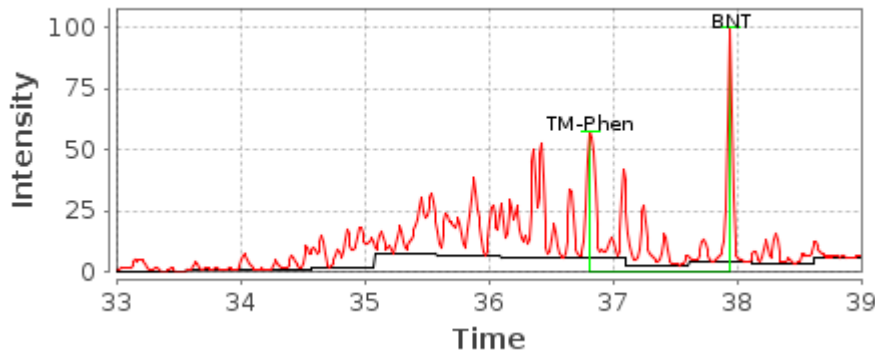
M/Z 191, No-1-18.102



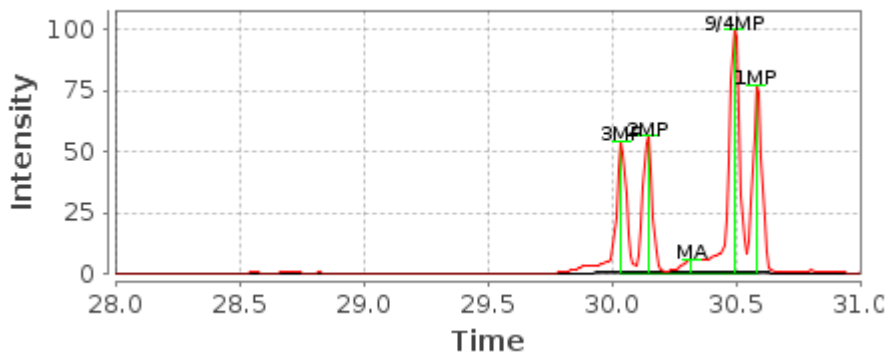
M/Z 231, No-1-18.102



M/Z 234, No-1-18.102

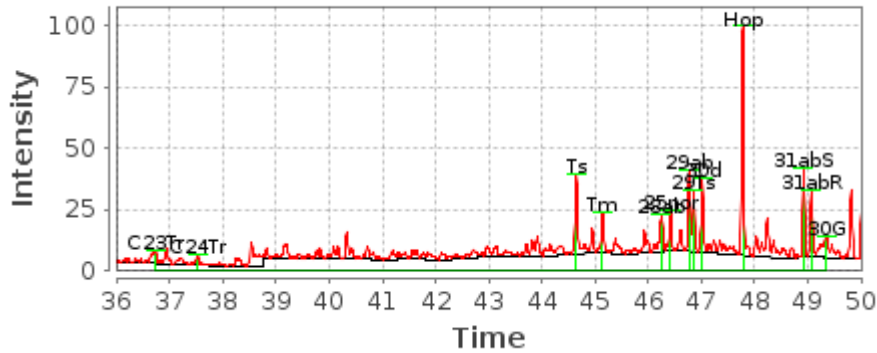


M/Z 192, No-1-18.102

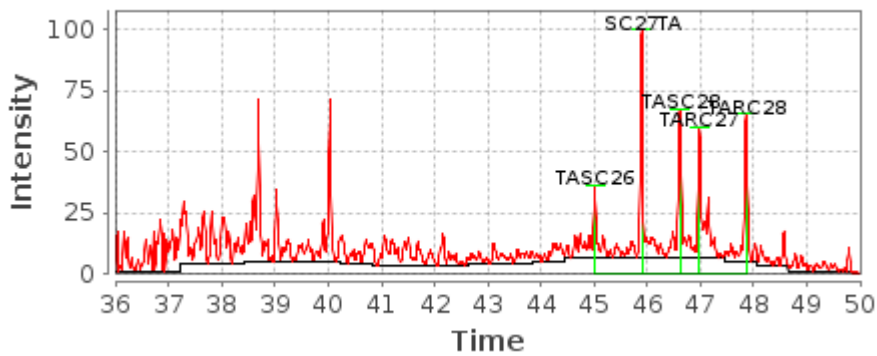


2012-Fram

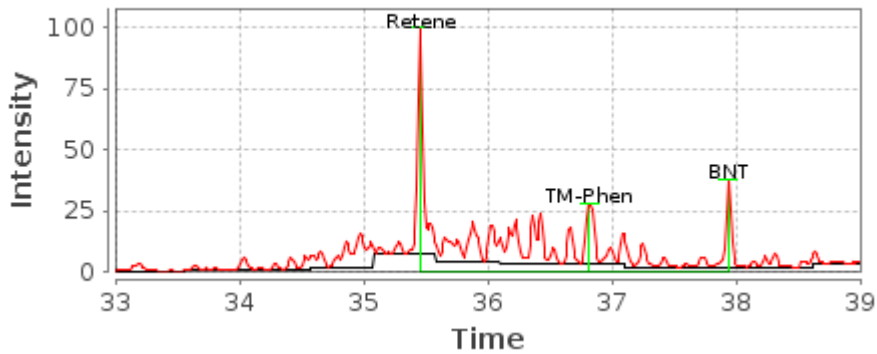
M/Z 191, No-1-18.112



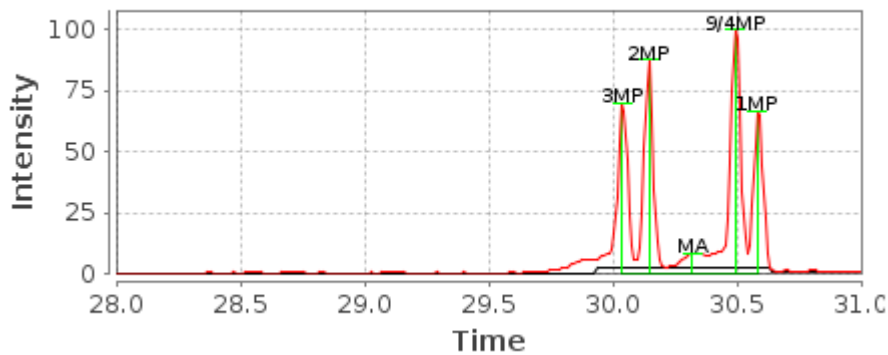
M/Z 231, No-1-18.112



M/Z 234, No-1-18.112

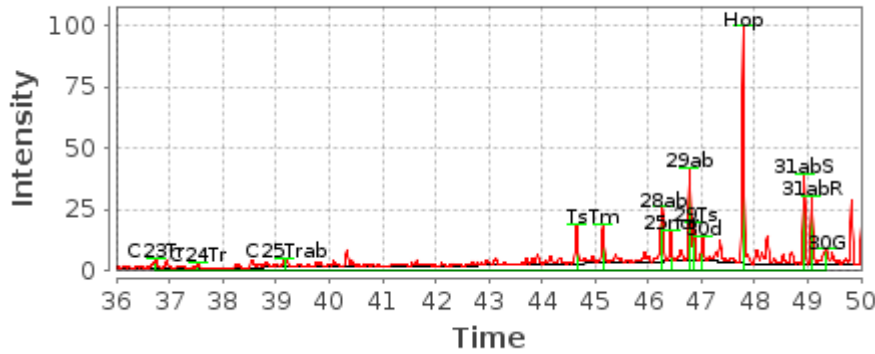


M/Z 192, No-1-18.112

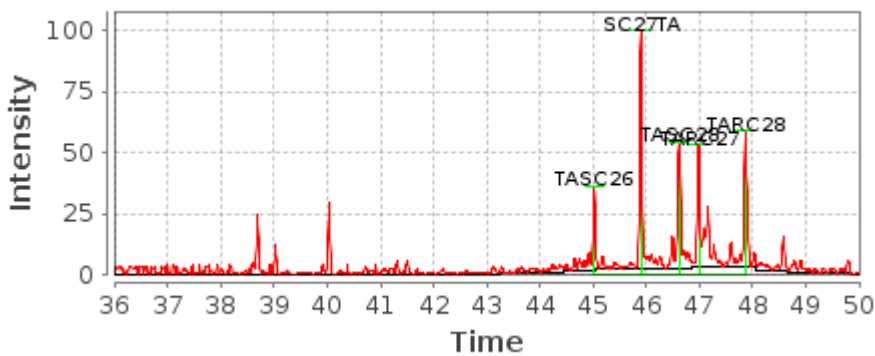


2012-0341 Oseberg A

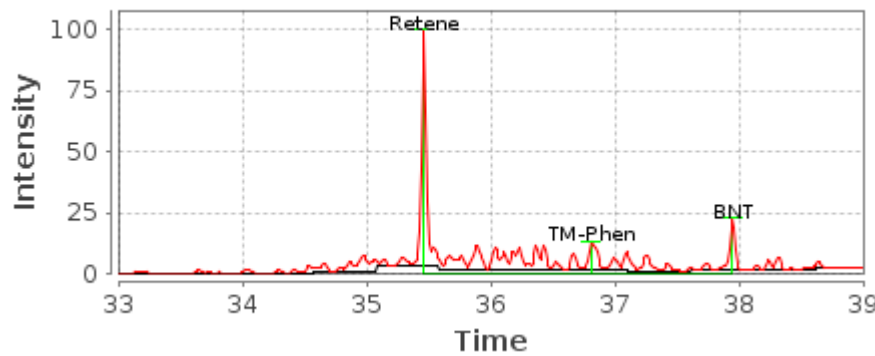
M/Z 191, No-1-18.113



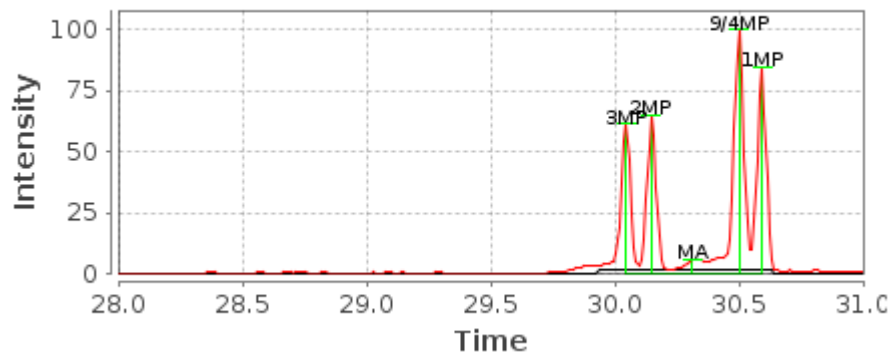
M/Z 231, No-1-18.113



M/Z 234, No-1-18.113

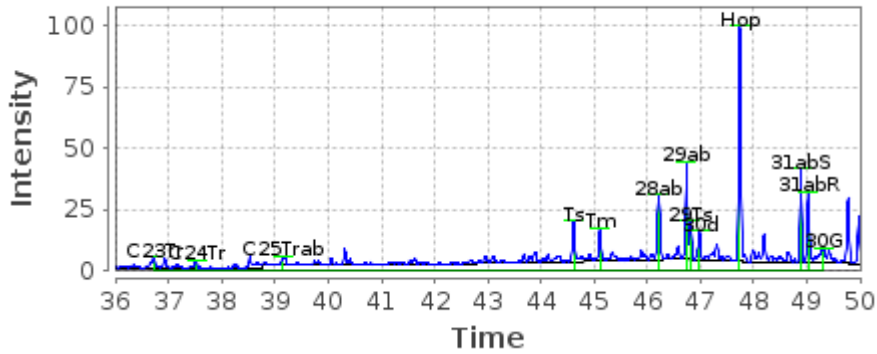


M/Z 192, No-1-18.113

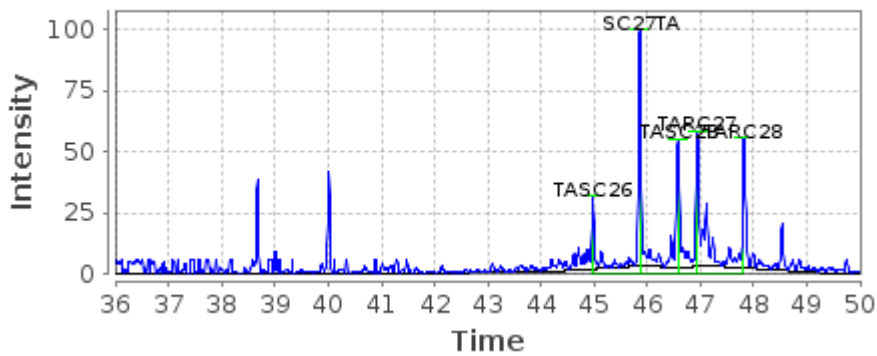


2000-0036 Statfjord

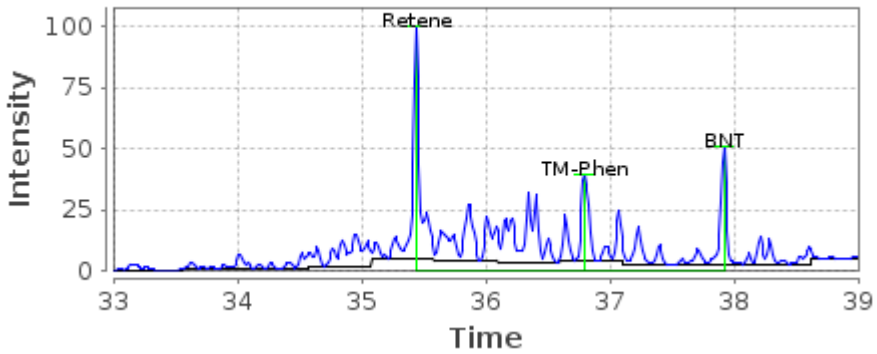
M/Z 191, No-1-18.27



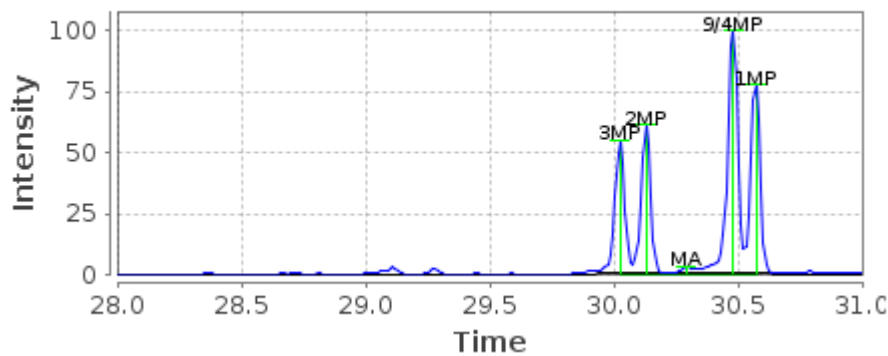
M/Z 231, No-1-18.27



M/Z 234, No-1-18.27

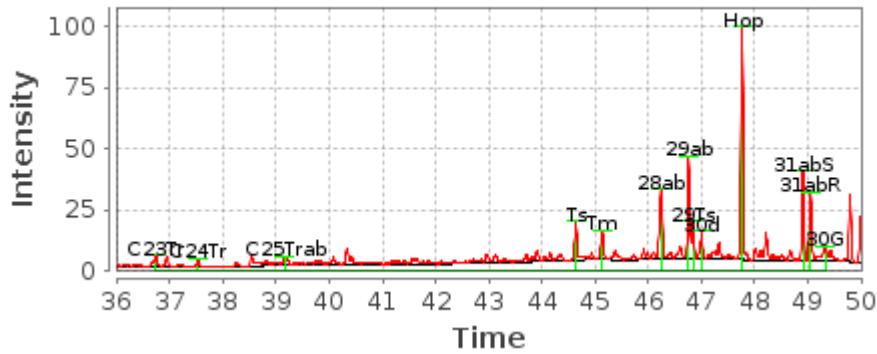


M/Z 192, No-1-18.27

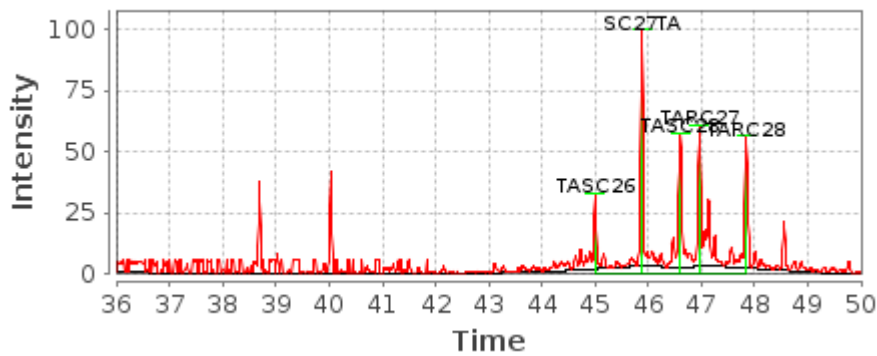


2002-0067 Snorre A TLP

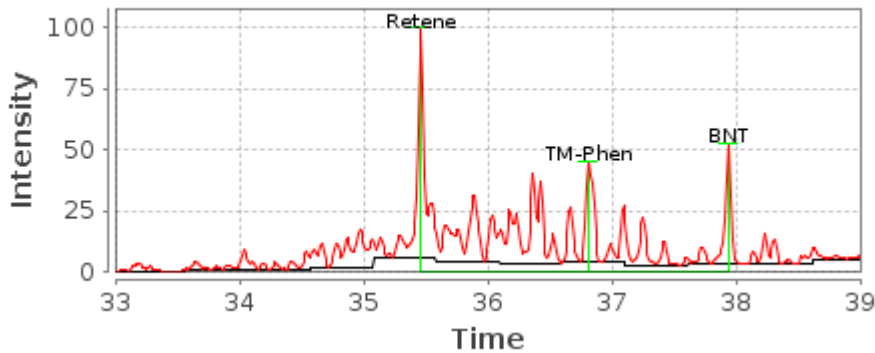
M/Z 191, No-1-18.43



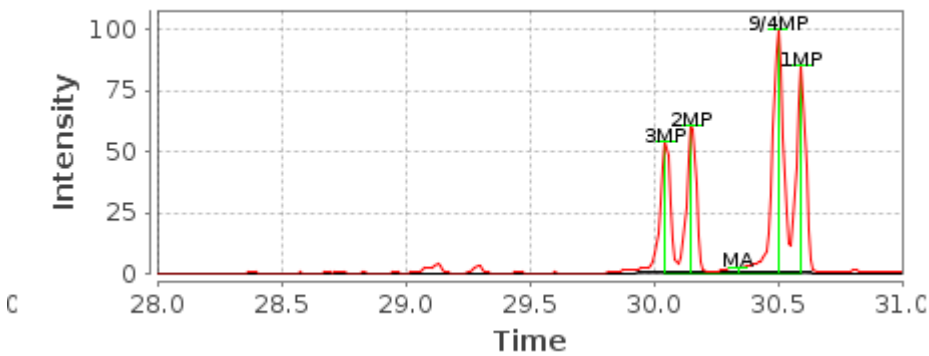
M/Z 231, No-1-18.43



M/Z 234, No-1-18.43

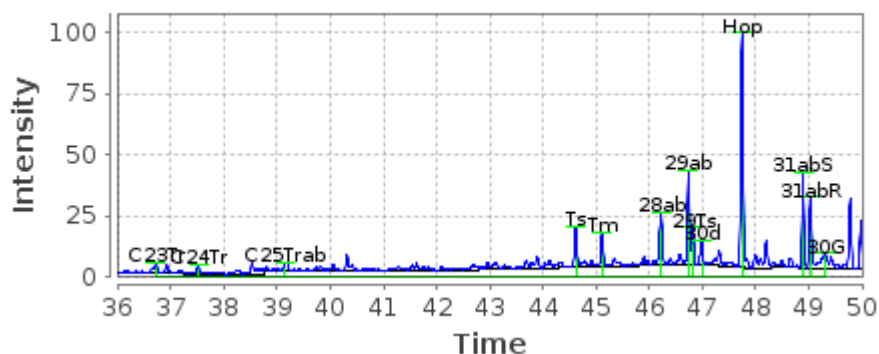


M/Z 192, No-1-18.43

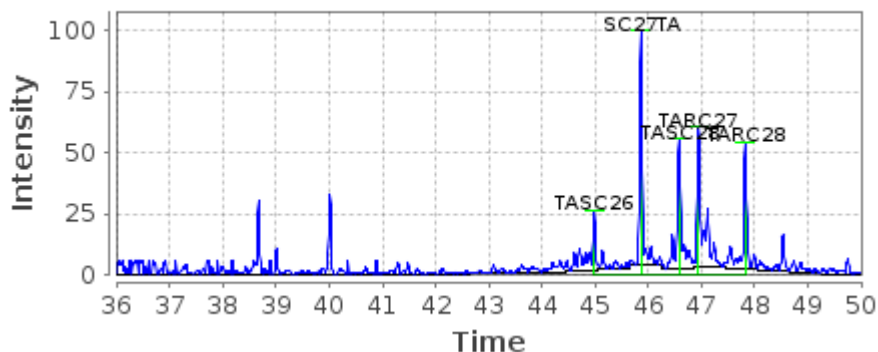


2000-0037 Statfjord B

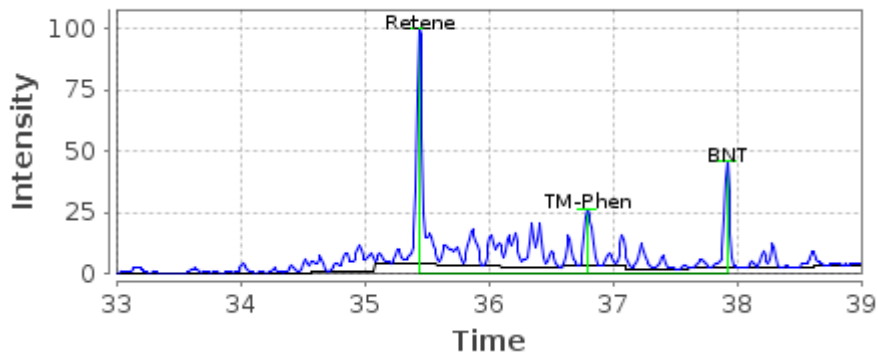
M/Z 191, No-1-18.28



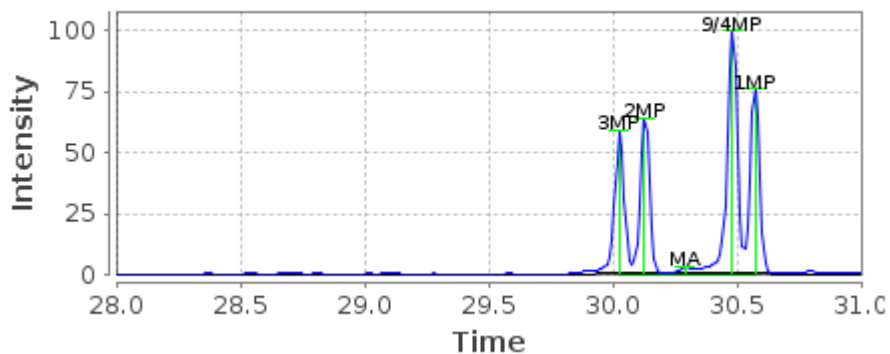
M/Z 231, No-1-18.28



M/Z 234, No-1-18.28

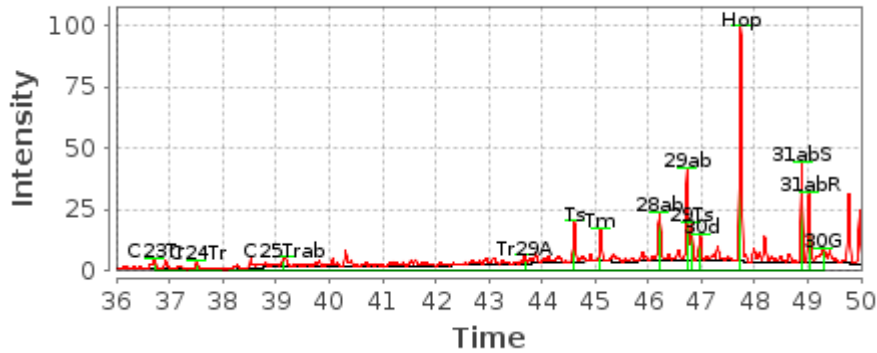


M/Z 192, No-1-18.28

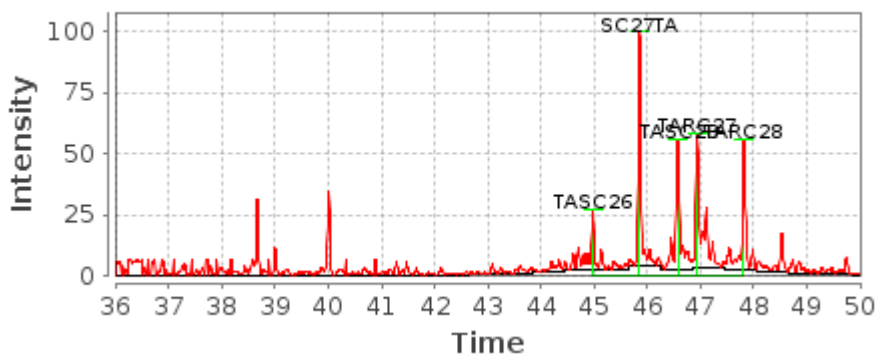


2000-0043 Statfjord C

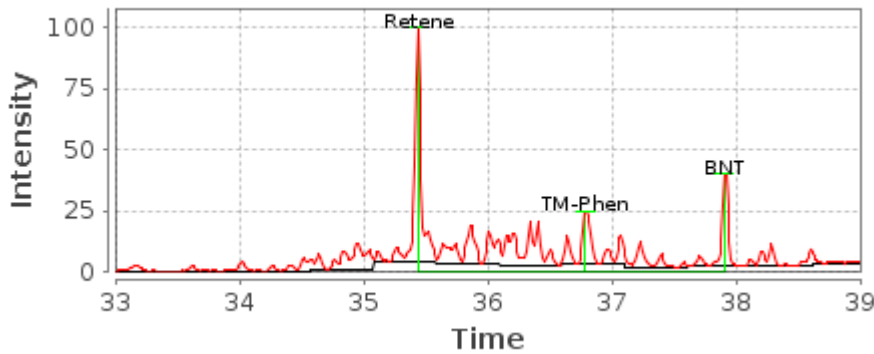
M/Z 191, No-1-18.29



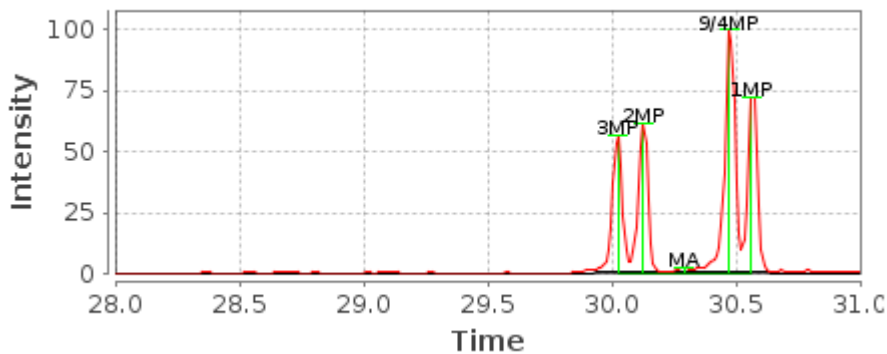
M/Z 231, No-1-18.29



M/Z 234, No-1-18.29

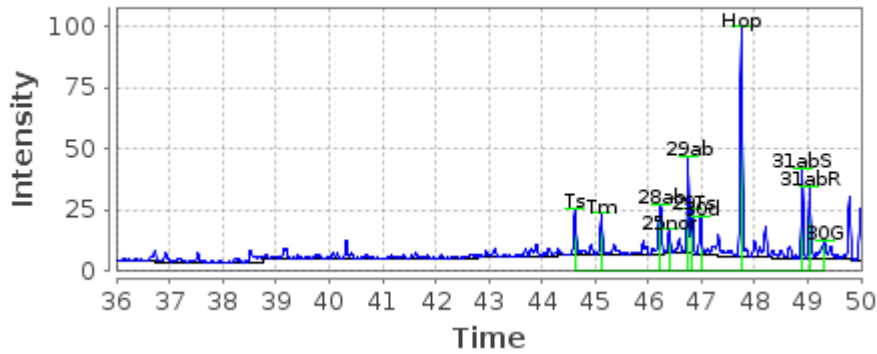


M/Z 192, No-1-18.29

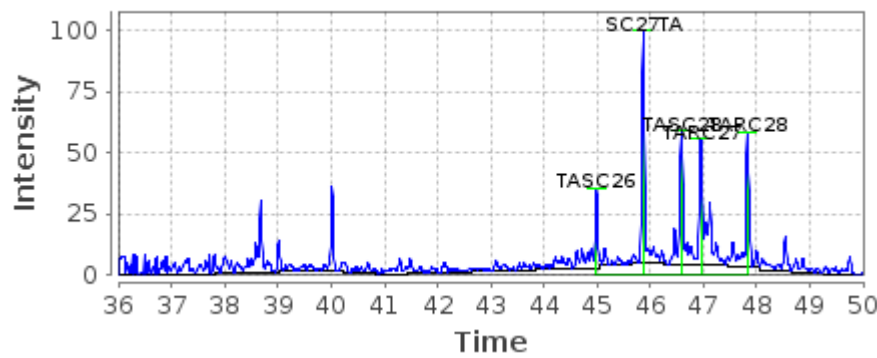


2000-0052 Troll B

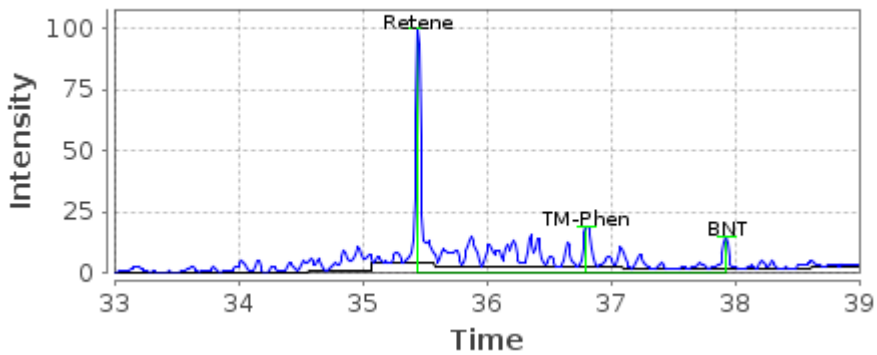
M/Z 191, No-1-18.30



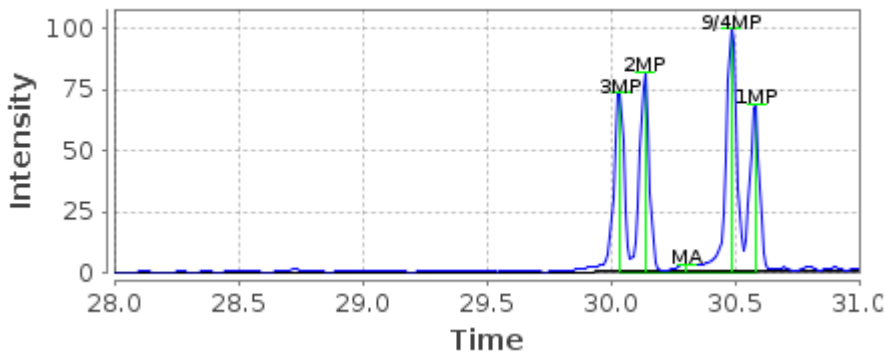
M/Z 231, No-1-18.30



M/Z 234, No-1-18.30

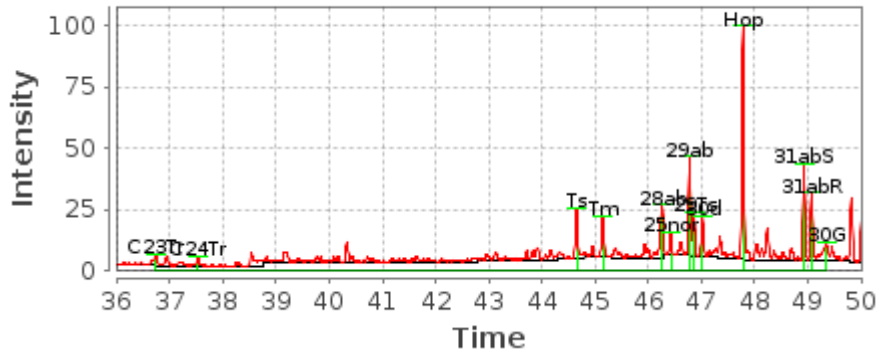


M/Z 192, No-1-18.30

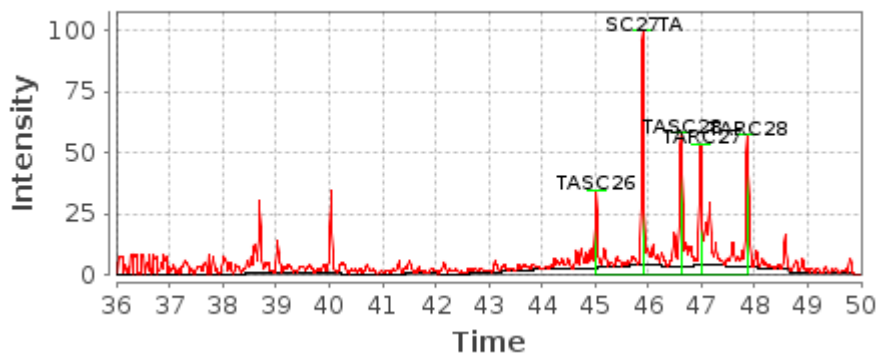


2013-0409 Troll B

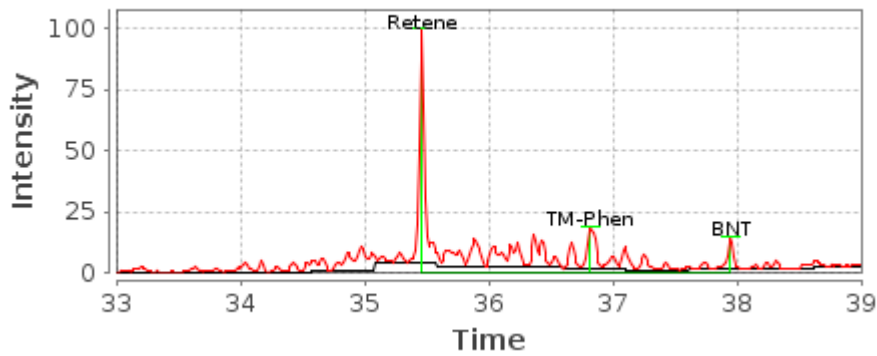
M/Z 191, No-1-18.116



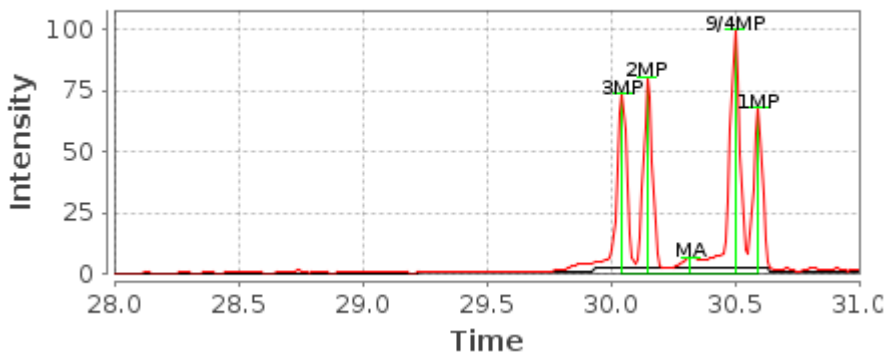
M/Z 231, No-1-18.116



M/Z 234, No-1-18.116

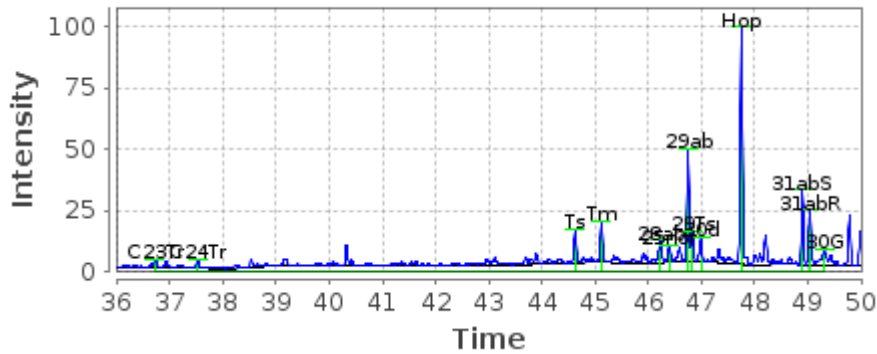


M/Z 192, No-1-18.116

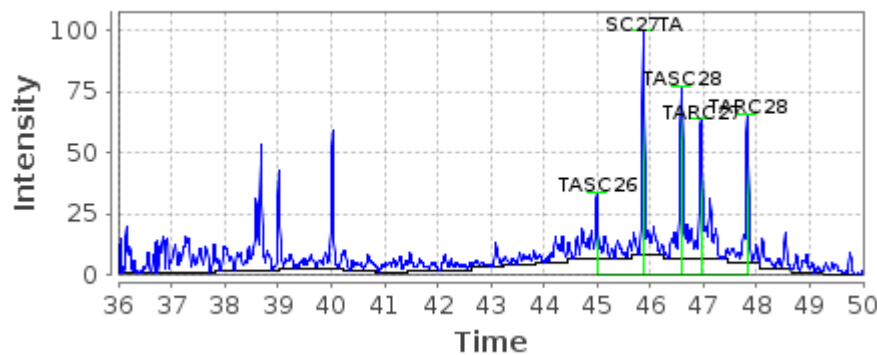


2000-0218 Norne fersk

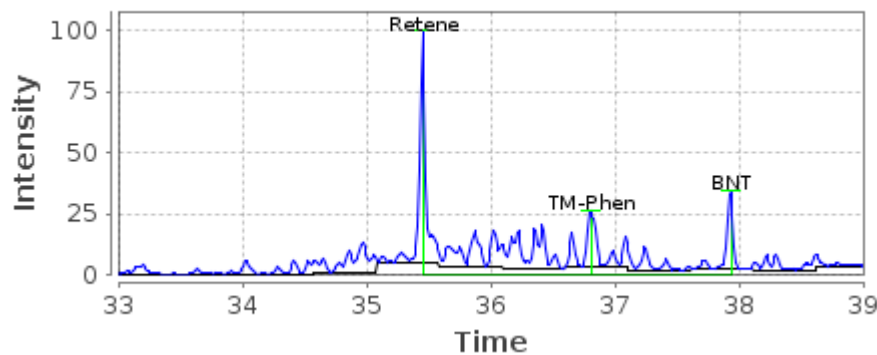
M/Z 191, No-1-18.31



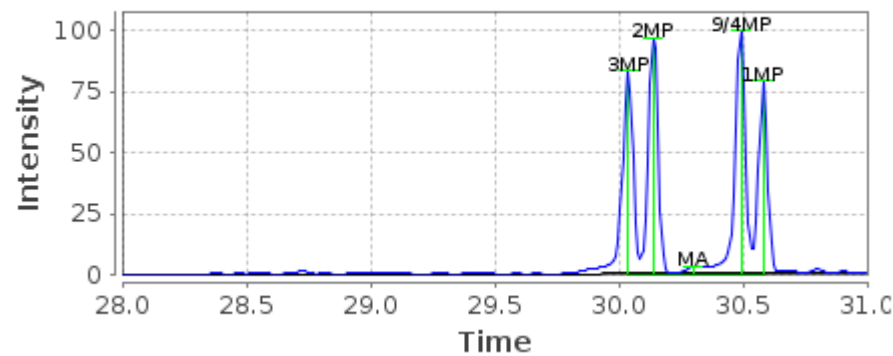
M/Z 231, No-1-18.31



M/Z 234, No-1-18.31

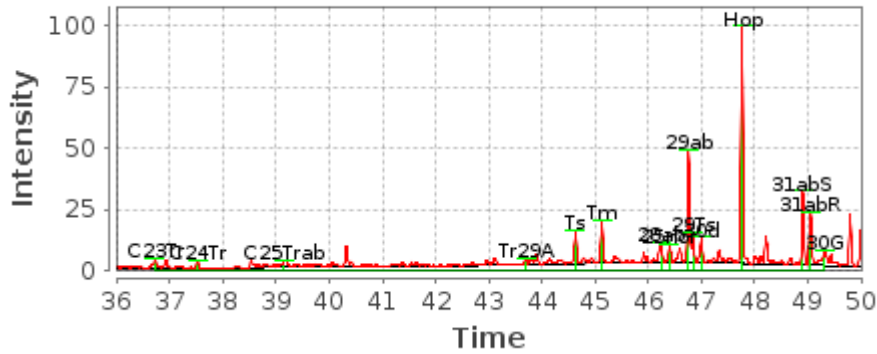


M/Z 192, No-1-18.31

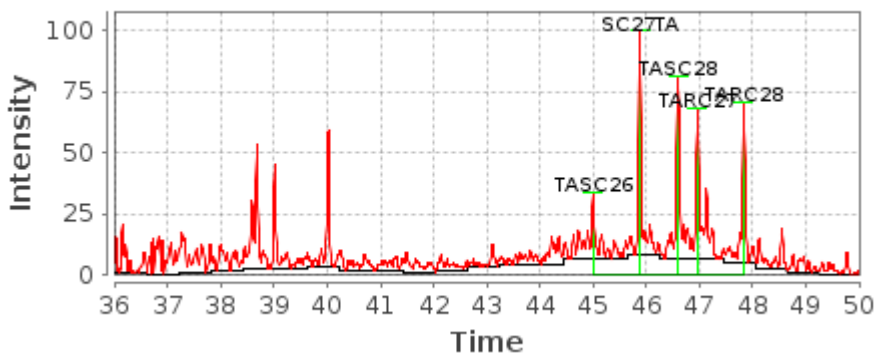


2007-0260 Norne fersk

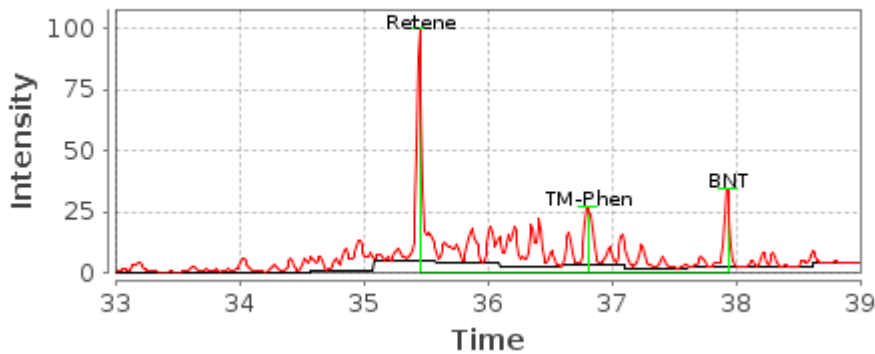
M/Z 191, No-1-18.65



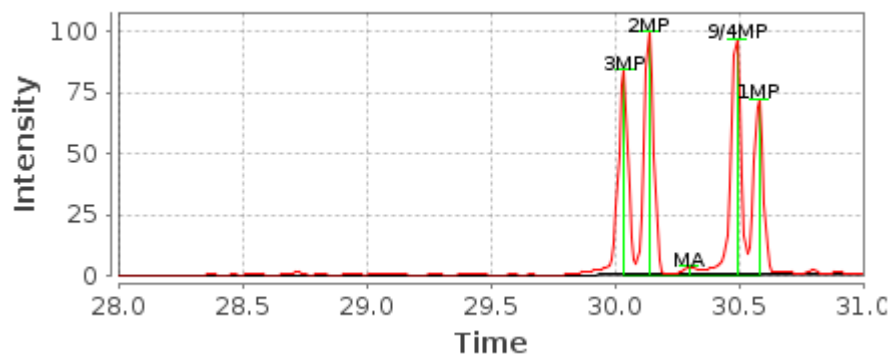
M/Z 231, No-1-18.65



M/Z 234, No-1-18.65

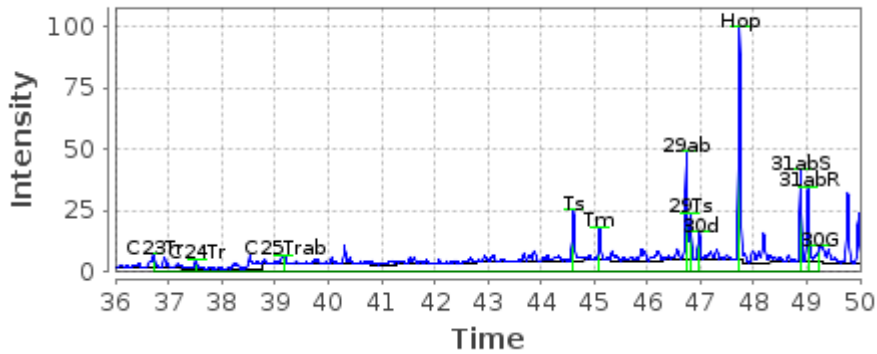


M/Z 192, No-1-18.65

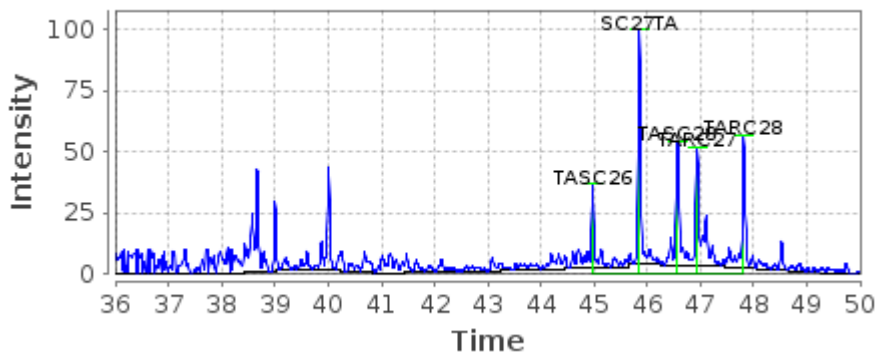


2000-0600 Eldfisk fersk

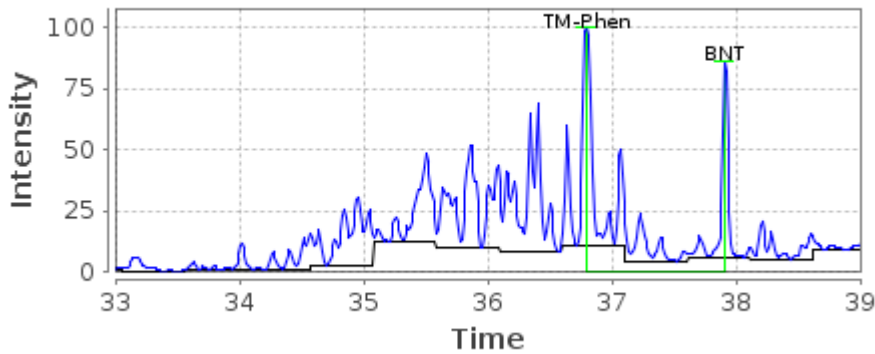
M/Z 191, No-1-18.32



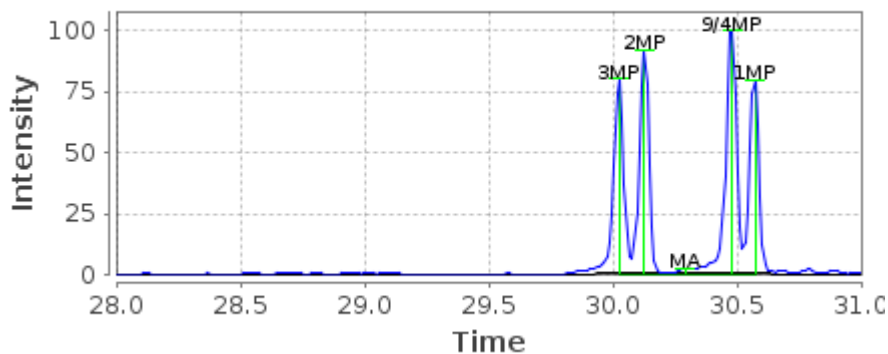
M/Z 231, No-1-18.32



M/Z 234, No-1-18.32

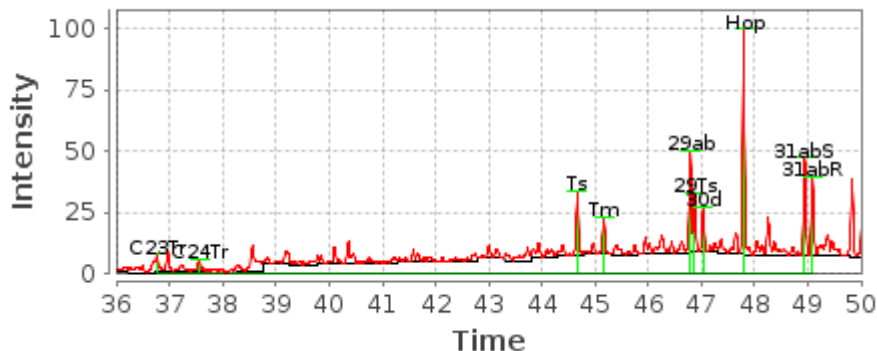


M/Z 192, No-1-18.32

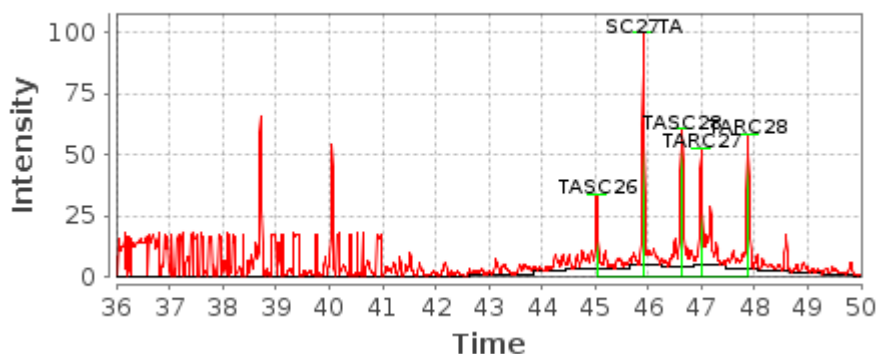


2008-0099 Blane fersk

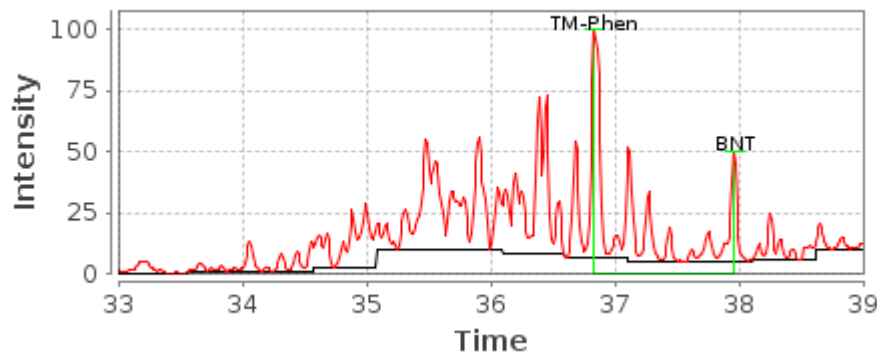
M/Z 191, No-1-18.70



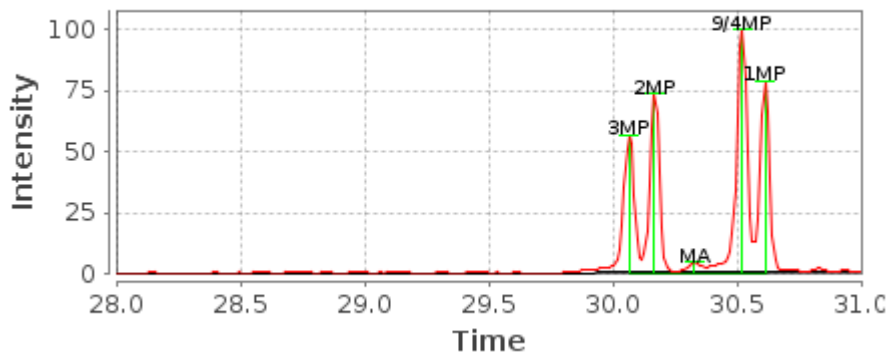
M/Z 231, No-1-18.70



M/Z 234, No-1-18.70

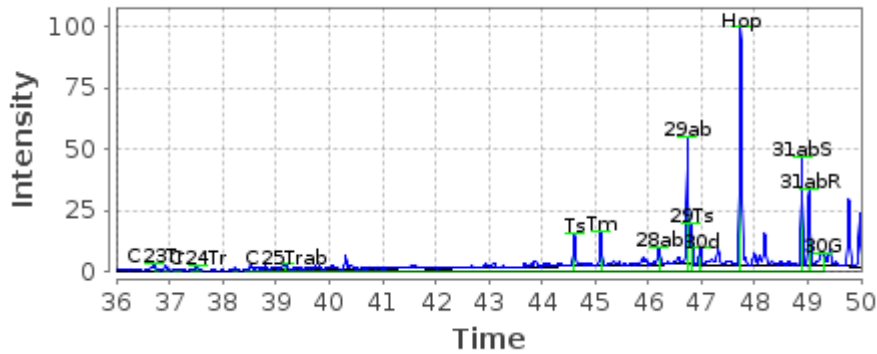


M/Z 192, No-1-18.70

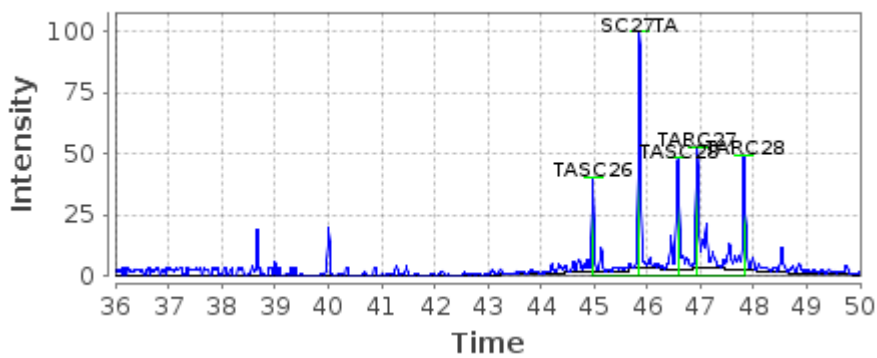


2000-0601 Valhall fersk

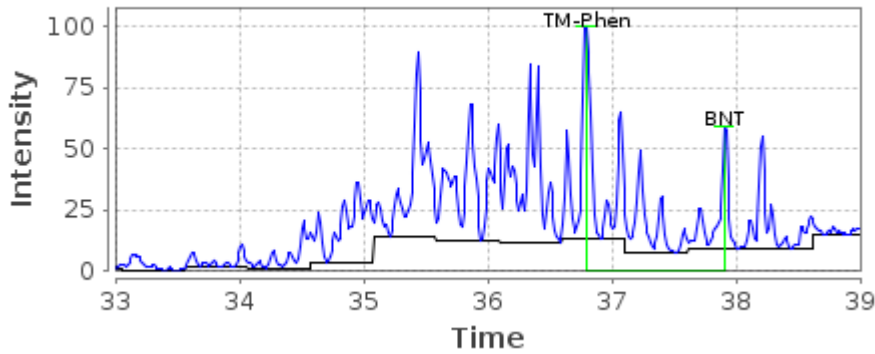
M/Z 191, No-1-18.33



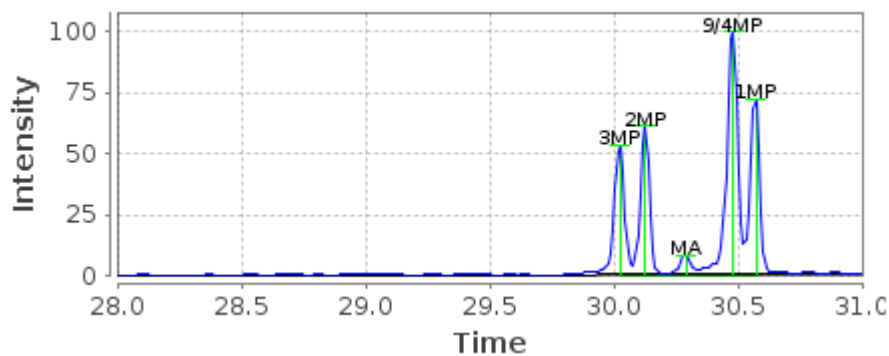
M/Z 231, No-1-18.33



M/Z 234, No-1-18.33

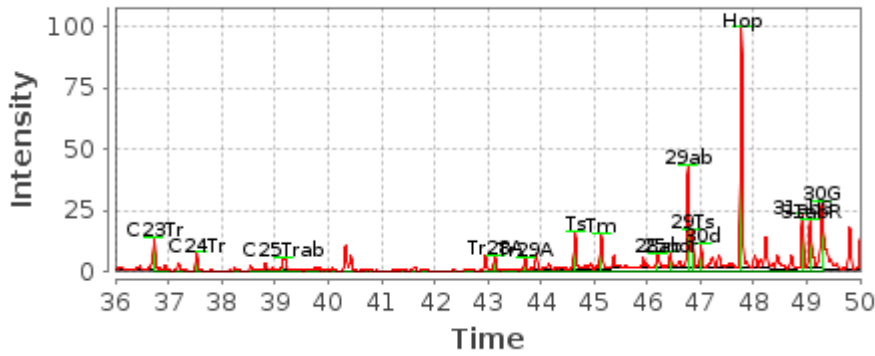


M/Z 192, No-1-18.33

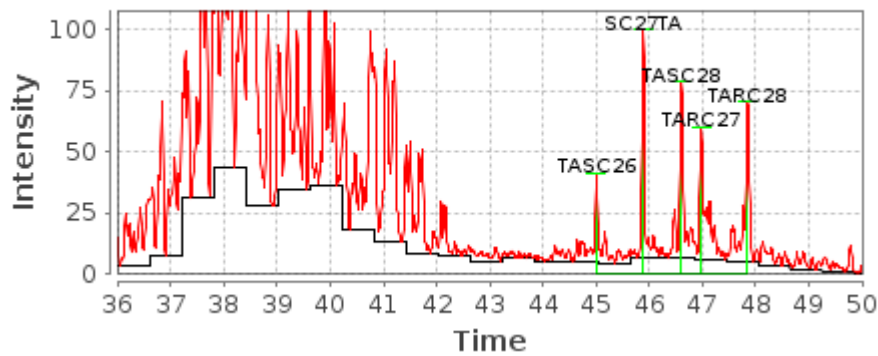


MC-2016-0233 ULSFO

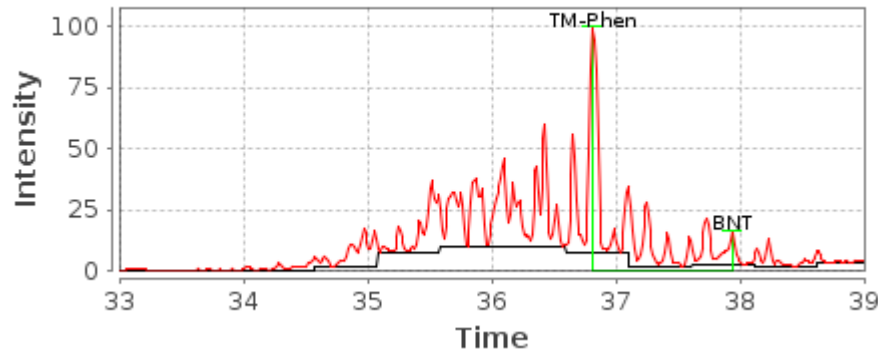
M/Z 191, No-1-18.136



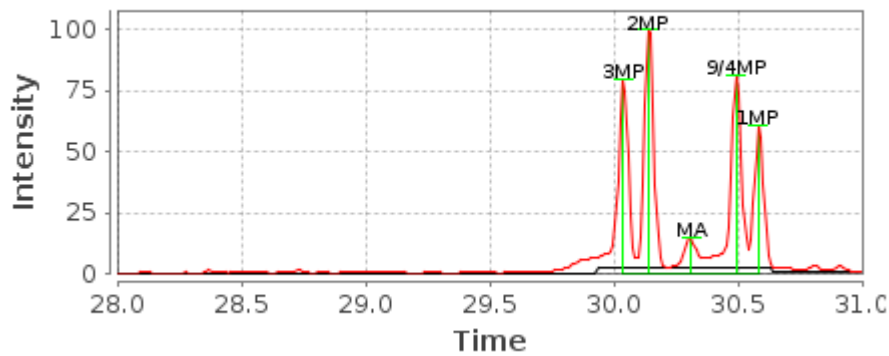
M/Z 231, No-1-18.136



M/Z 234, No-1-18.136

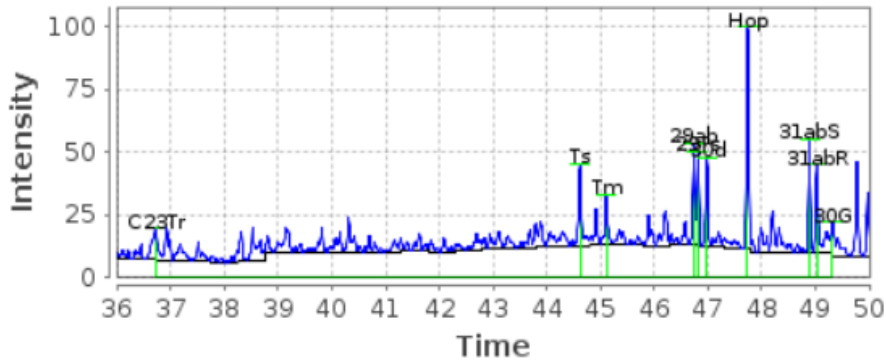


M/Z 192, No-1-18.136

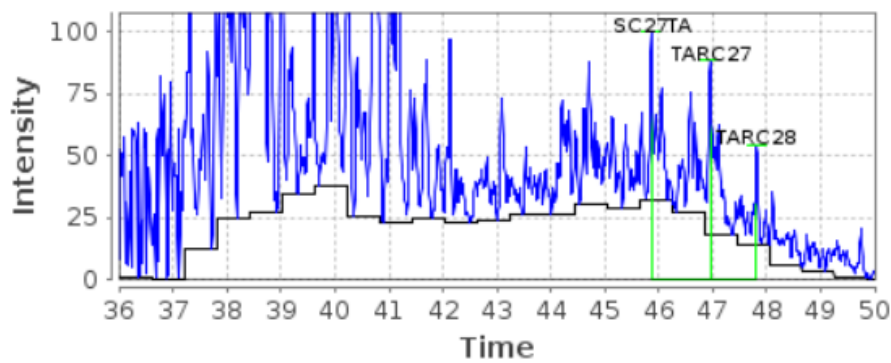


2000-0631 Gyda

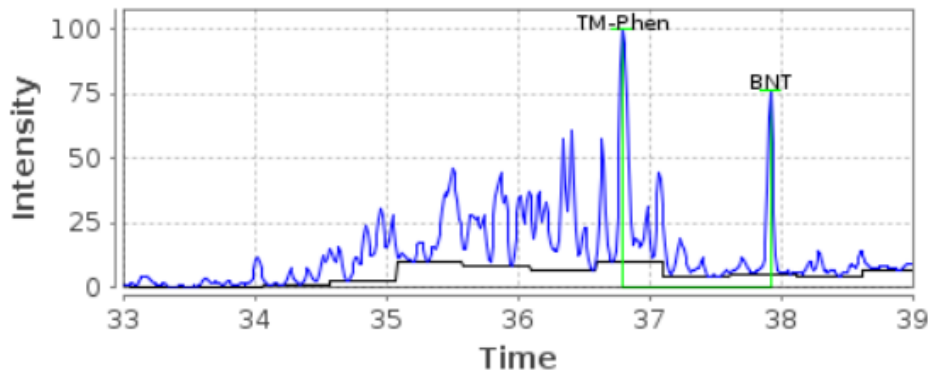
M/Z 191, No-1-18.34



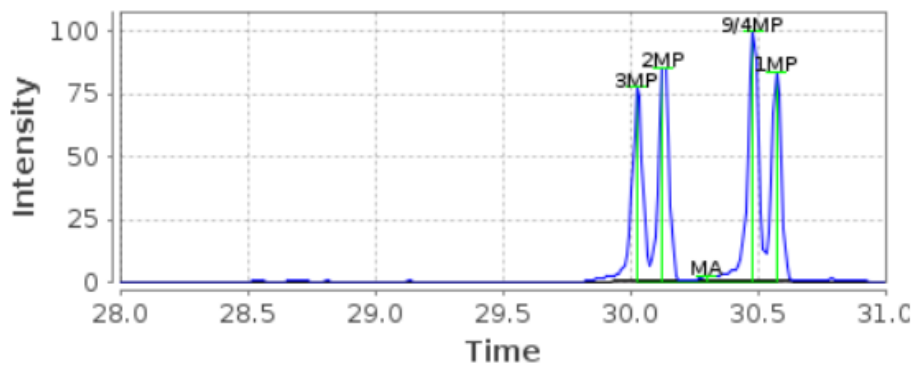
M/Z 231, No-1-18.34



M/Z 234, No-1-18.34

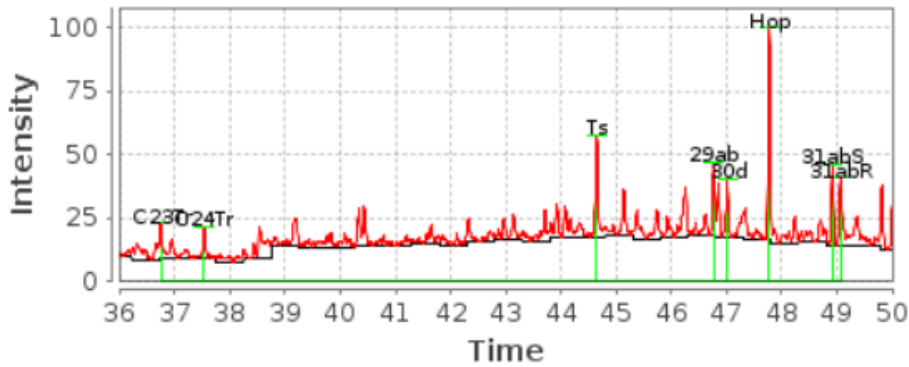


M/Z 192, No-1-18.34

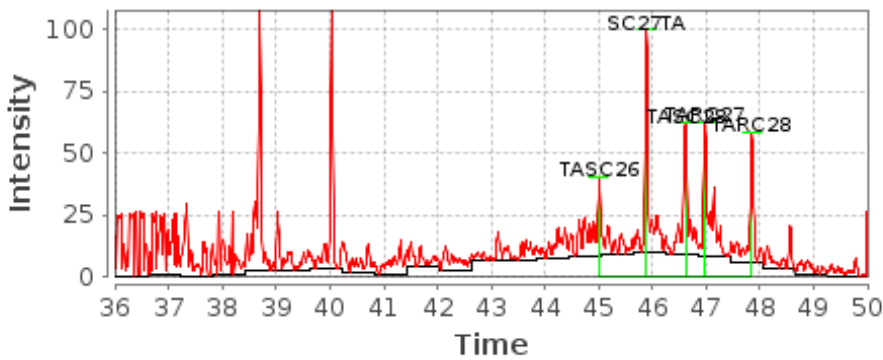


2007-0288 Alvheim Kneler

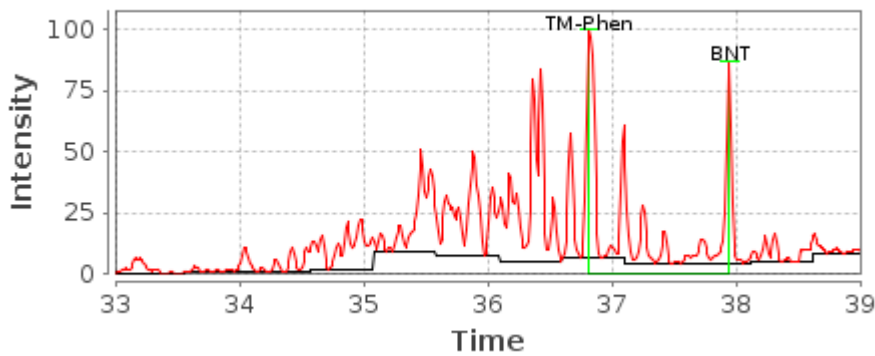
M/Z 191, No-1-18.66



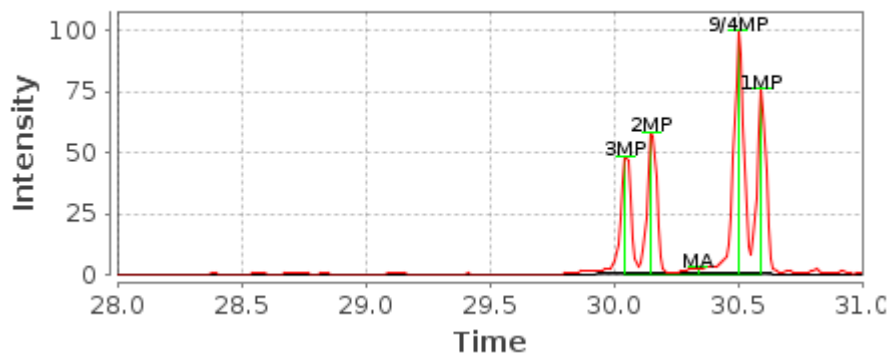
M/Z 231, No-1-18.66



M/Z 234, No-1-18.66

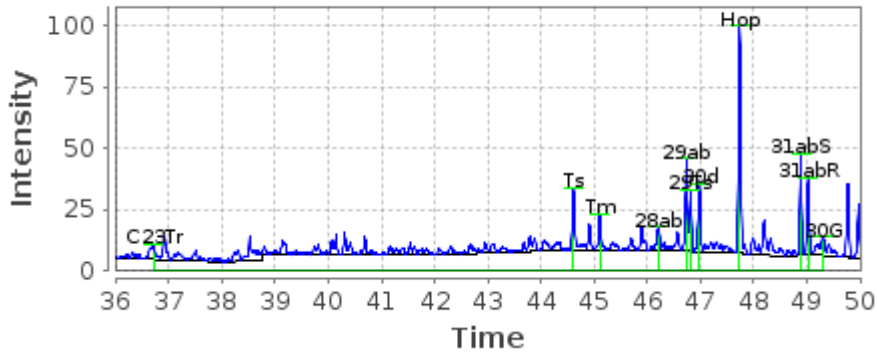


M/Z 192, No-1-18.66

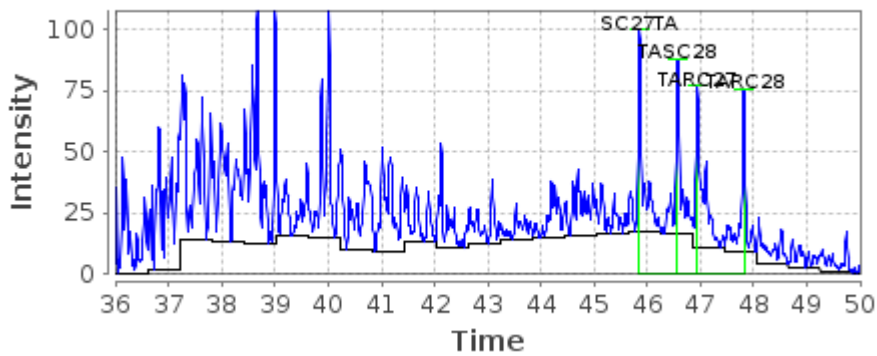


2001-0063 Vale

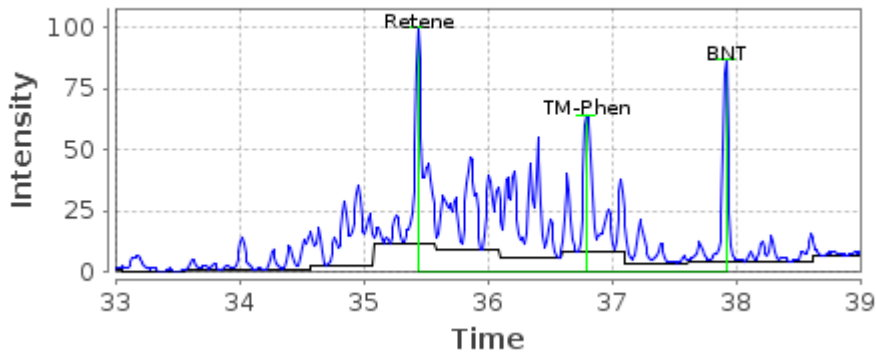
M/Z 191, No-1-18.37



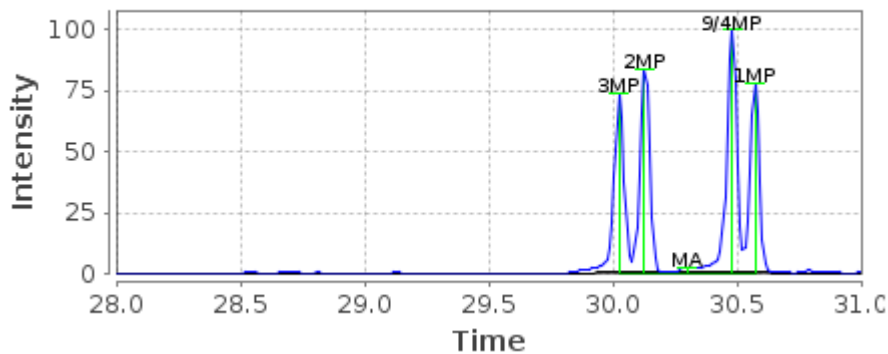
M/Z 231, No-1-18.37



M/Z 234, No-1-18.37

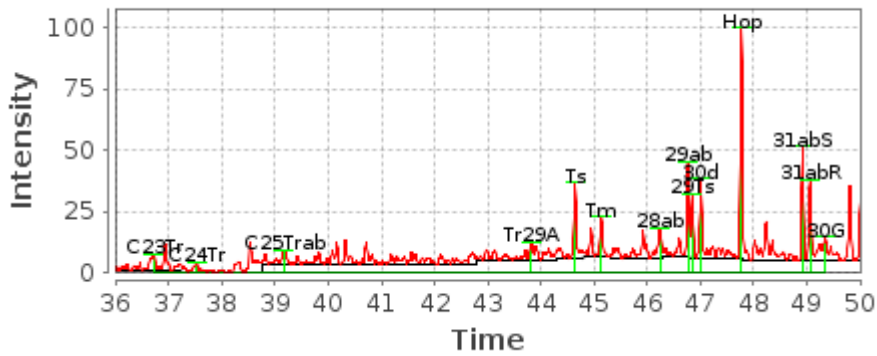


M/Z 192, No-1-18.37

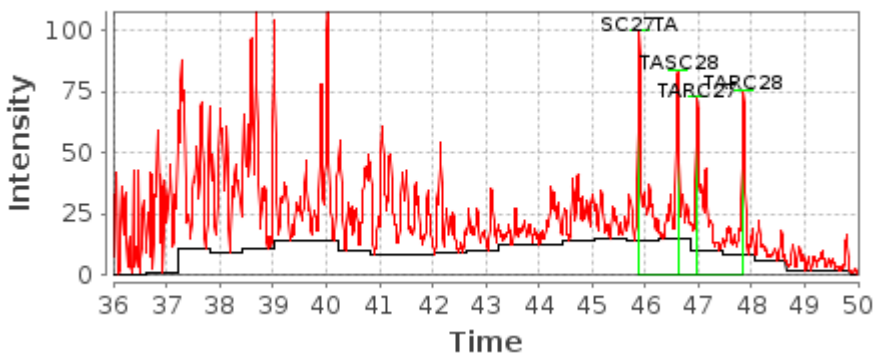


2013-0582 Vale

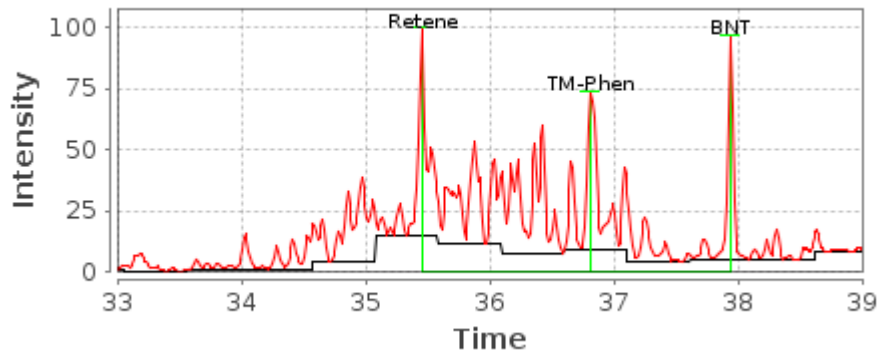
M/Z 191, No-1-18.118



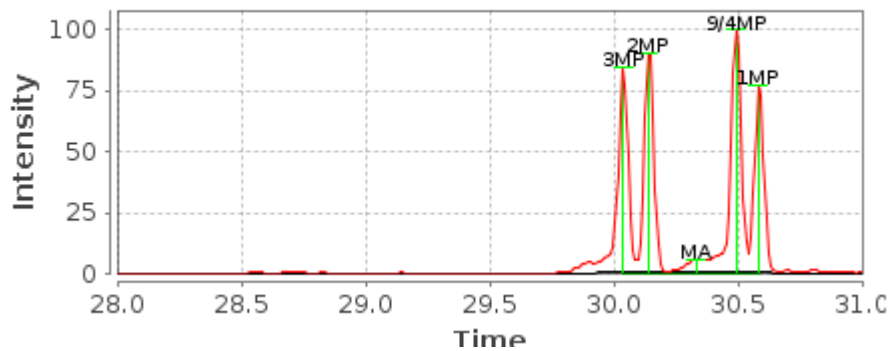
M/Z 231, No-1-18.118



M/Z 234, No-1-18.118

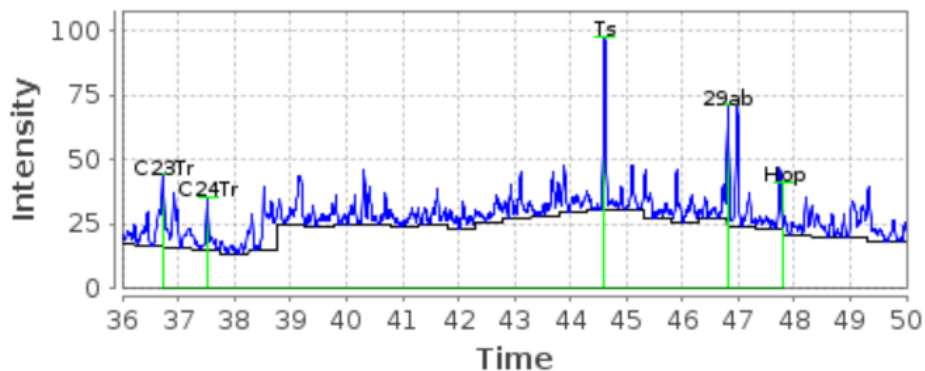


M/Z 192, No-1-18.118

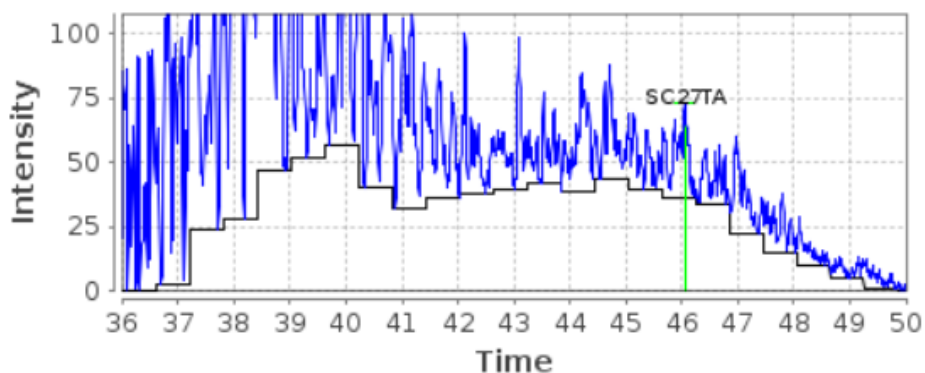


2000-0622 Embla

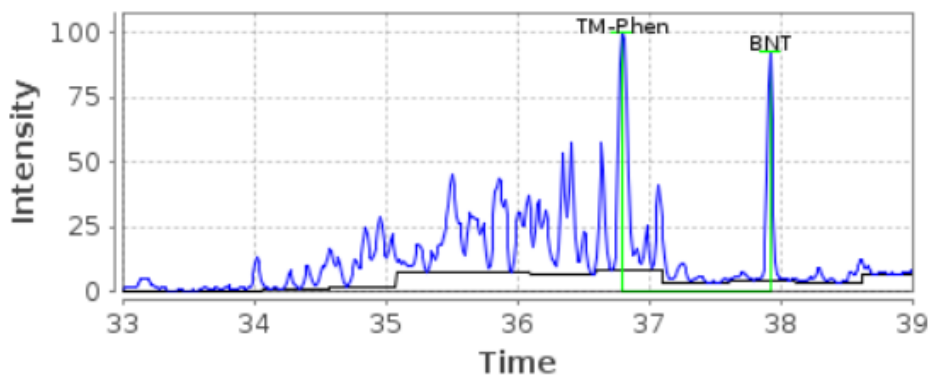
M/Z 191, No-1-18.36



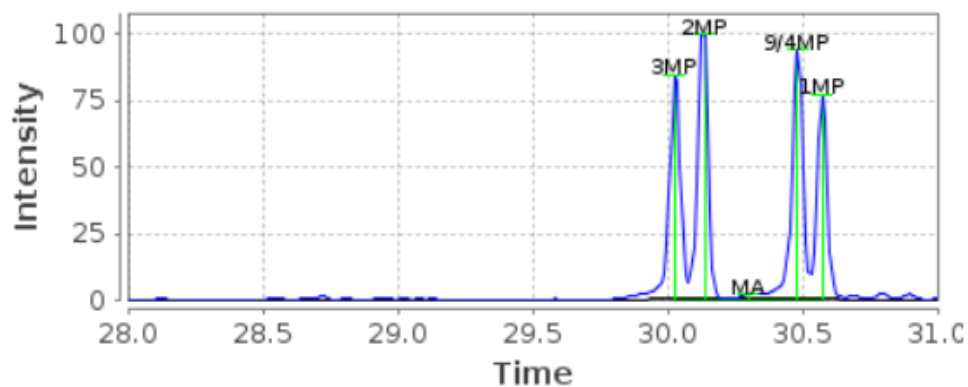
M/Z 231, No-1-18.36



M/Z 234, No-1-18.36

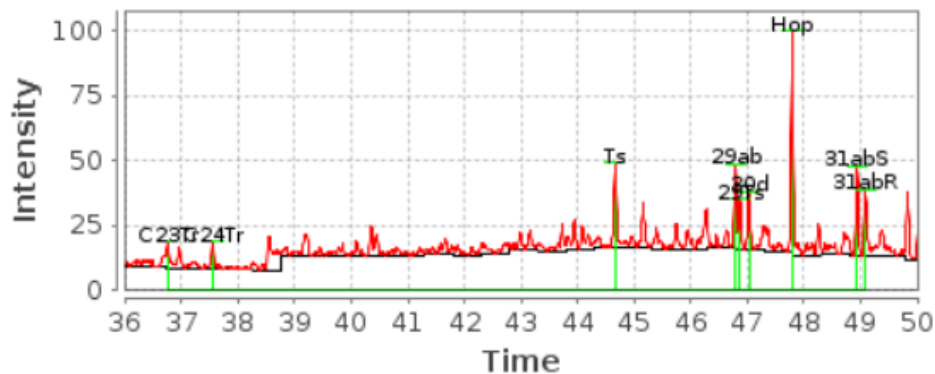


M/Z 192, No-1-18.36

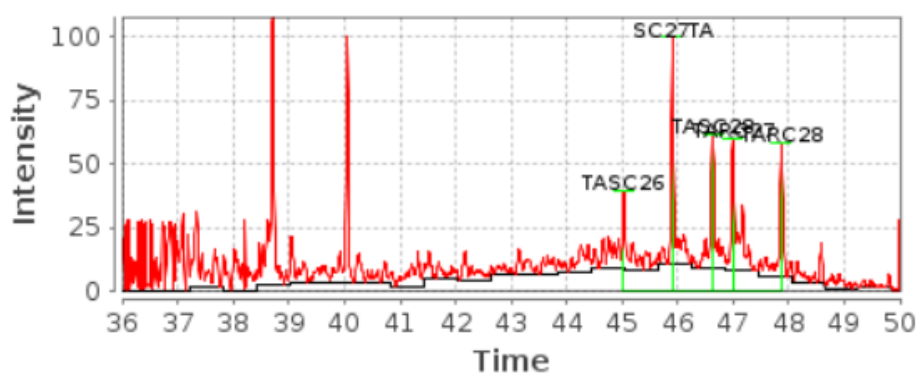


2008-0282 Alvheim

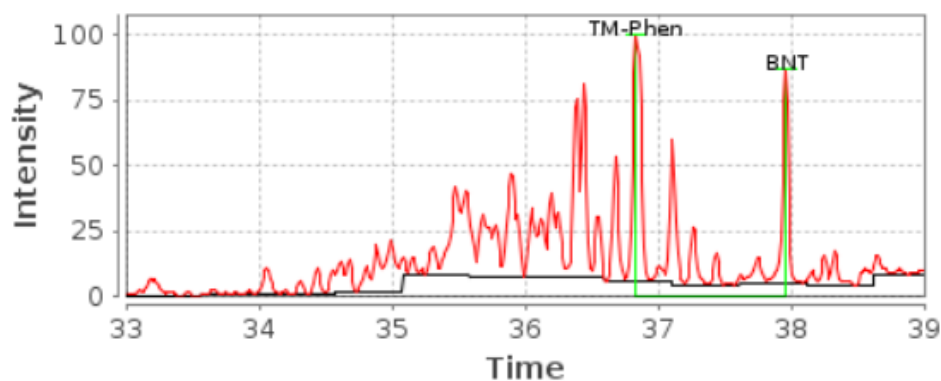
M/Z 191, No-1-18.72



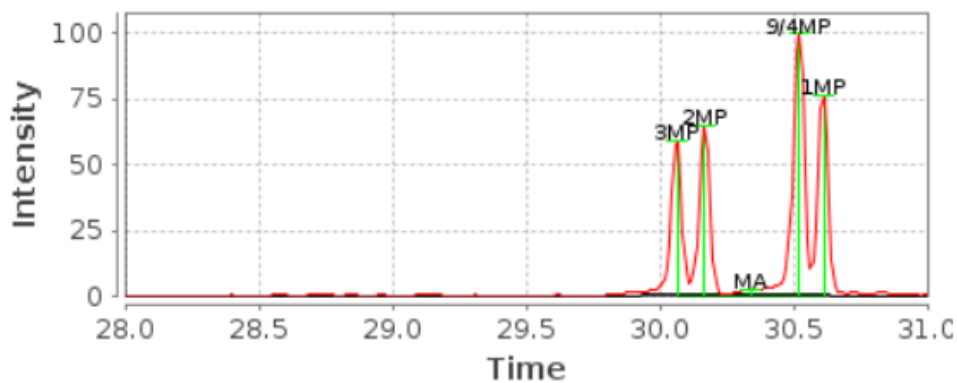
M/Z 231, No-1-18.72



M/Z 234, No-1-18.72

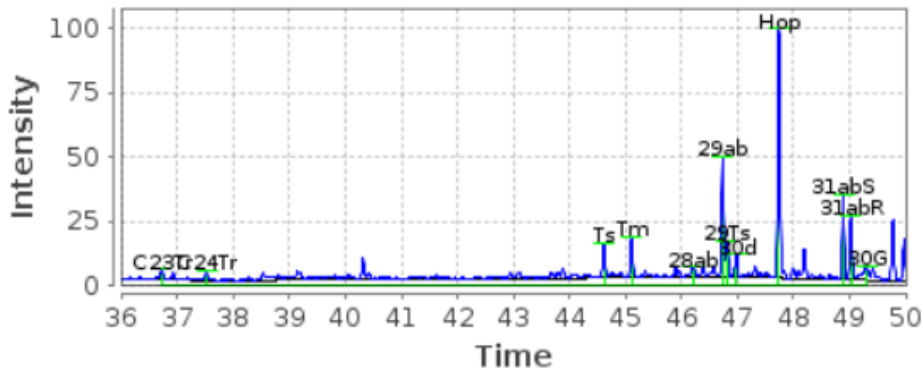


M/Z 192, No-1-18.72

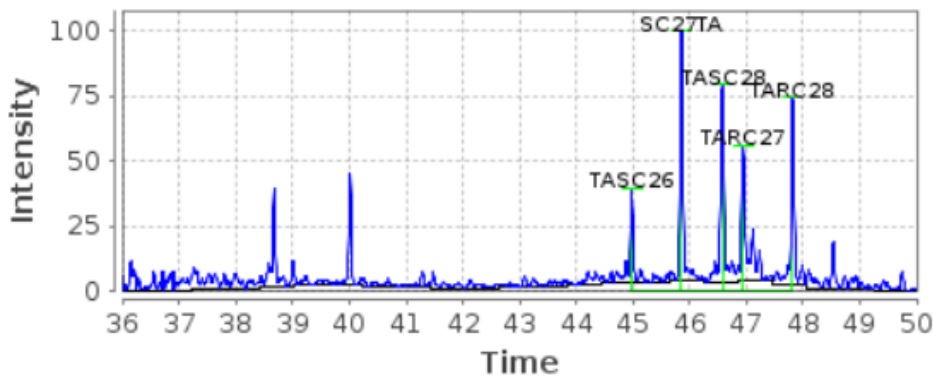


2001-0104 Goliath

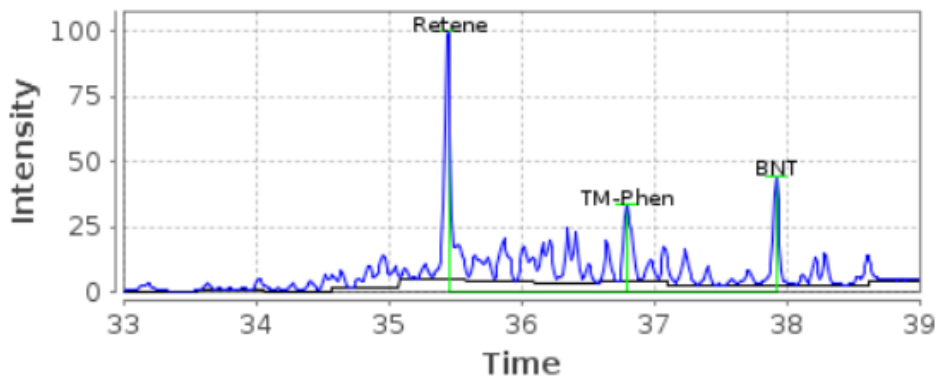
M/Z 191, No-1-18.39



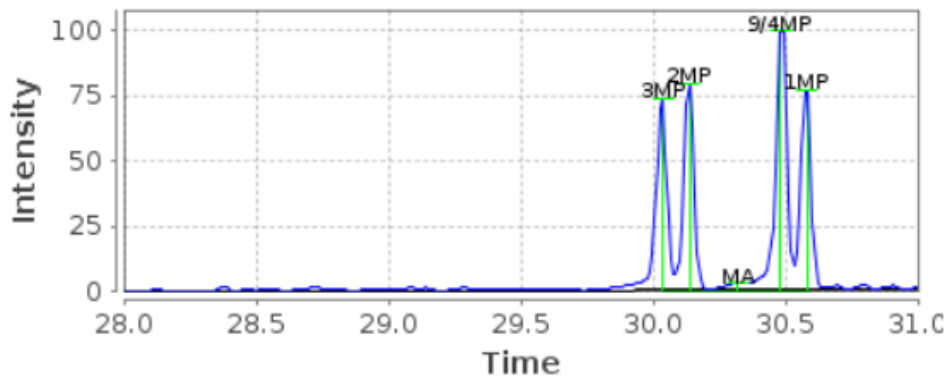
M/Z 231, No-1-18.39



M/Z 234, No-1-18.39

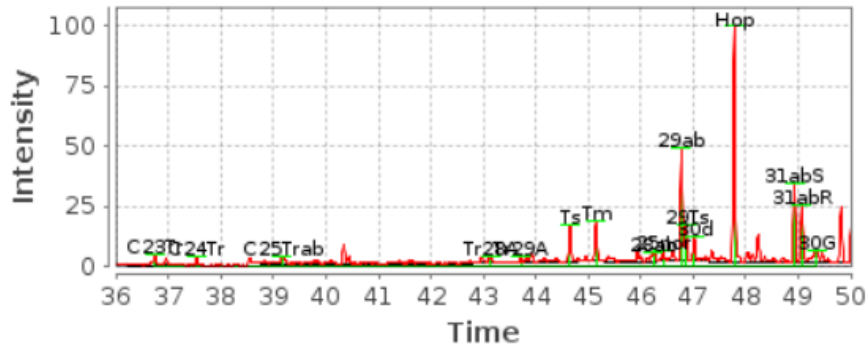


M/Z 192, No-1-18.39

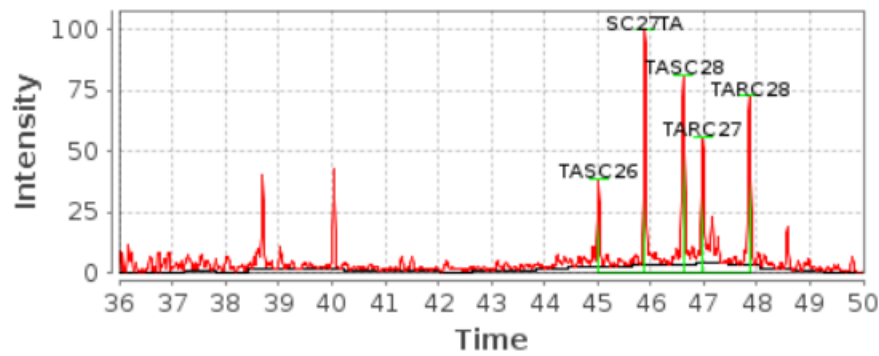


2010-0030 Realgrunnen

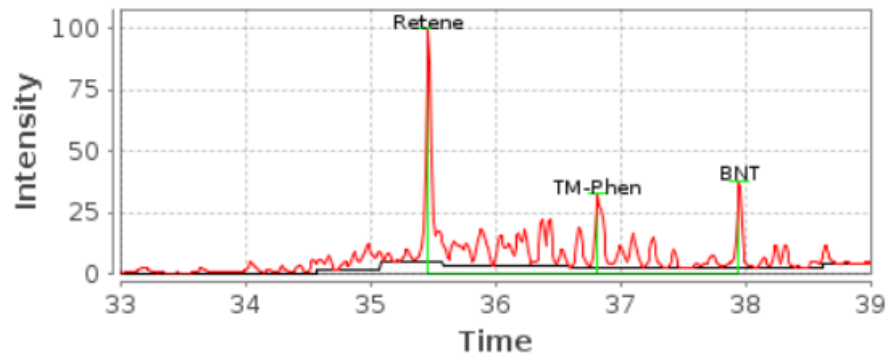
M/Z 191, No-1-18.90



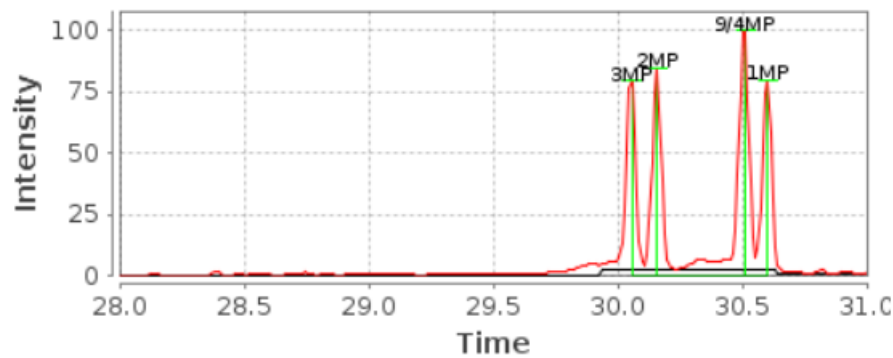
M/Z 231, No-1-18.90



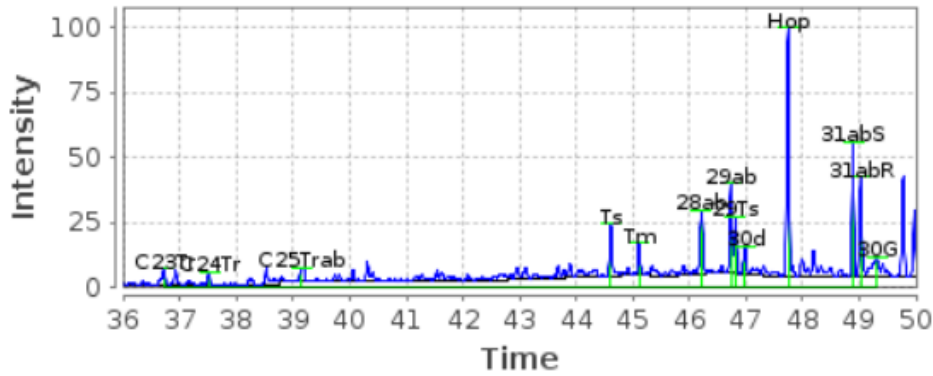
M/Z 234, No-1-18.90



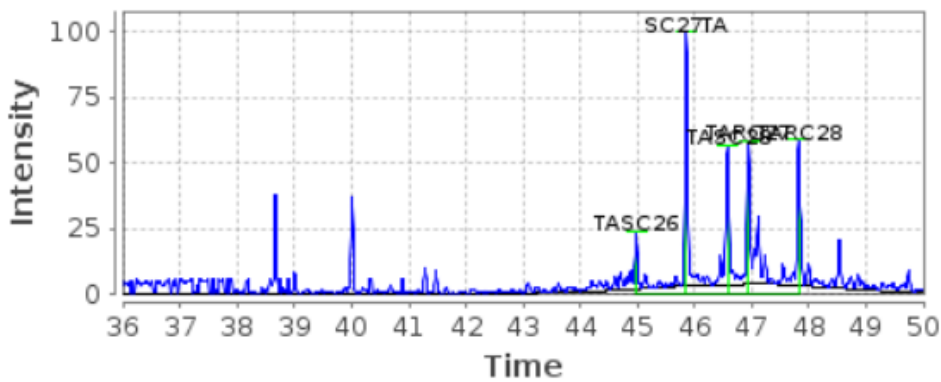
M/Z 192, No-1-18.90



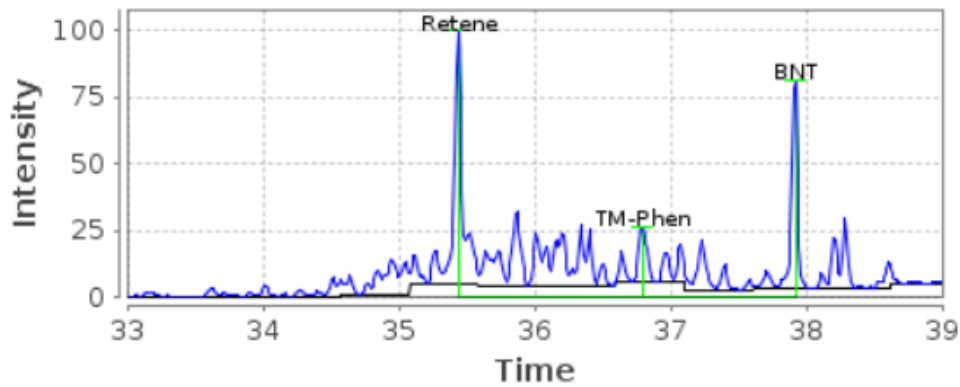
2001-0247 Glitne
 M/Z 191, No-1-18.40



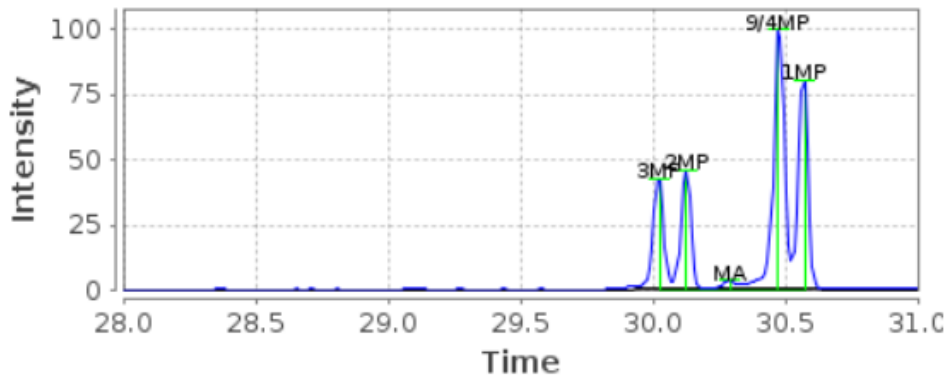
M/Z 231, No-1-18.40



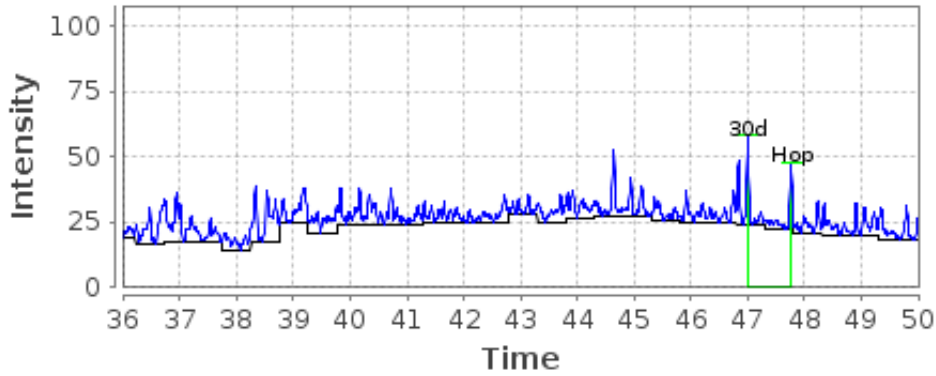
M/Z 234, No-1-18.40



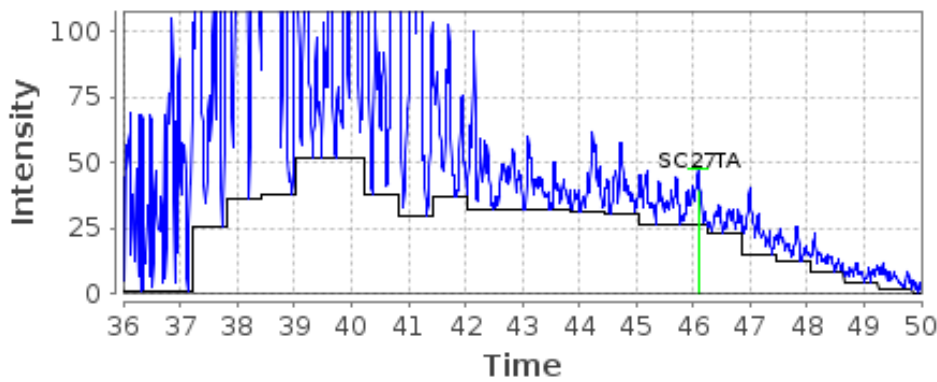
M/Z 192, No-1-18.40



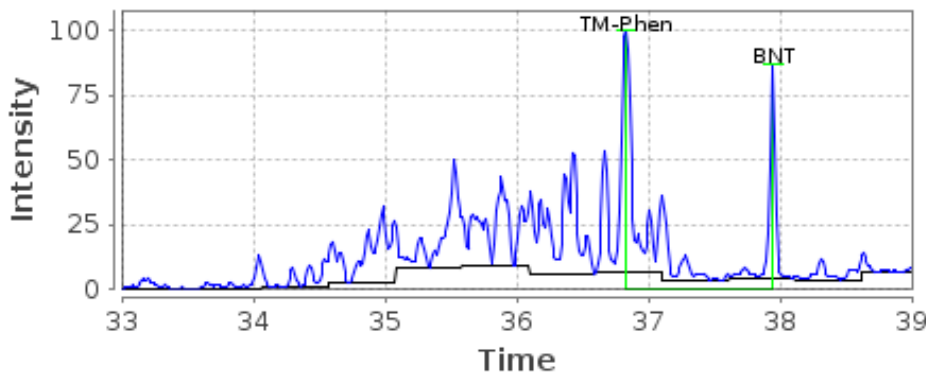
2001-0631 Tambar
 M/Z 191, No-1-18.41



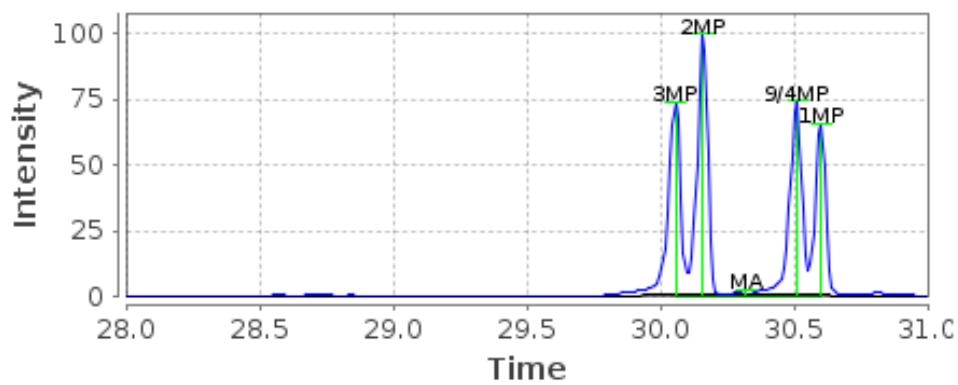
M/Z 231, No-1-18.41



M/Z 234, No-1-18.41

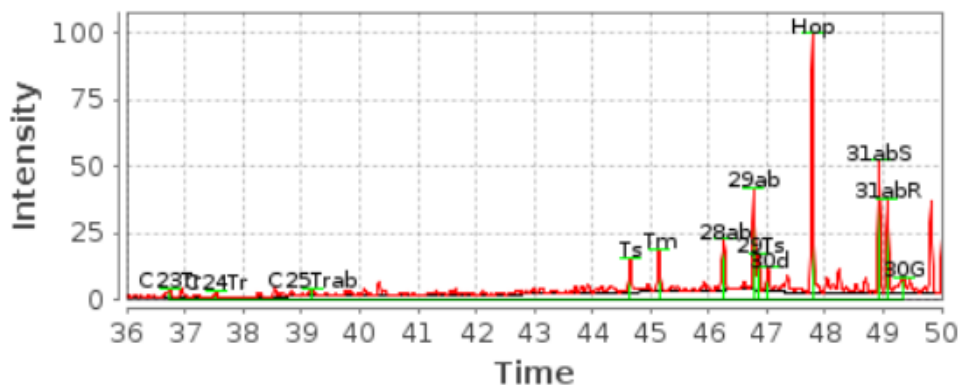


M/Z 192, No-1-18.41

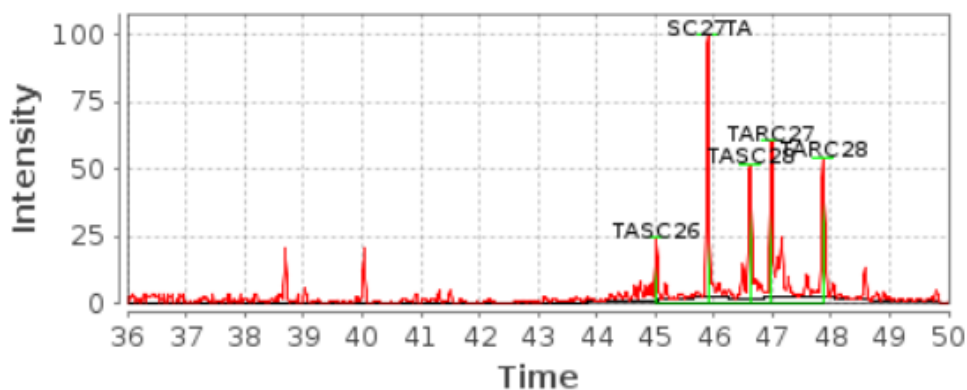


2011-0444 Avaldsnes

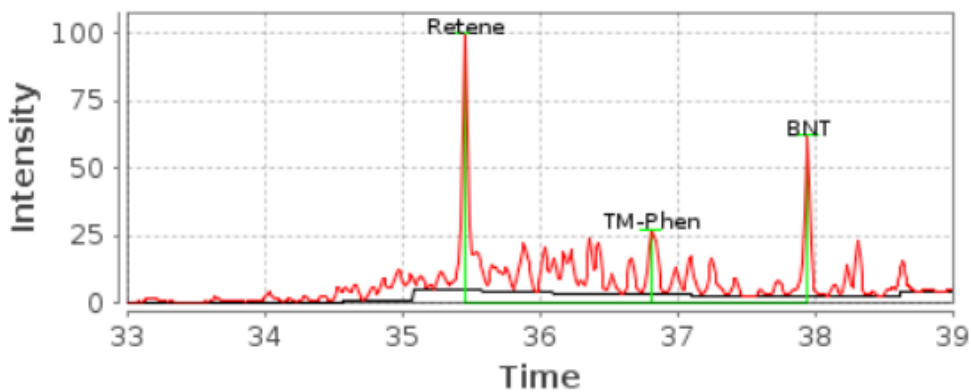
M/Z 191, No-1-18.98



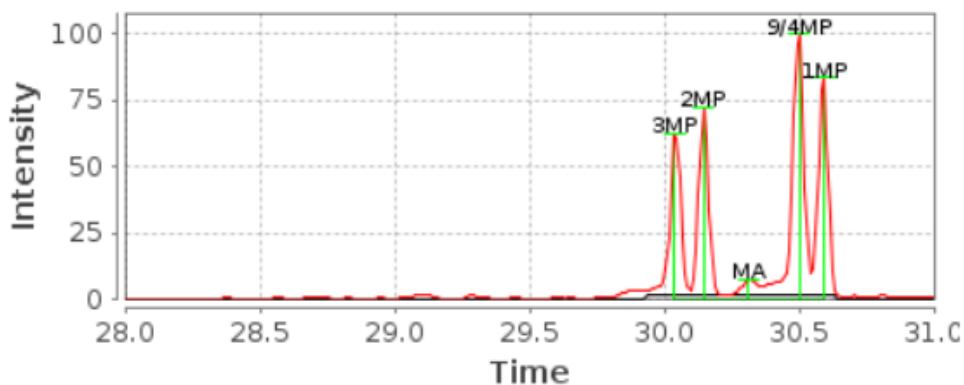
M/Z 231, No-1-18.98



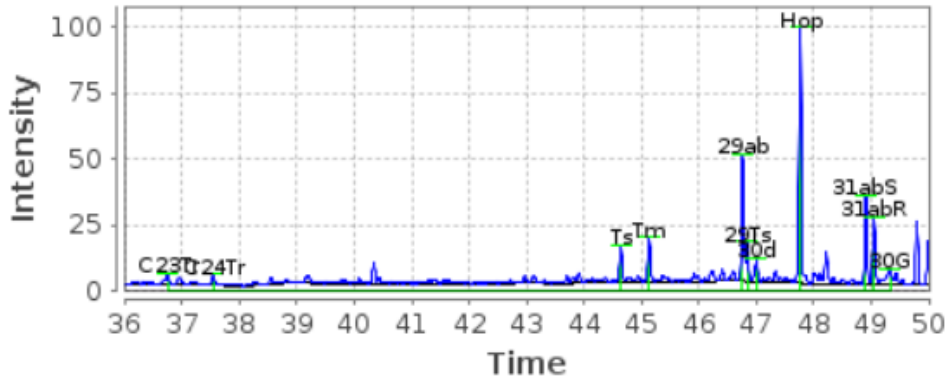
M/Z 234, No-1-18.98



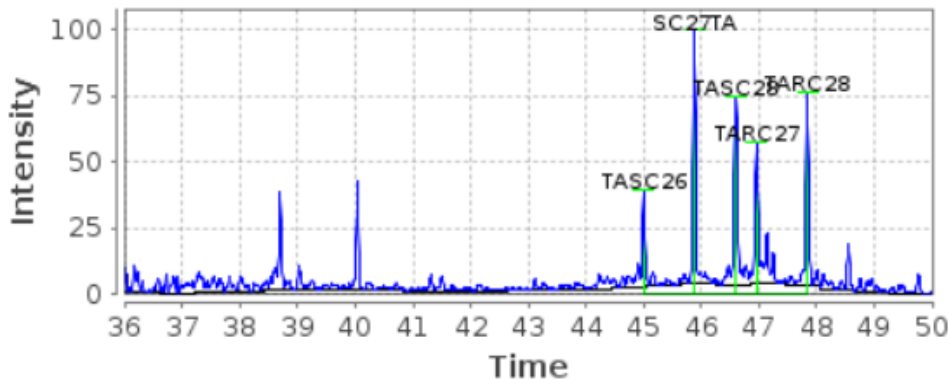
M/Z 192, No-1-18.98



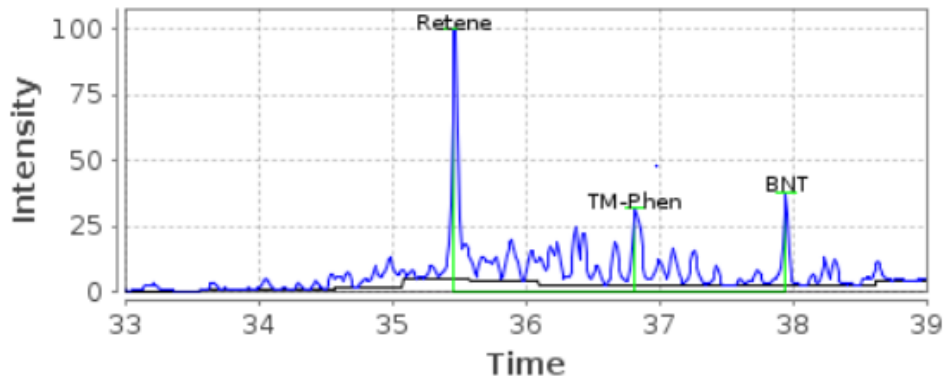
2001-0729 Goliath
 M/Z 191, No-1-18.42



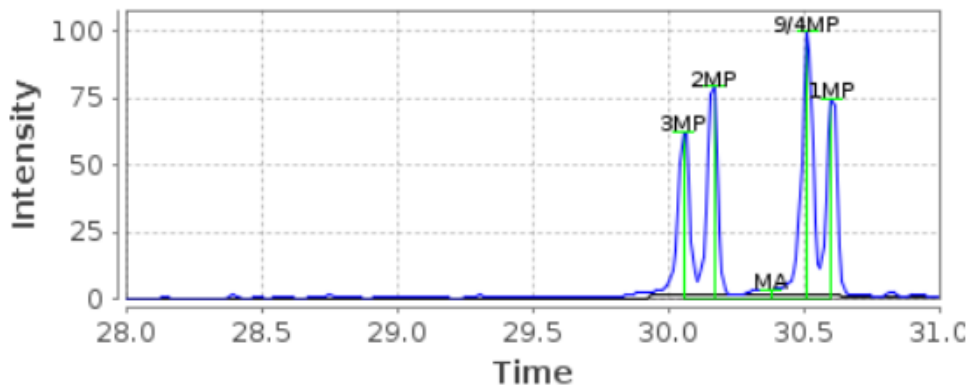
M/Z 231, No-1-18.42



M/Z 234, No-1-18.42

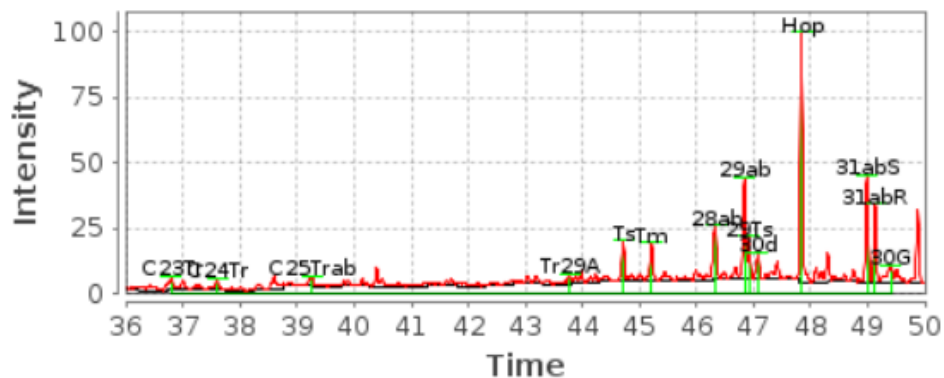


M/Z 192, No-1-18.42

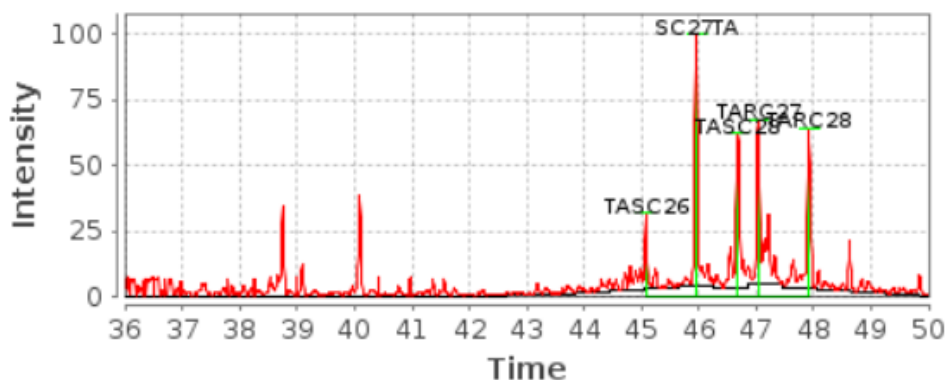


2008-0047 Statfjord

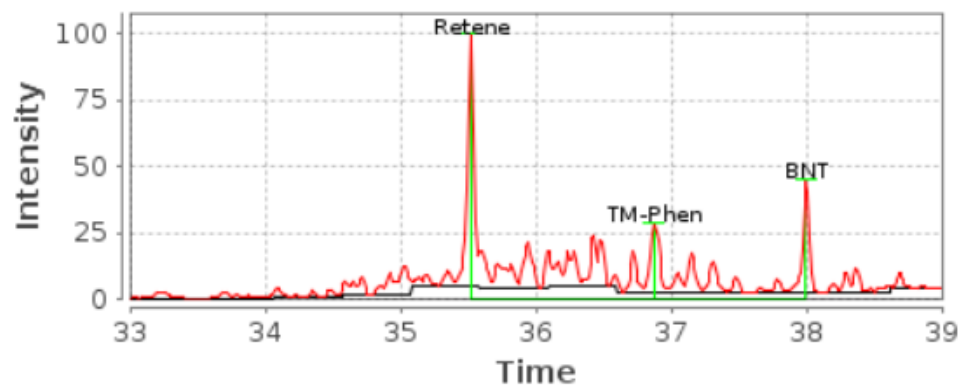
M/Z 191, No-1-18.69



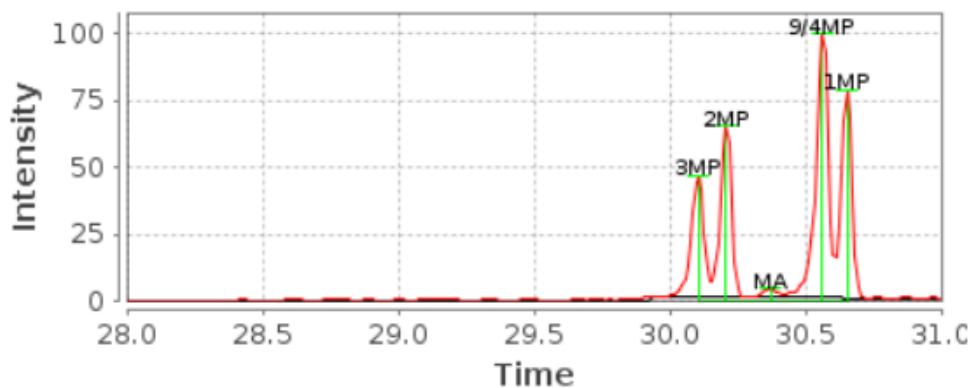
M/Z 231, No-1-18.69



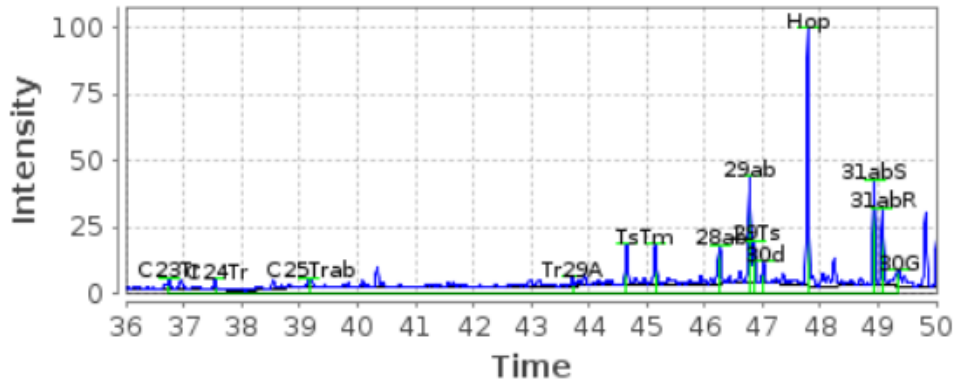
M/Z 234, No-1-18.69



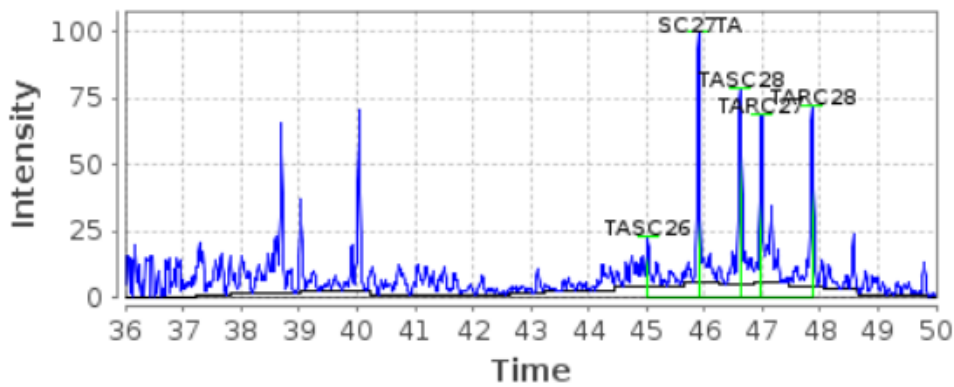
M/Z 192, No-1-18.69



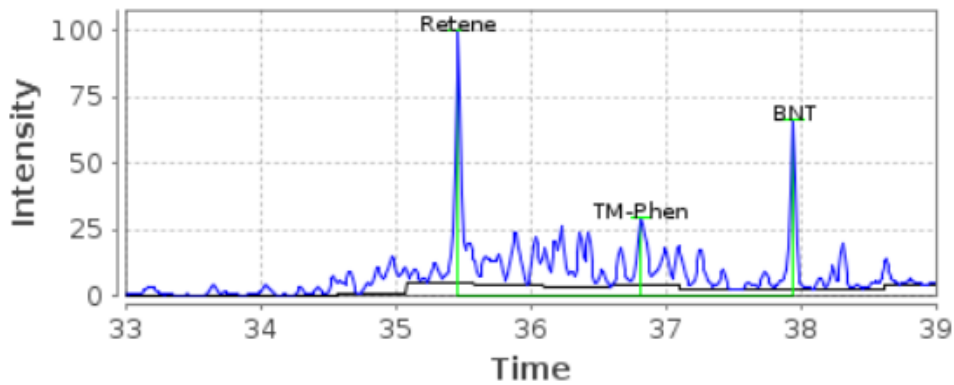
2002-0135 Skarv
 M/Z 191, No-1-18.45



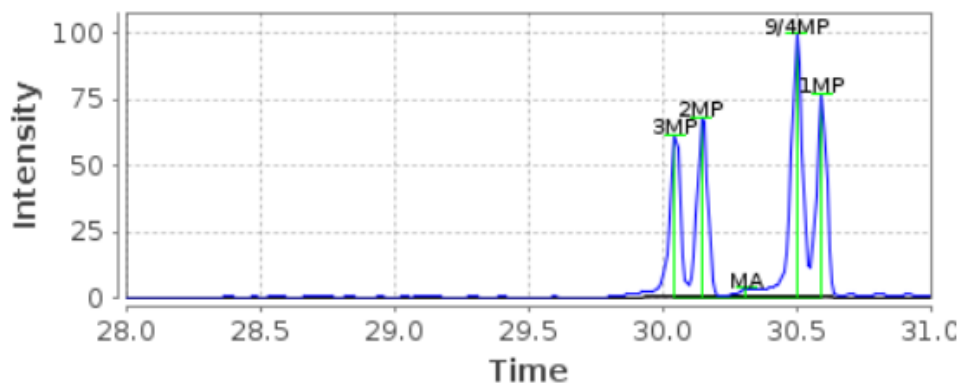
M/Z 231, No-1-18.45



M/Z 234, No-1-18.45

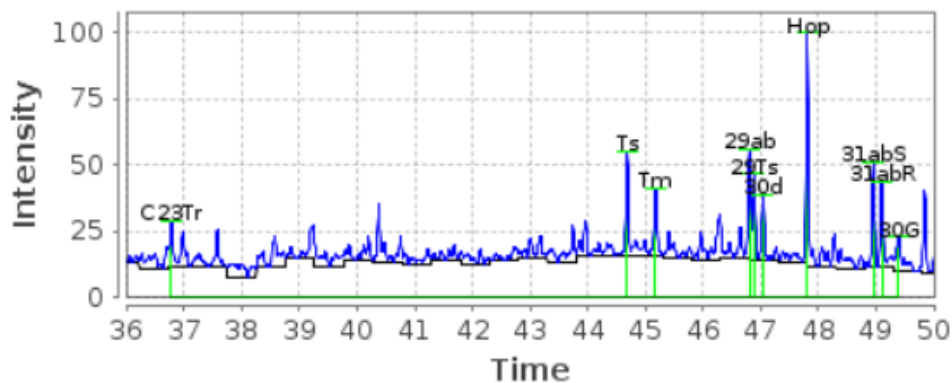


M/Z 192, No-1-18.45

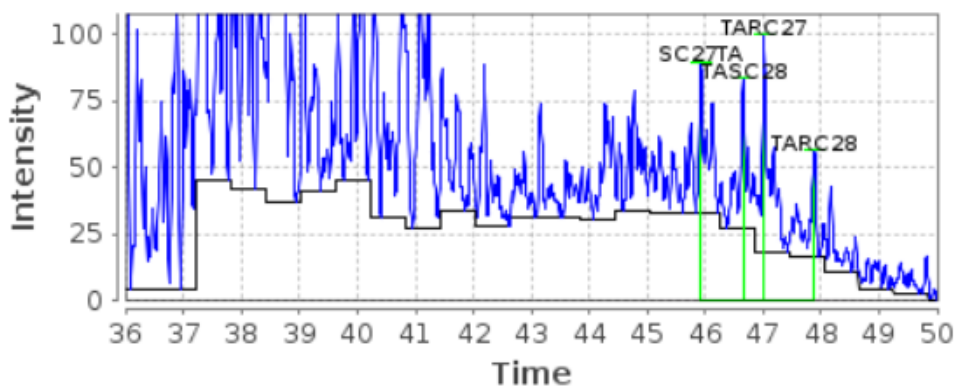


2002-0599 Åsgard

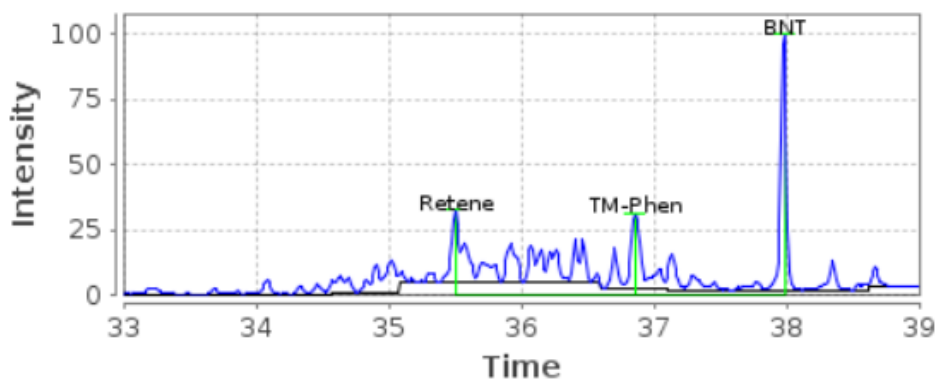
M/Z 191, No-1-18.46



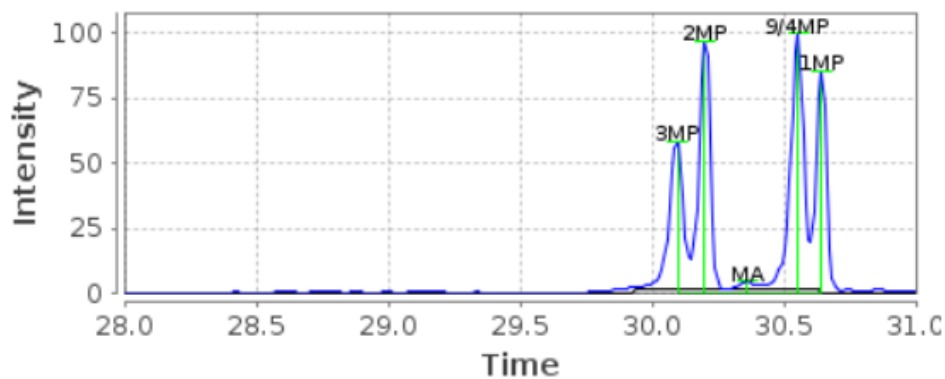
M/Z 231, No-1-18.46



M/Z 234, No-1-18.46

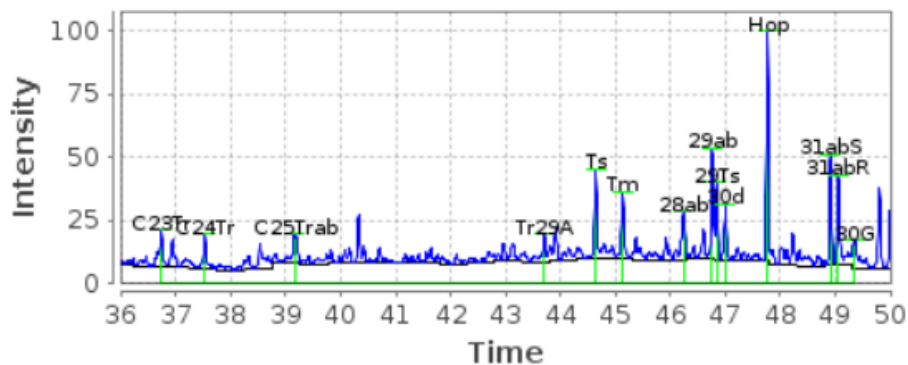


M/Z 192, No-1-18.46

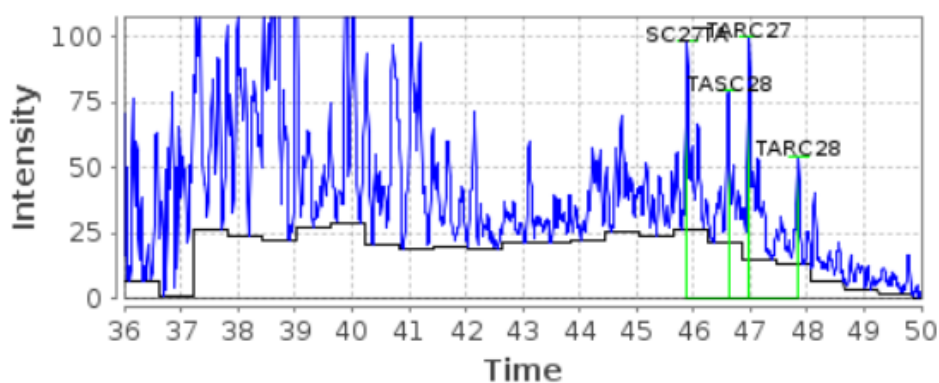


2002-0600 Smørbukk

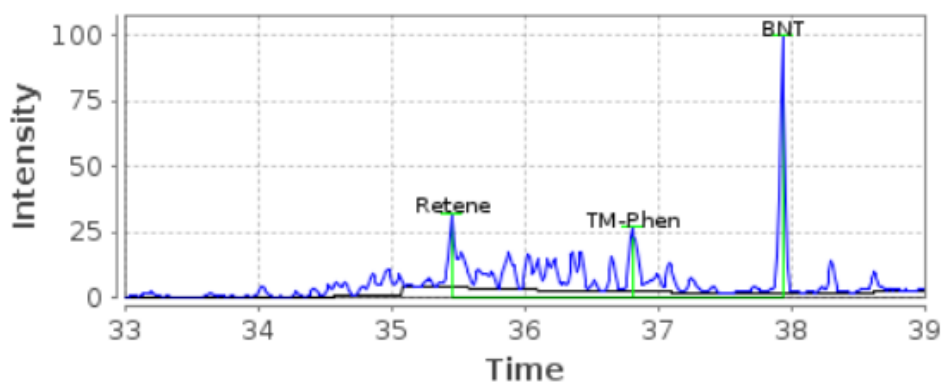
M/Z 191, No-1-18.47



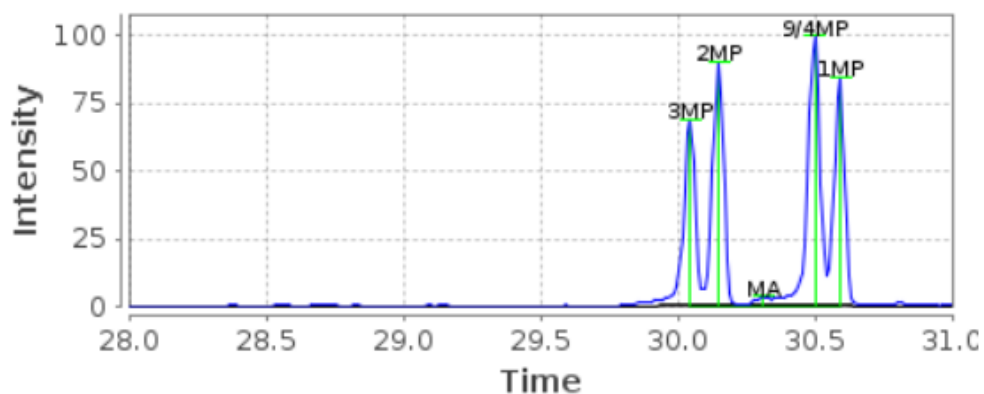
M/Z 231, No-1-18.47



M/Z 234, No-1-18.47

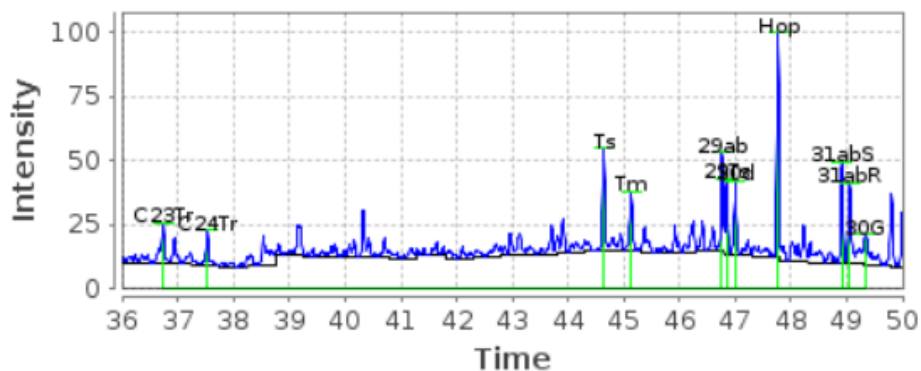


M/Z 192, No-1-18.47

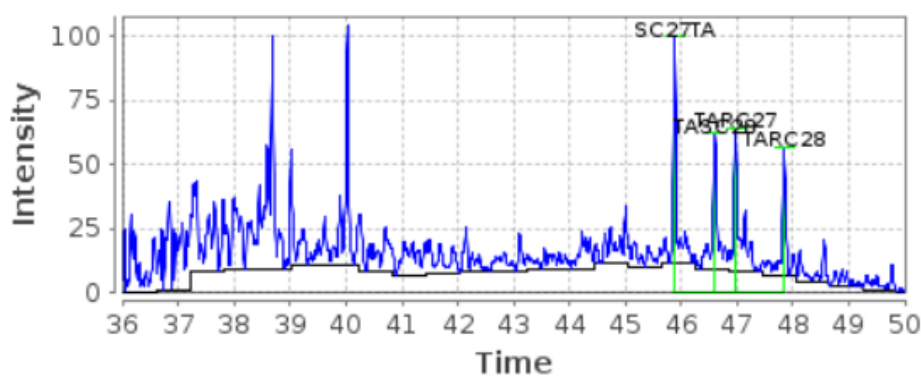


2003-0107 Heidrun Tilje

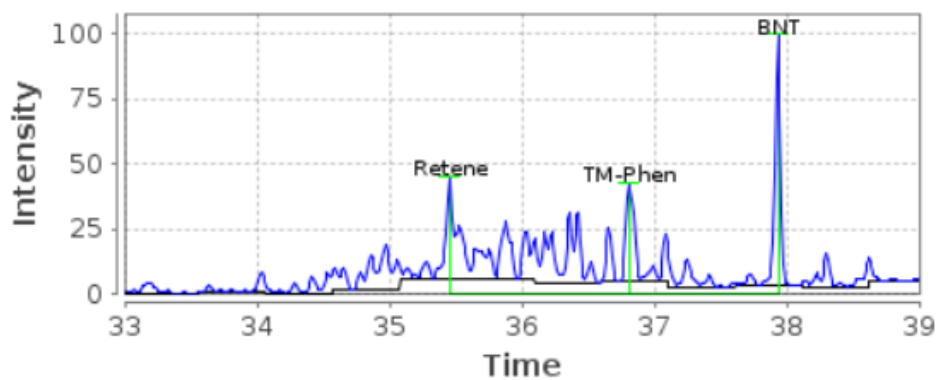
M/Z 191, No-1-18.48



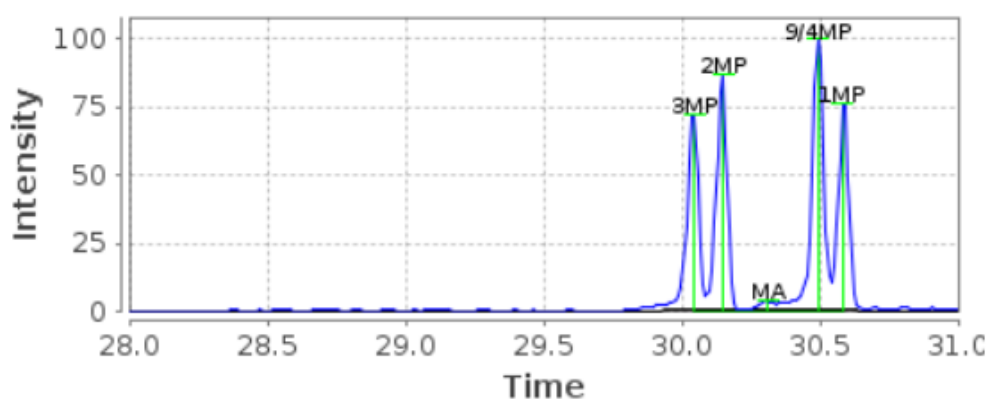
M/Z 231, No-1-18.48



M/Z 234, No-1-18.48

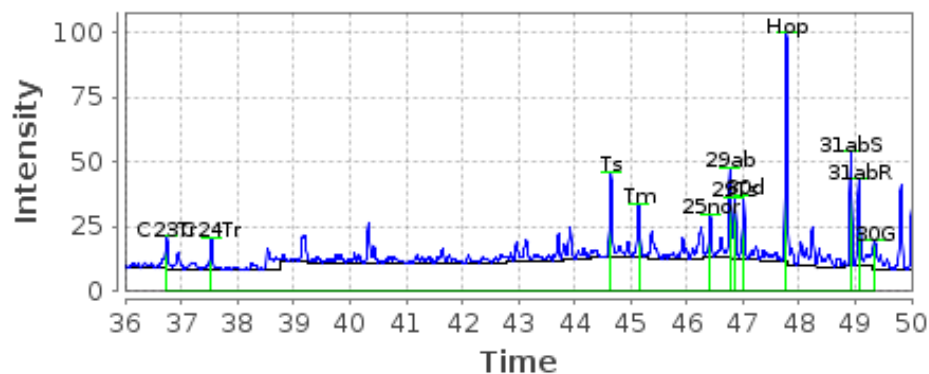


M/Z 192, No-1-18.48

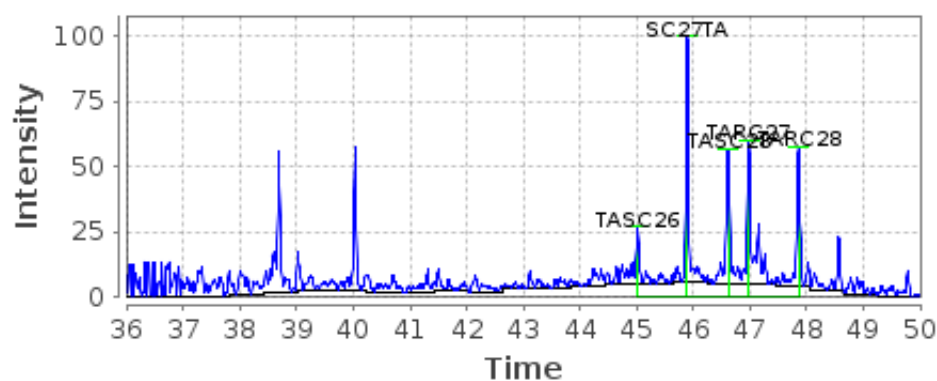


2003-0348 Heidrun Åre

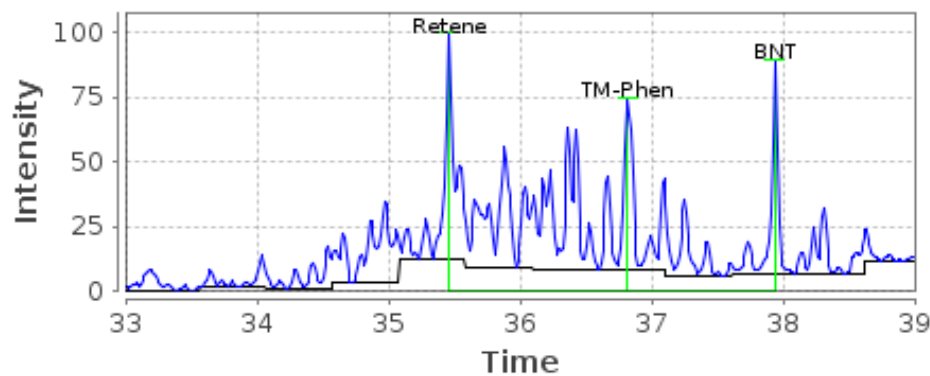
M/Z 191, No-1-18.49



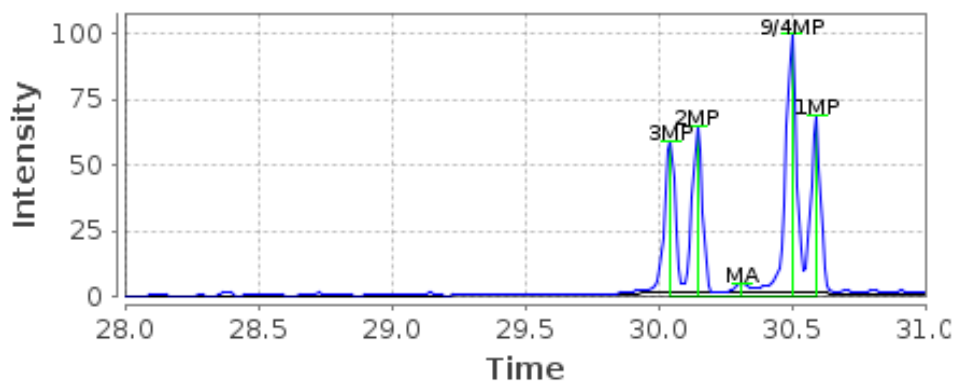
M/Z 231, No-1-18.49



M/Z 234, No-1-18.49

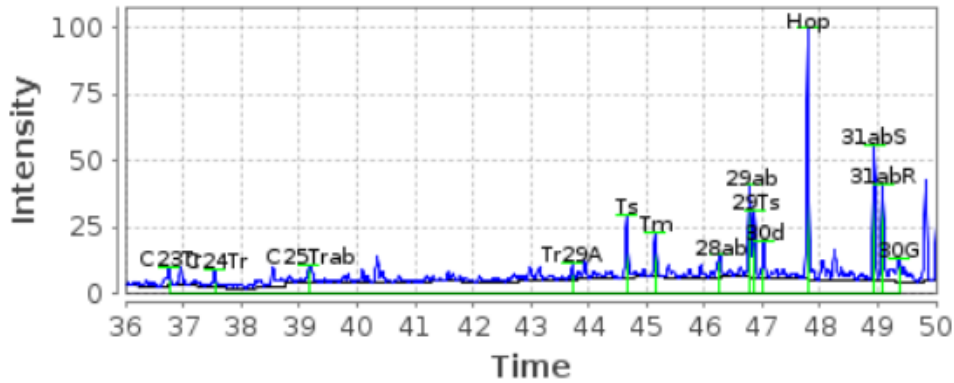


M/Z 192, No-1-18.49

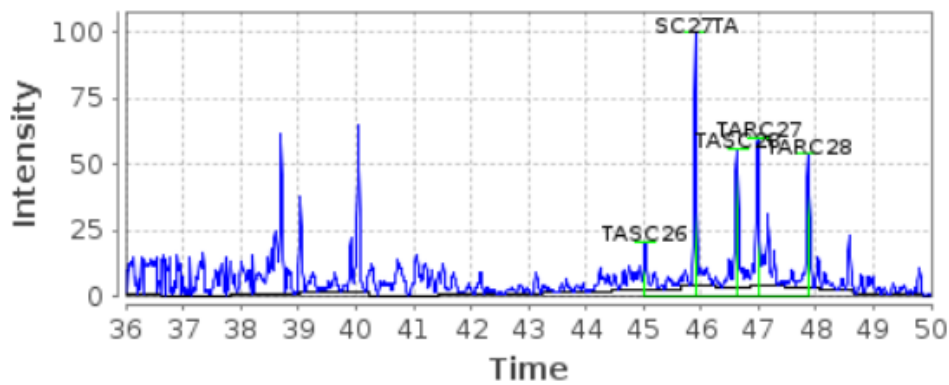


2003-1149 Tyrihans Nord

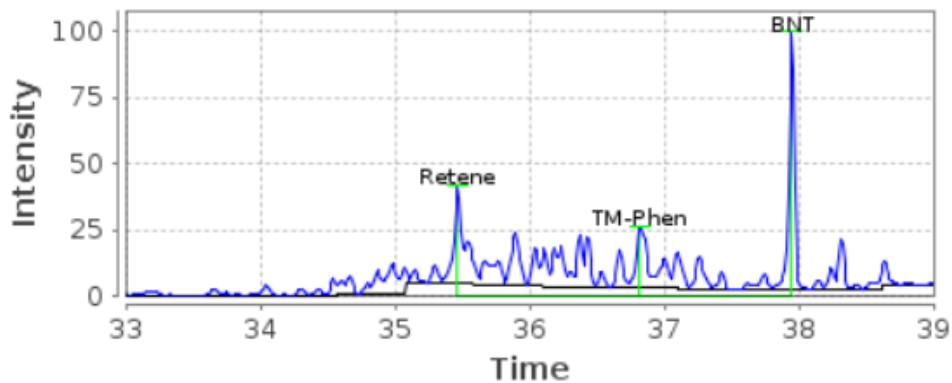
M/Z 191, No-1-18.50



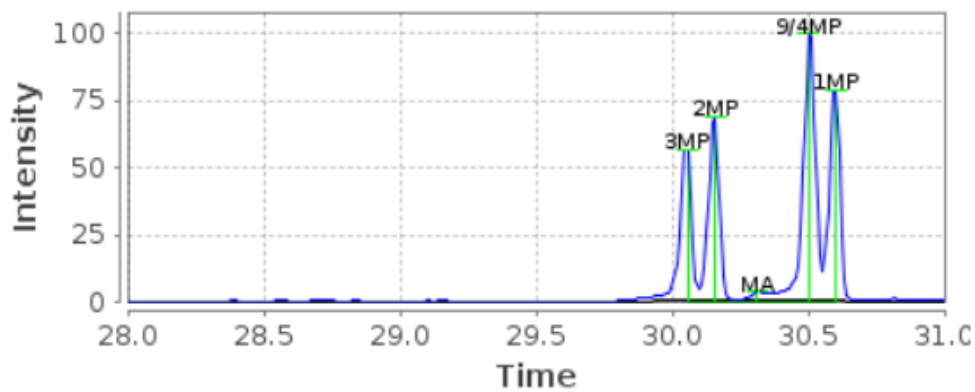
M/Z 231, No-1-18.50



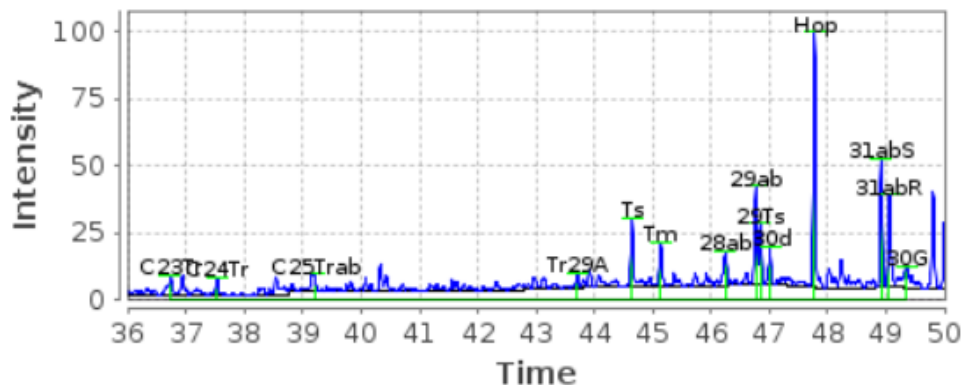
M/Z 234, No-1-18.50



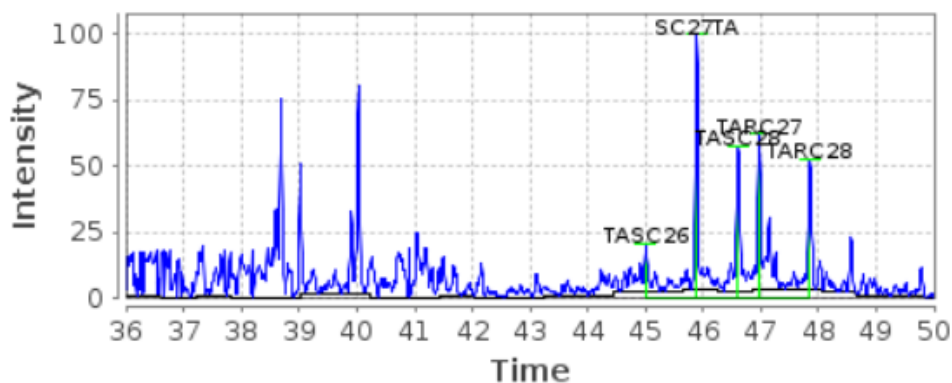
M/Z 192, No-1-18.50



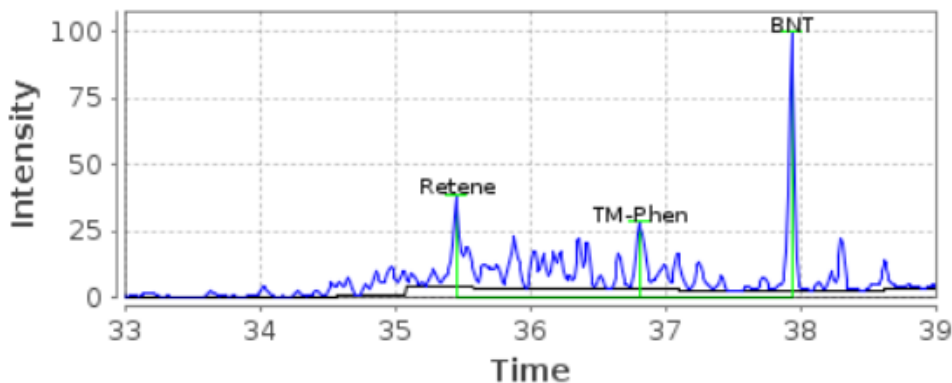
2003-1150 Tyrihans Sør
 M/Z 191, No-1-18.51



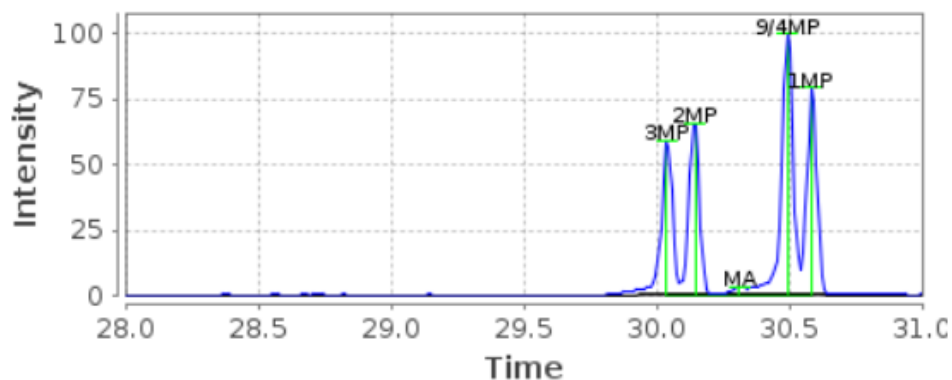
M/Z 231, No-1-18.51



M/Z 234, No-1-18.51

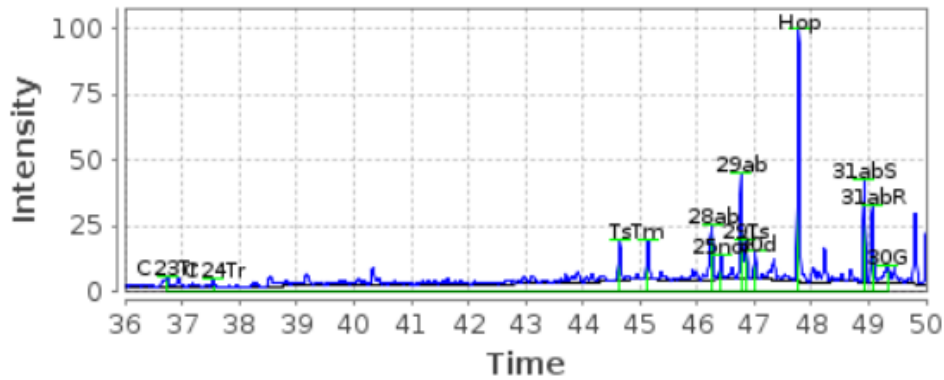


M/Z 192, No-1-18.51

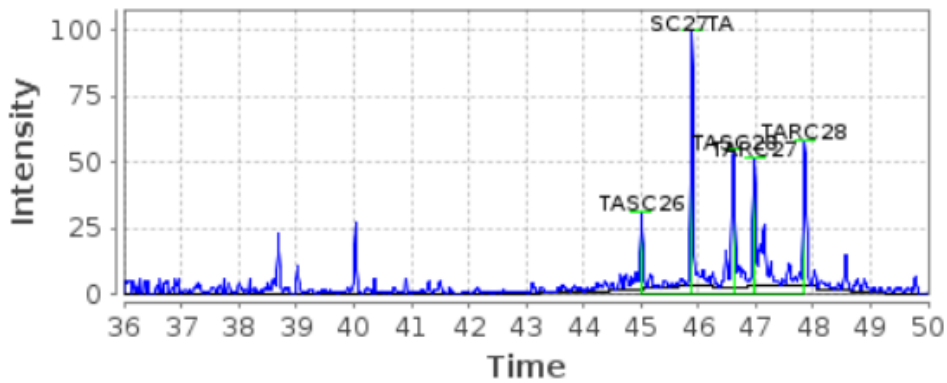


2003-1252 Oseberg Sør

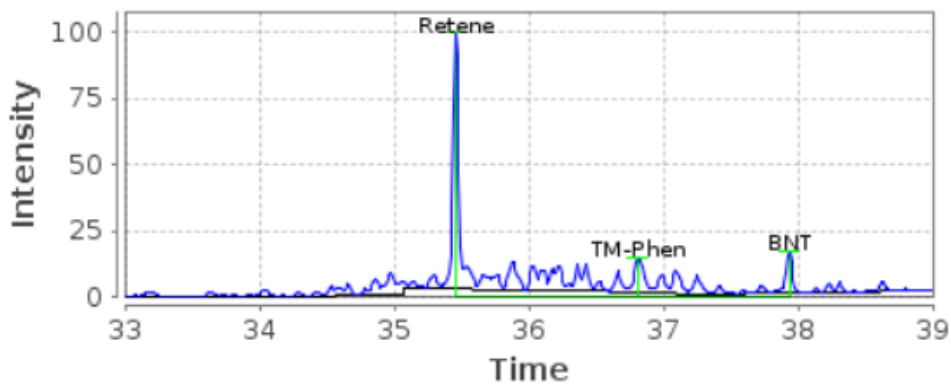
M/Z 191, No-1-18.52



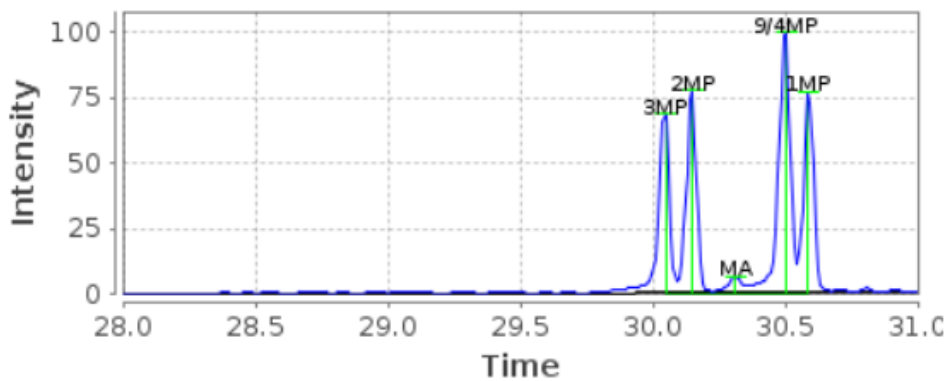
M/Z 231, No-1-18.52



M/Z 234, No-1-18.52

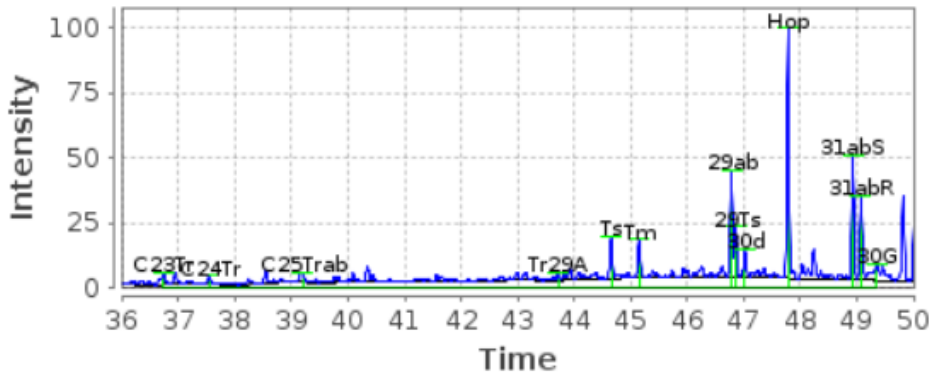


M/Z 192, No-1-18.52

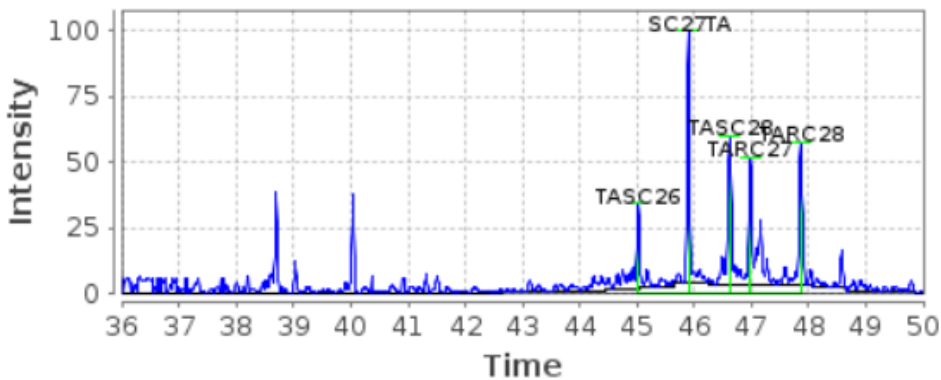


2003-2127 Varg

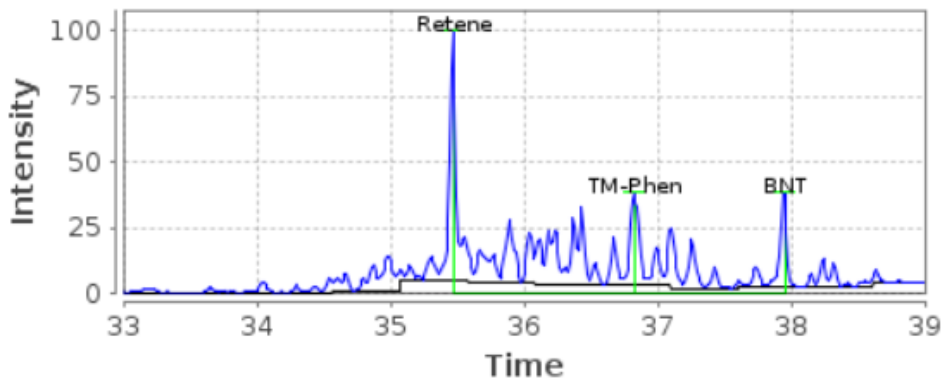
M/Z 191, No-1-18.53



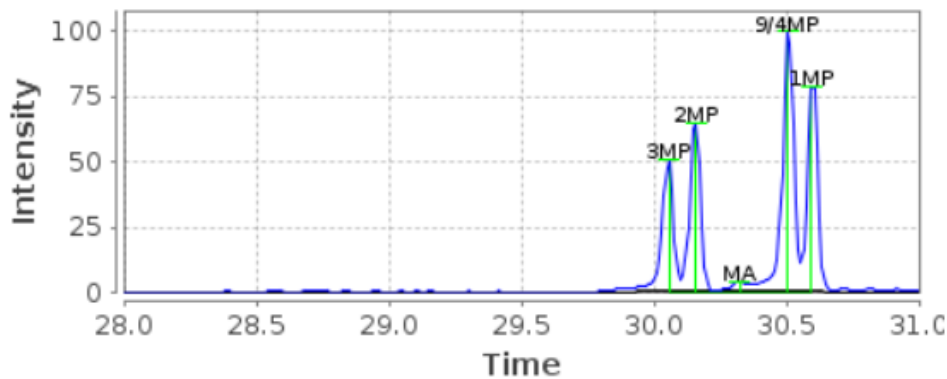
M/Z 231, No-1-18.53



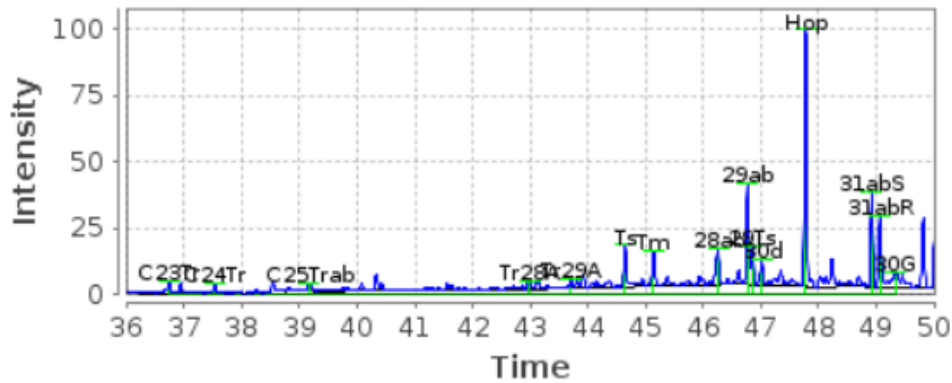
M/Z 234, No-1-18.53



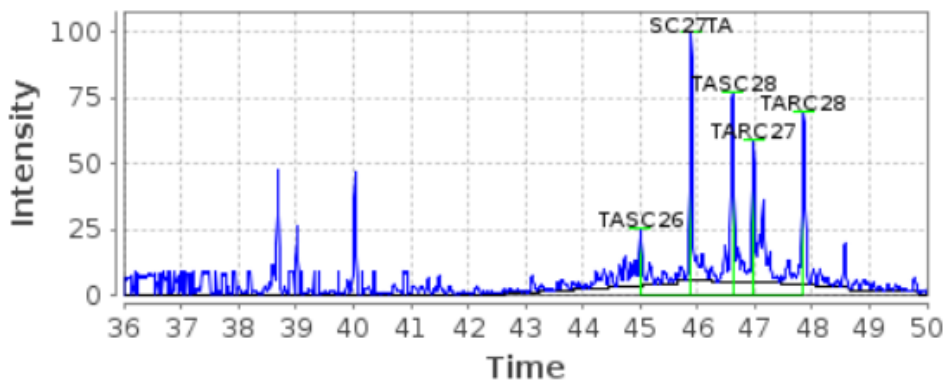
M/Z 192, No-1-18.53



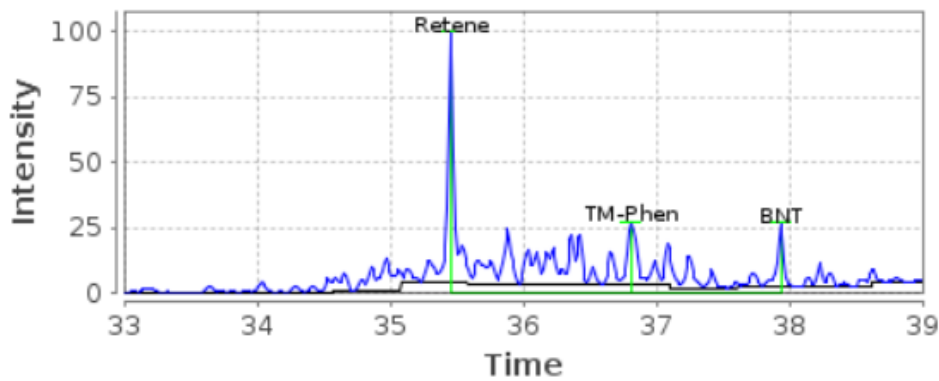
2003-2133 Oseberg Øst
M/Z 191, No-1-18.54



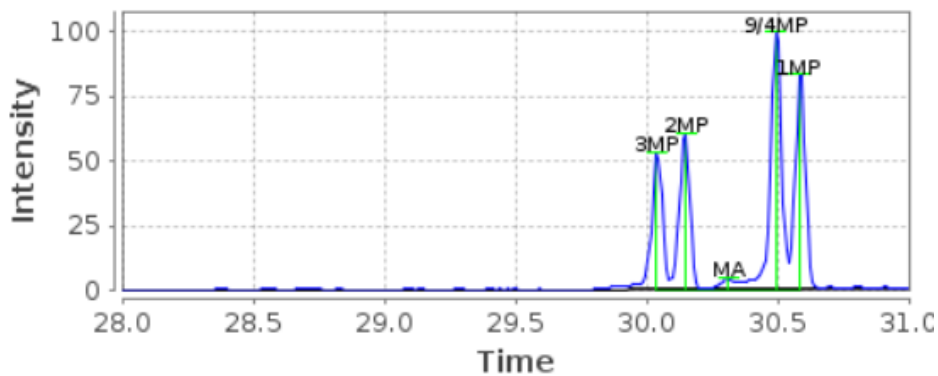
M/Z 231, No-1-18.54



M/Z 234, No-1-18.54

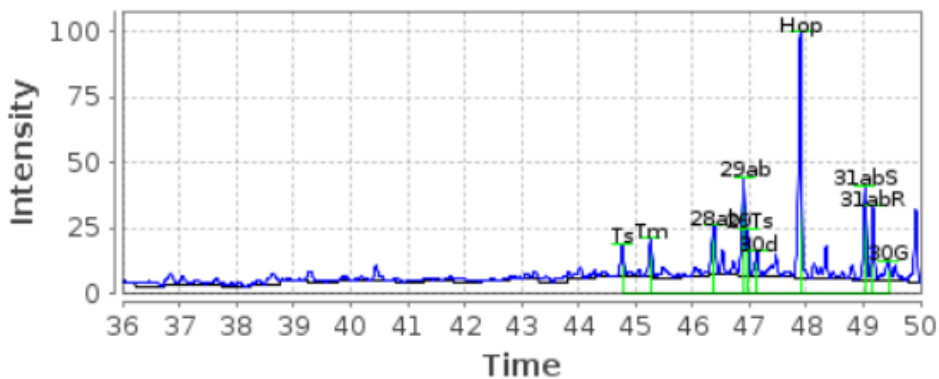


M/Z 192, No-1-18.54

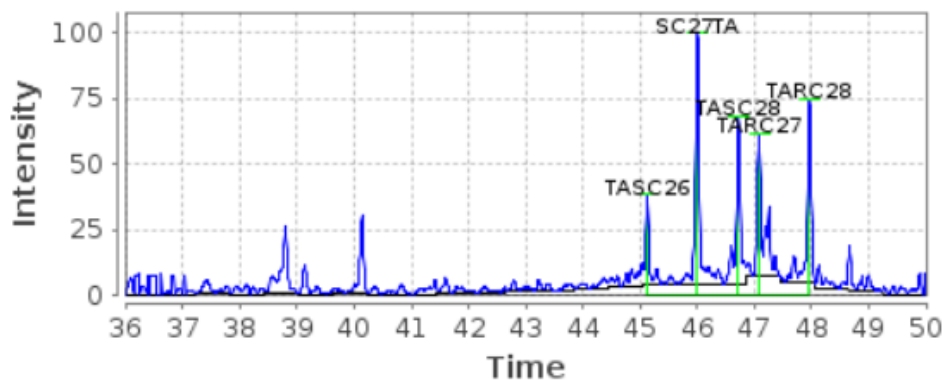


2003-2192 Oseberg C

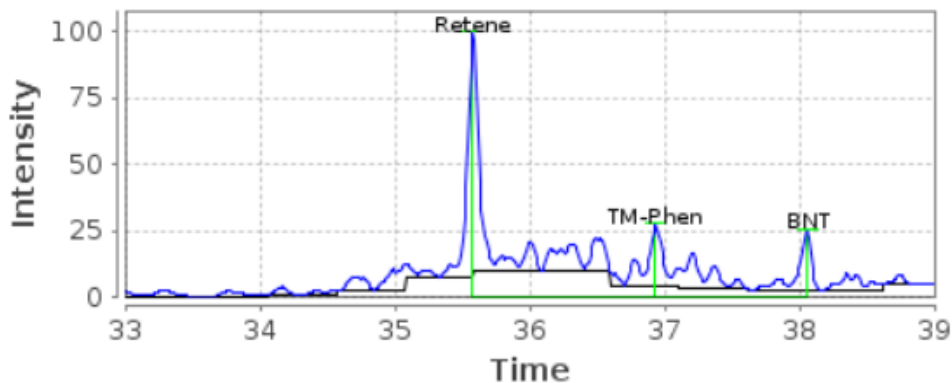
M/Z 191, No-1-18.55



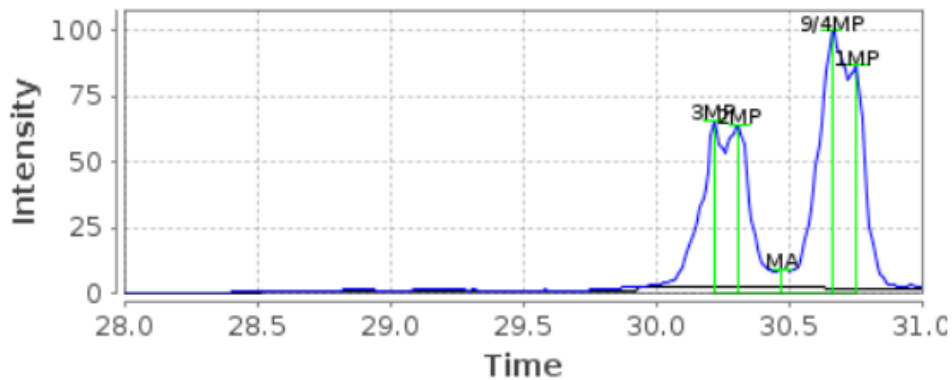
M/Z 231, No-1-18.55



M/Z 234, No-1-18.55

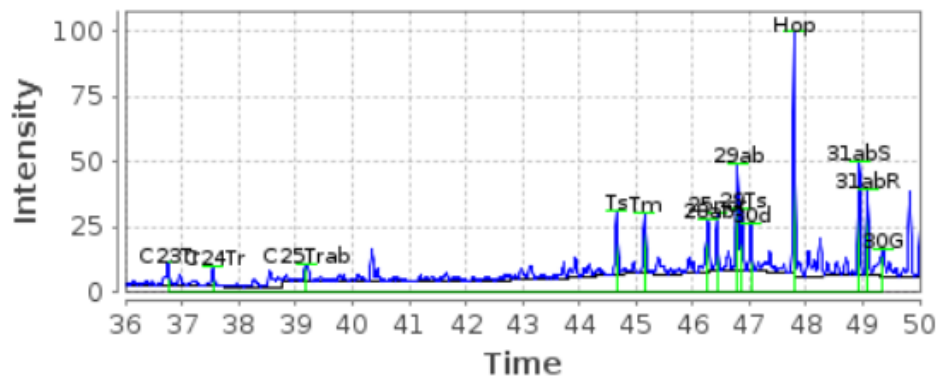


M/Z 192, No-1-18.55

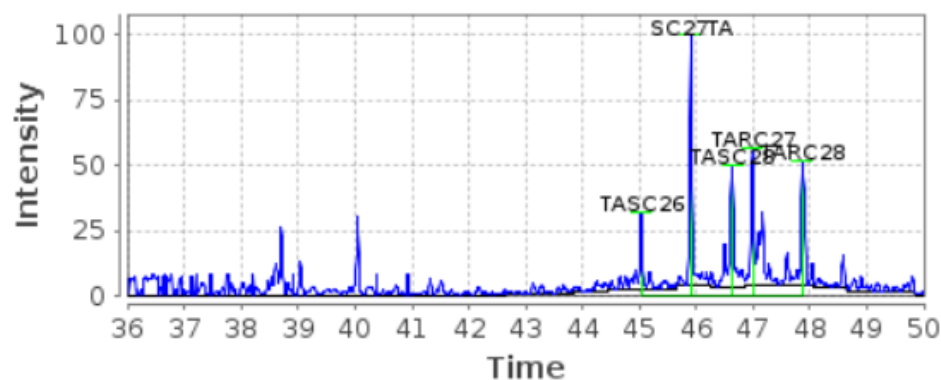


2003-2498 Grane

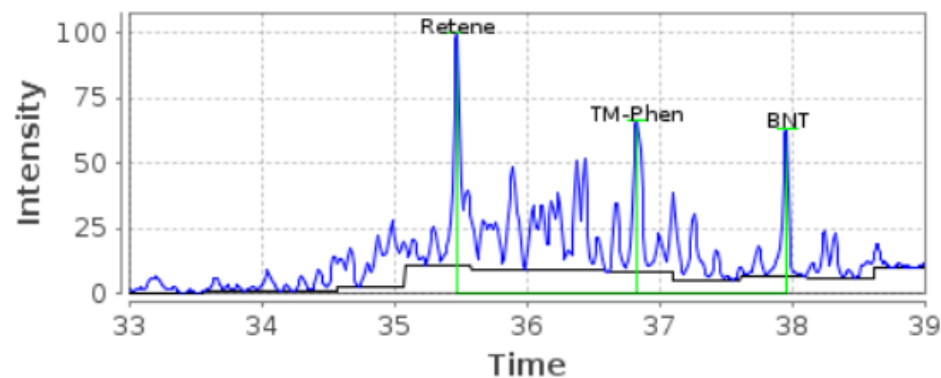
M/Z 191, No-1-18.56



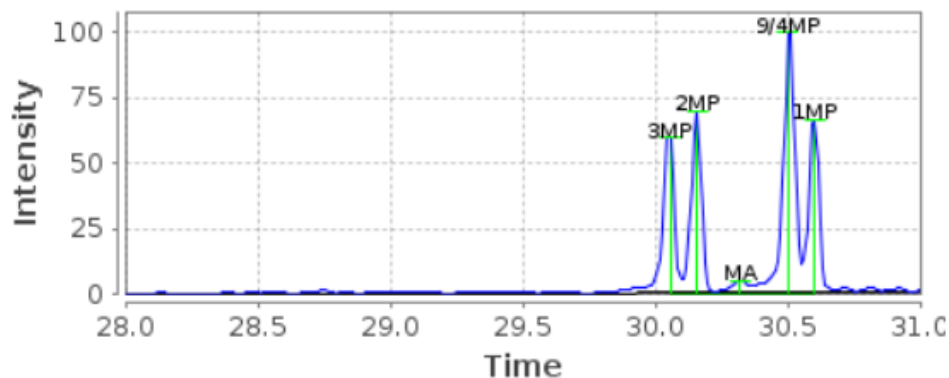
M/Z 231, No-1-18.56



M/Z 234, No-1-18.56

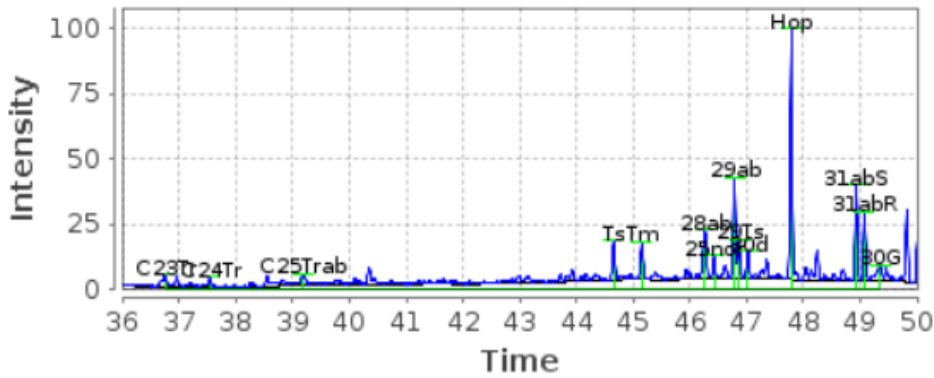


M/Z 192, No-1-18.56

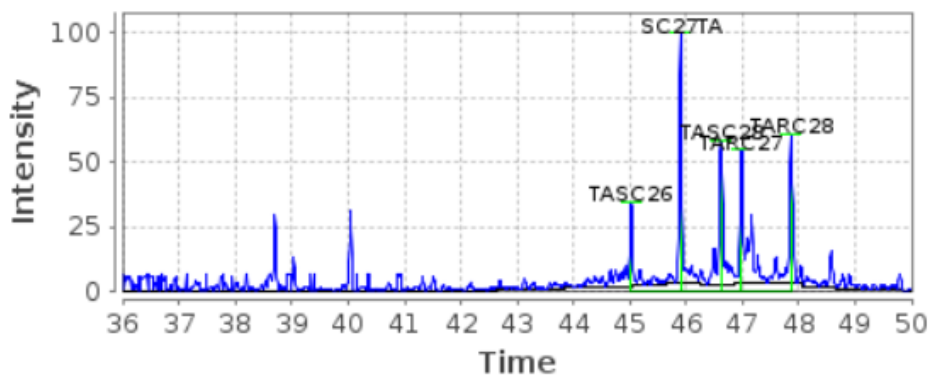


2003-2805 Oseberg A

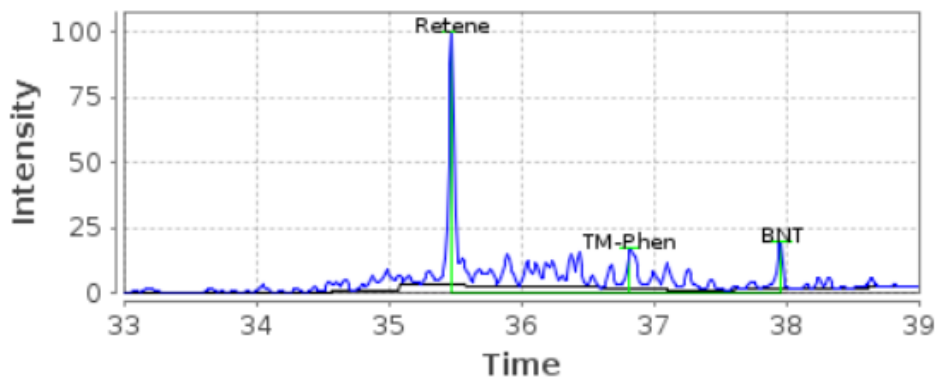
M/Z 191, No-1-18.57



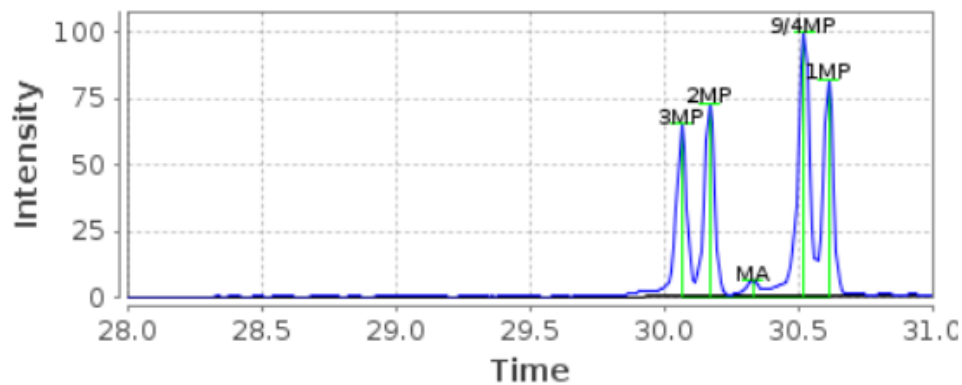
M/Z 231, No-1-18.57



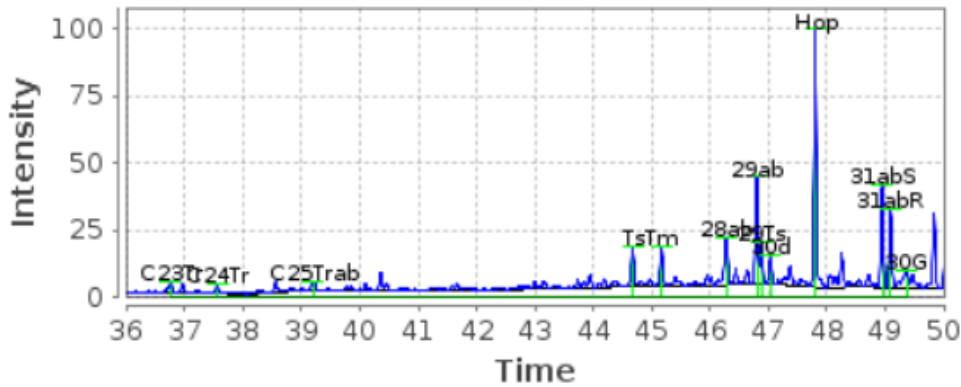
M/Z 234, No-1-18.57



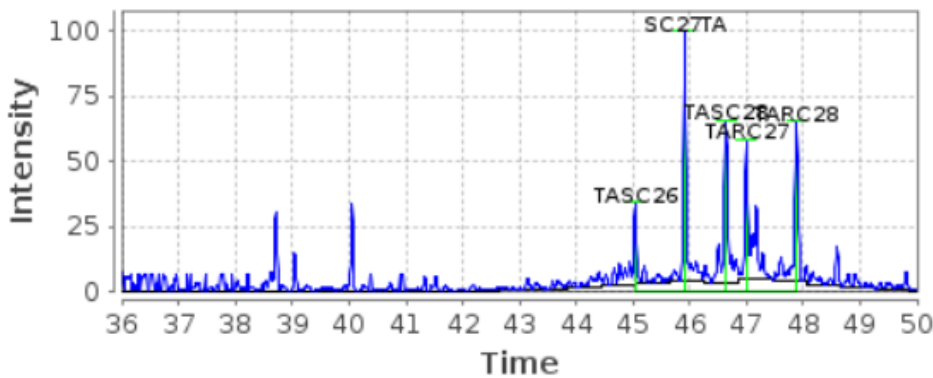
M/Z 192, No-1-18.57



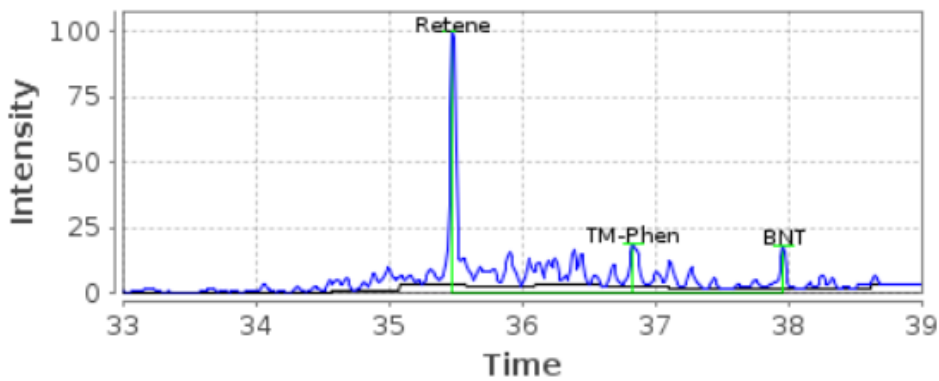
2004-0484 Brage
M/Z 191, No-1-18.58



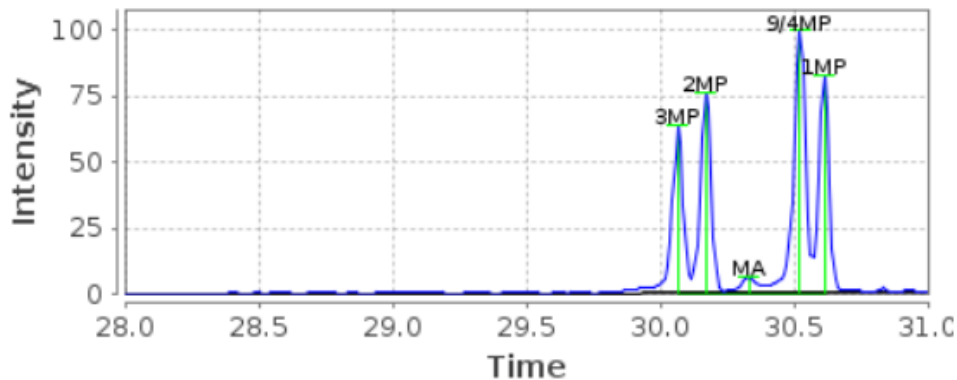
M/Z 231, No-1-18.58



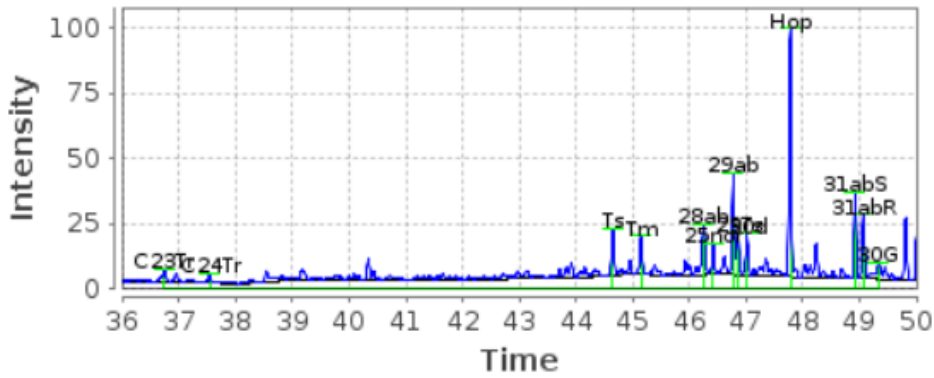
M/Z 234, No-1-18.58



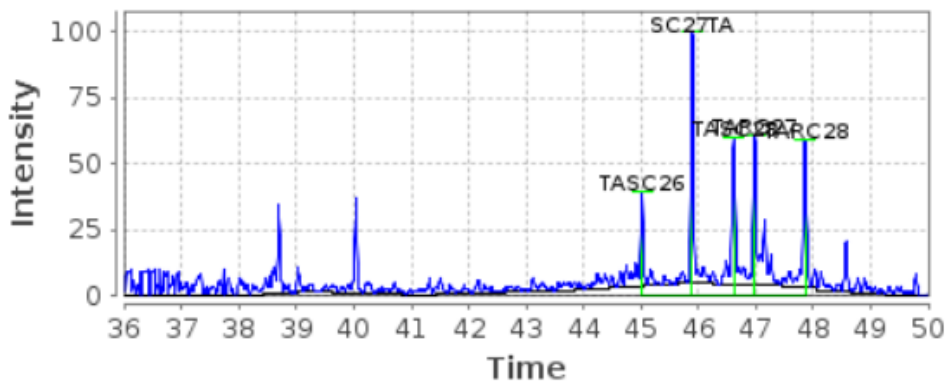
M/Z 192, No-1-18.58



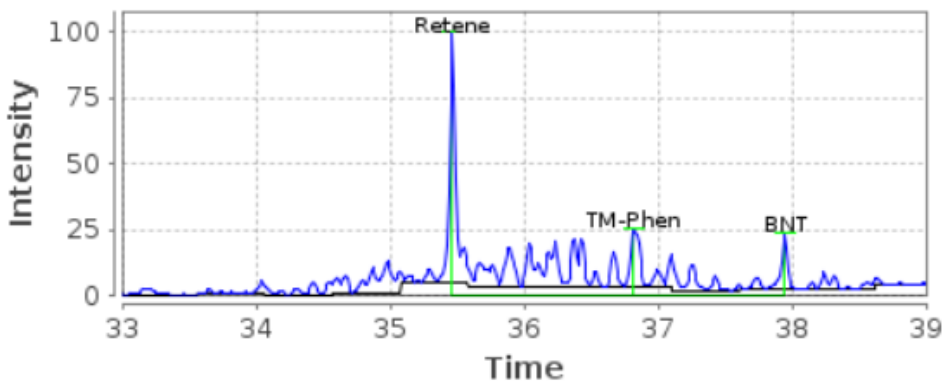
2004-0965 Draugen
 M/Z 191, No-1-18.59



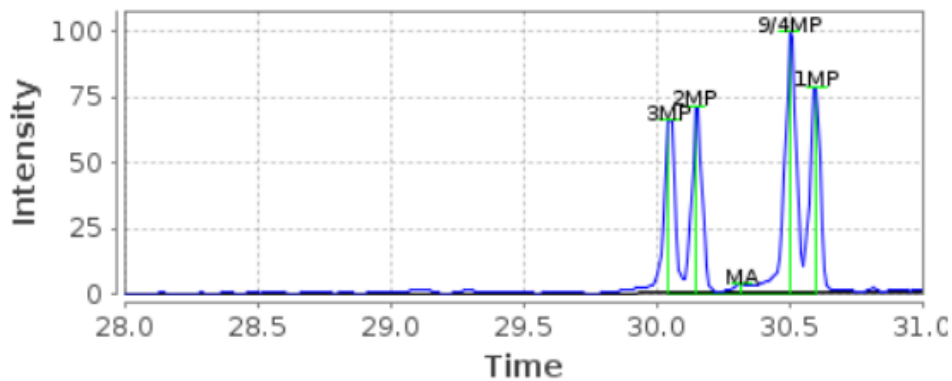
M/Z 231, No-1-18.59



M/Z 234, No-1-18.59

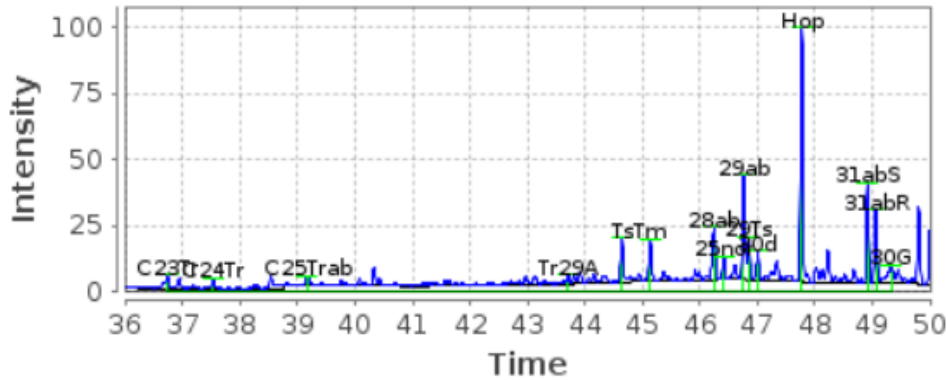


M/Z 192, No-1-18.59

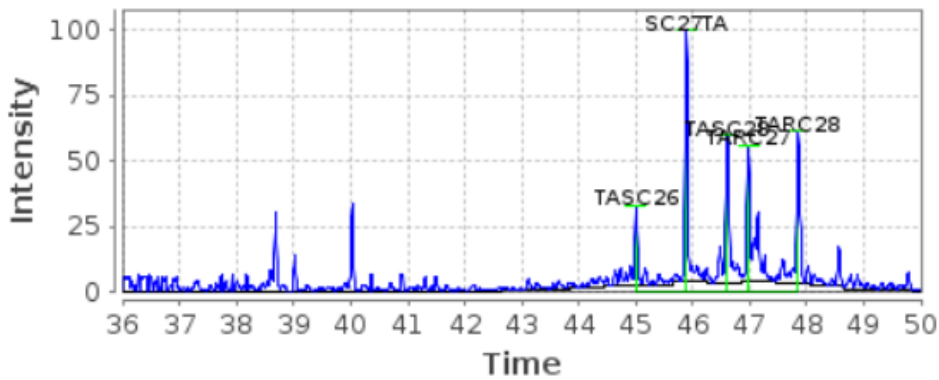


2004-1810 Oseberg Blend

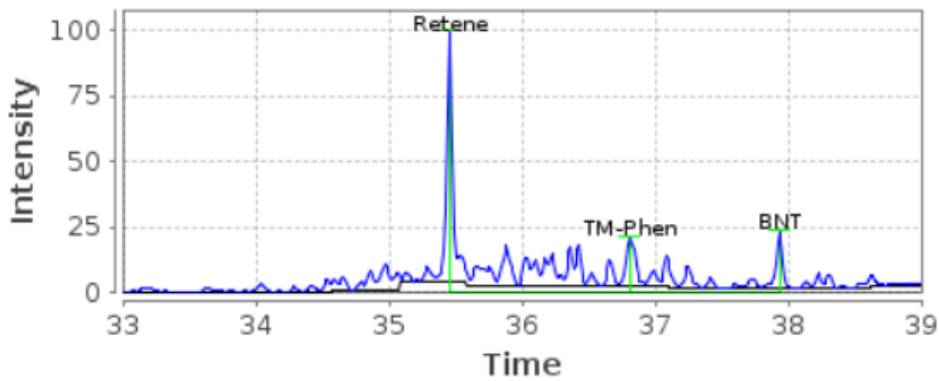
M/Z 191, No-1-18.60



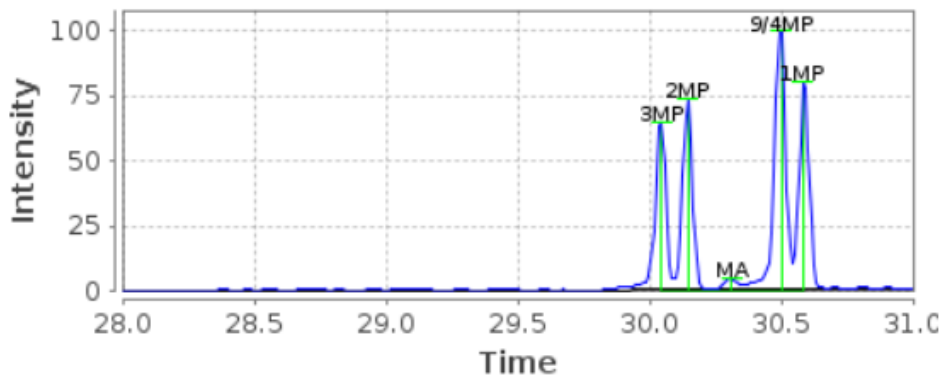
M/Z 231, No-1-18.60



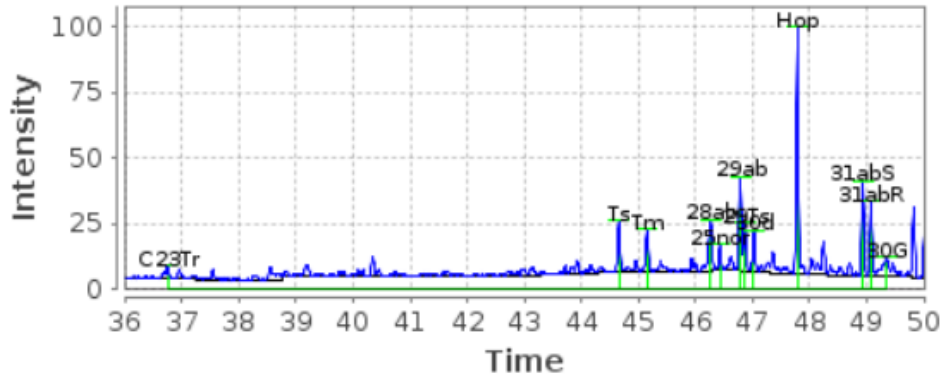
M/Z 234, No-1-18.60



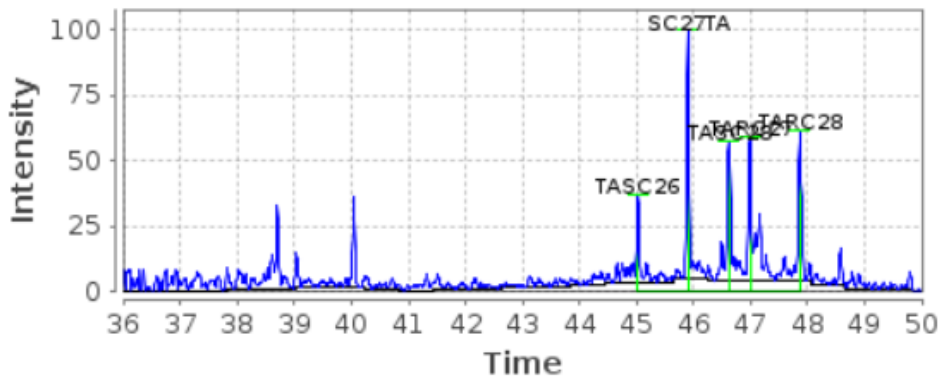
M/Z 192, No-1-18.60



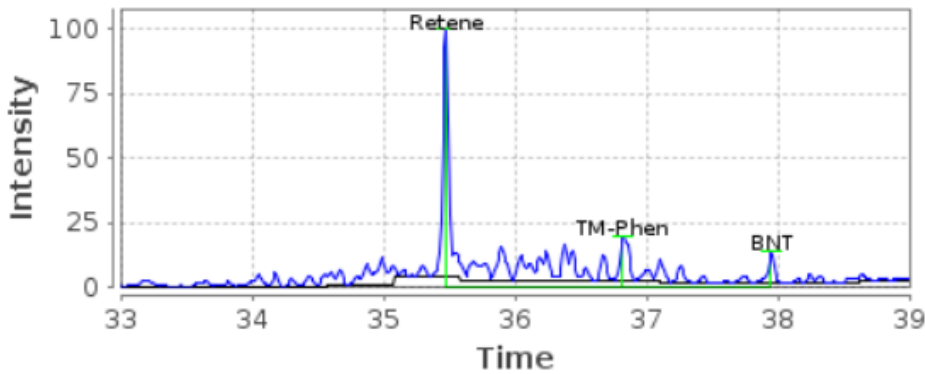
2005-0722 Troll B
 M/Z 191, No-1-18.62



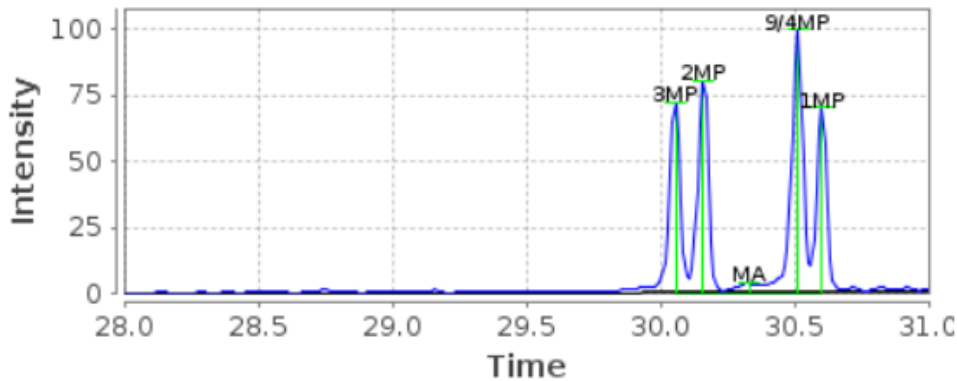
M/Z 231, No-1-18.62



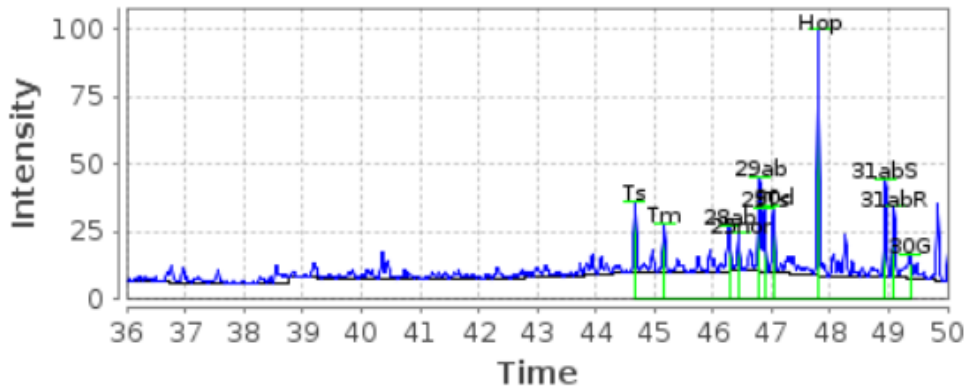
M/Z 234, No-1-18.62



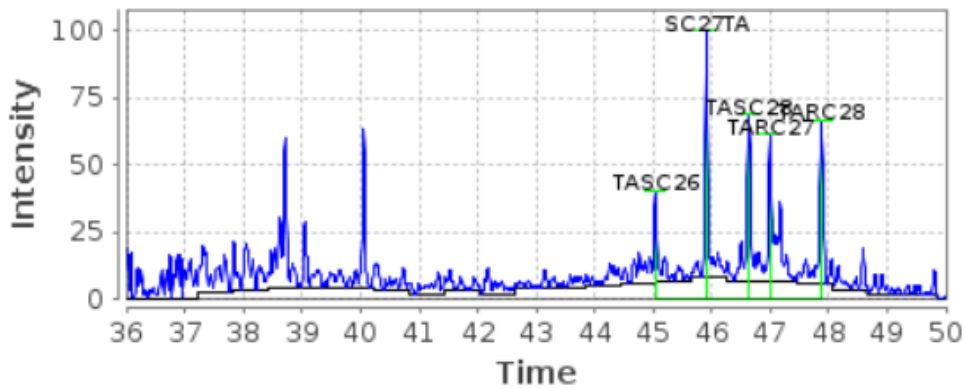
M/Z 192, No-1-18.62



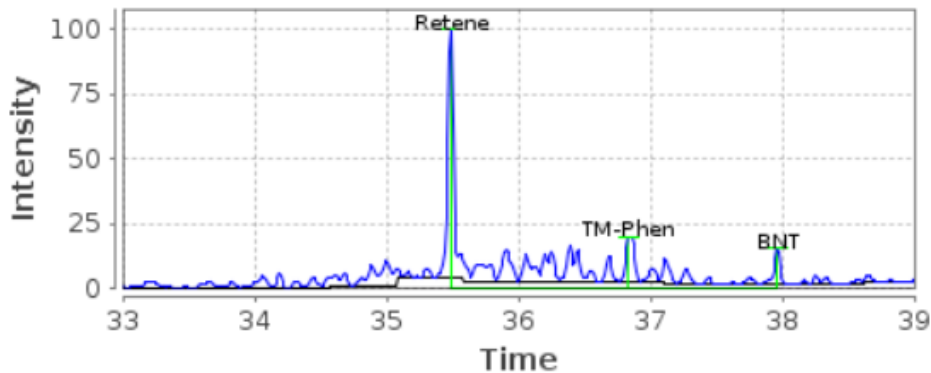
2005-0843 Troll B
M/Z 191, No-1-18.63



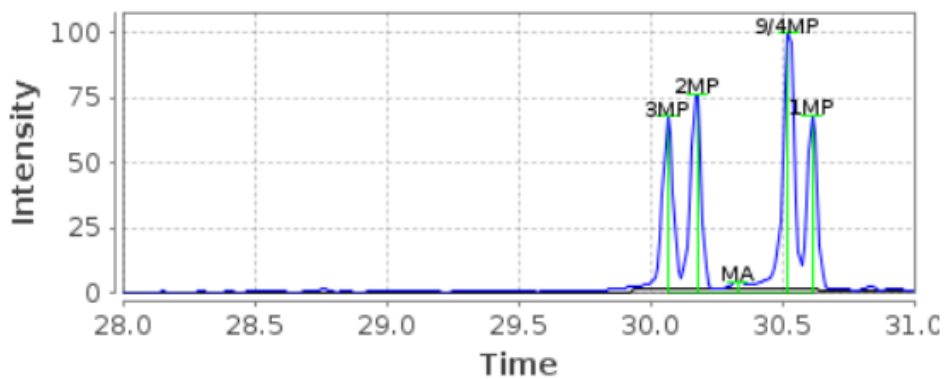
M/Z 231, No-1-18.63



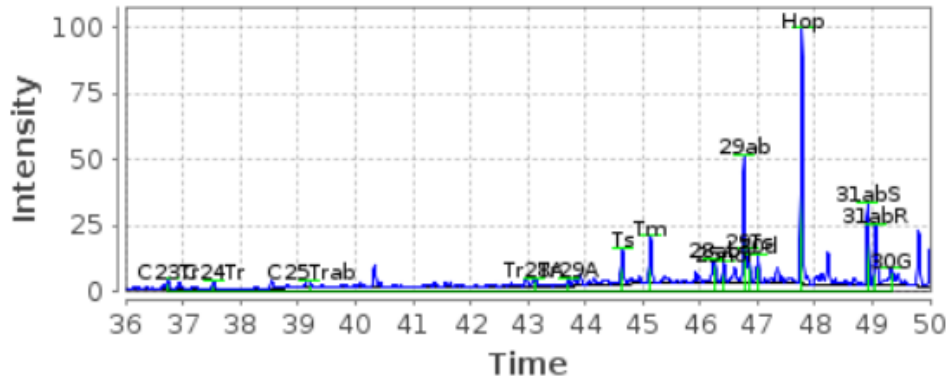
M/Z 234, No-1-18.63



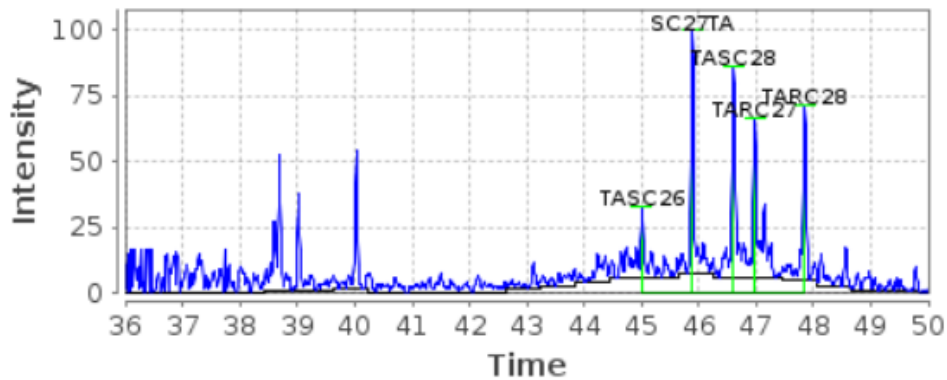
M/Z 192, No-1-18.63



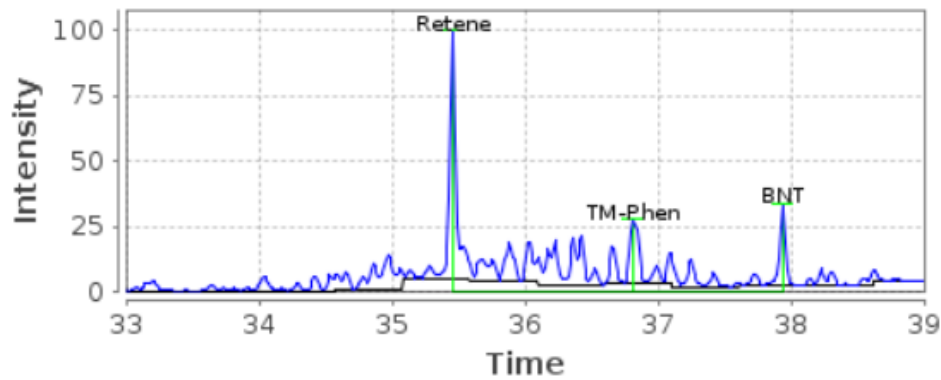
2006-0017 Norne 2
M/Z 191, No-1-18.64



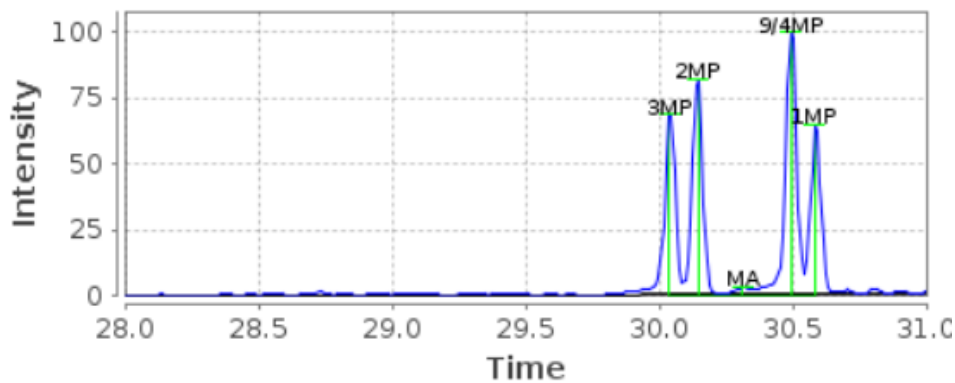
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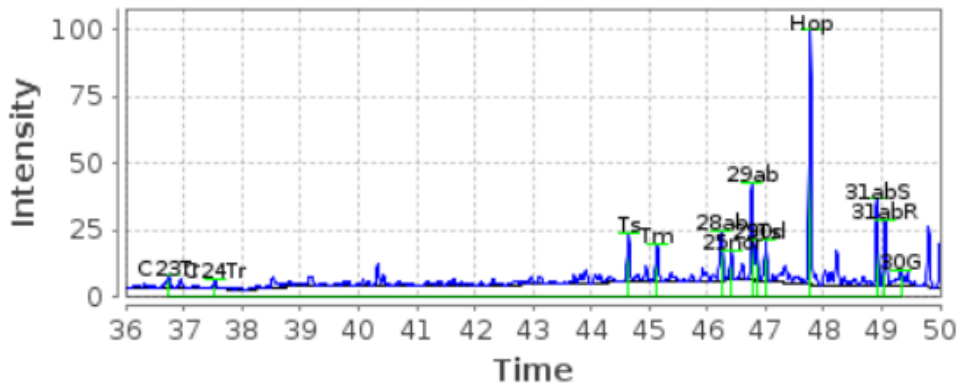
M/Z 234, No-1-18.64



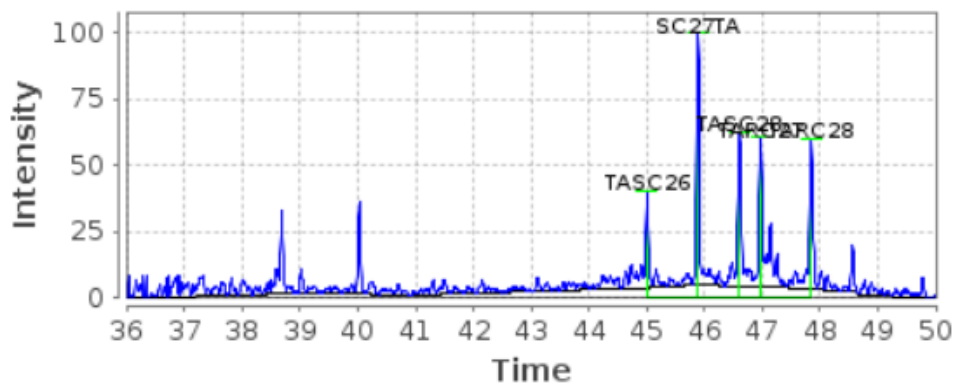
M/Z 192, No-1-18.64



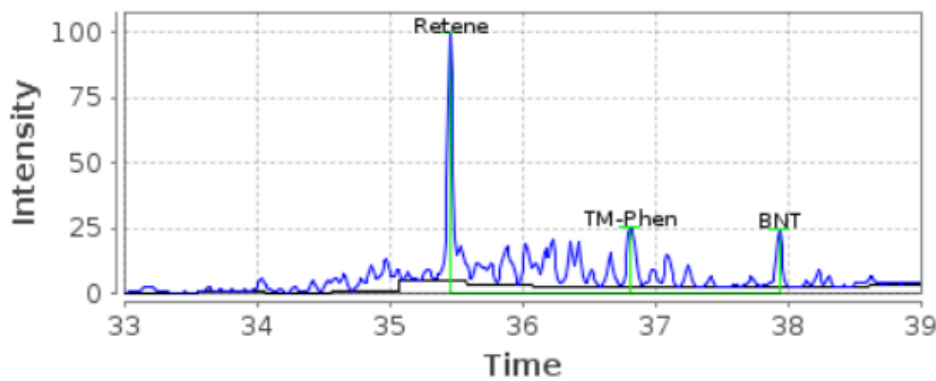
2007-0426 Draugen
 M/Z 191, No-1-18.67



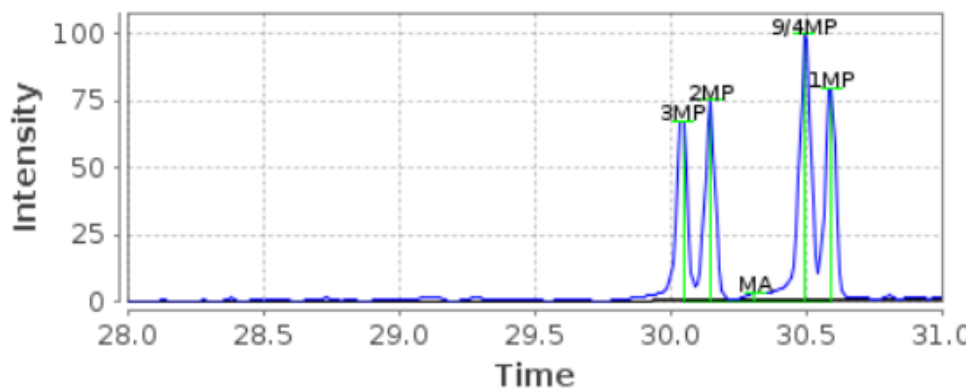
M/Z 231, No-1-18.67



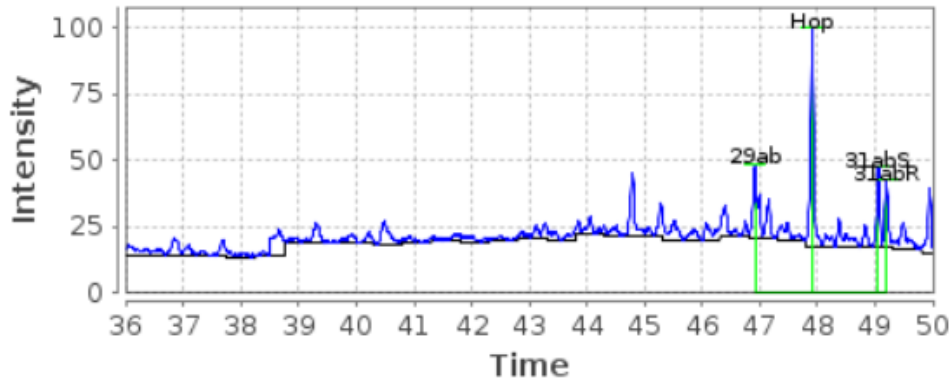
M/Z 234, No-1-18.67



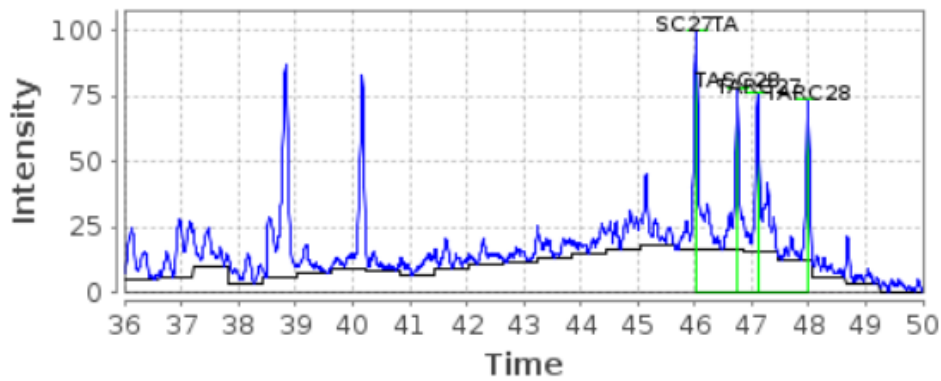
M/Z 192, No-1-18.67



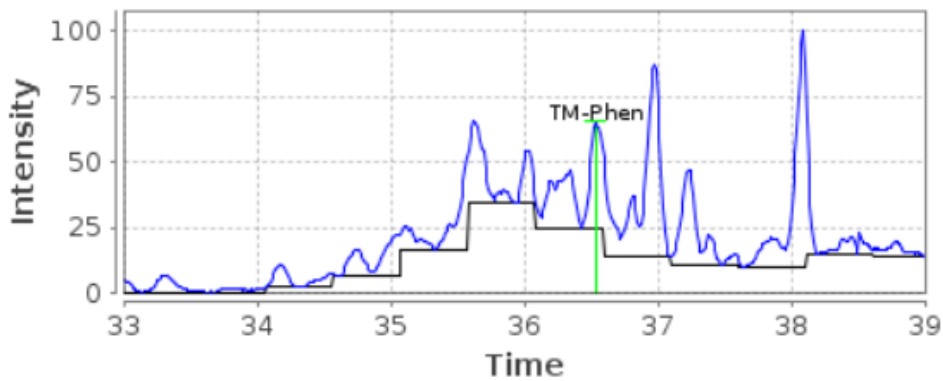
2007-0530 Alvheim Boa
 M/Z 191, No-1-18.68



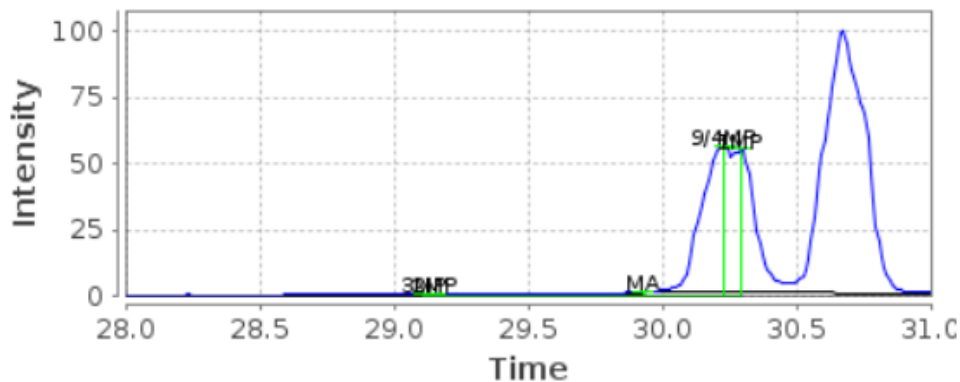
M/Z 231, No-1-18.68



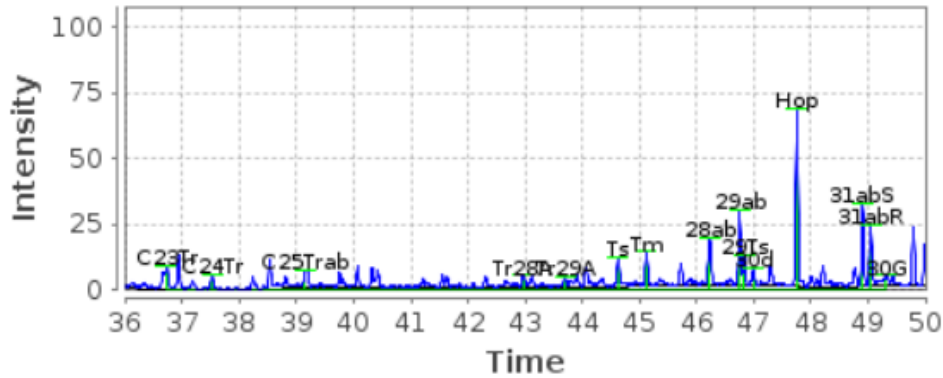
M/Z 234, No-1-18.68



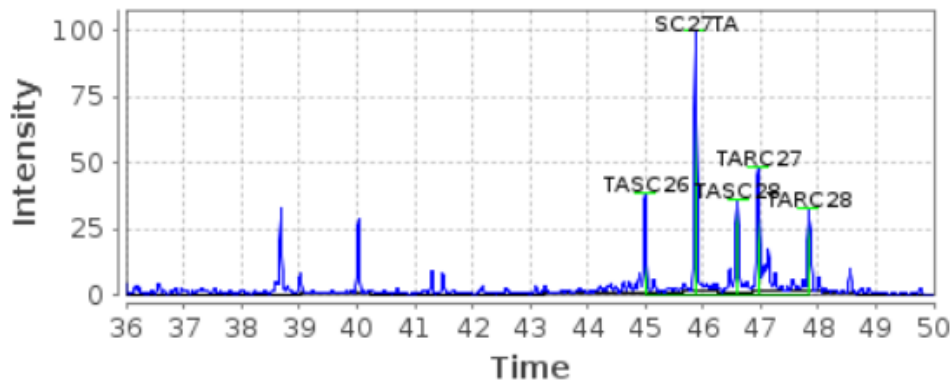
M/Z 192, No-1-18.68



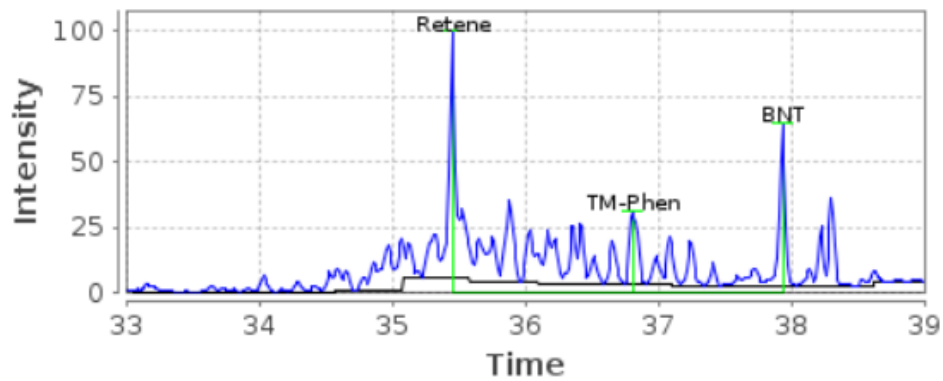
2008-0470 Rev
M/Z 191, No-1-18.73



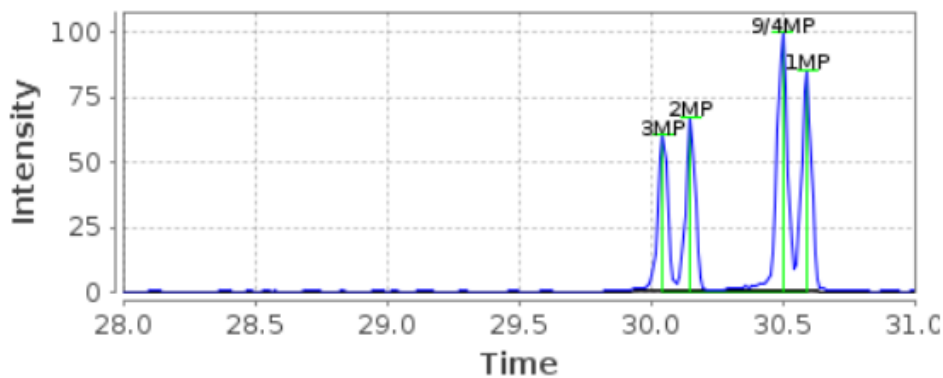
M/Z 231, No-1-18.73



M/Z 234, No-1-18.73

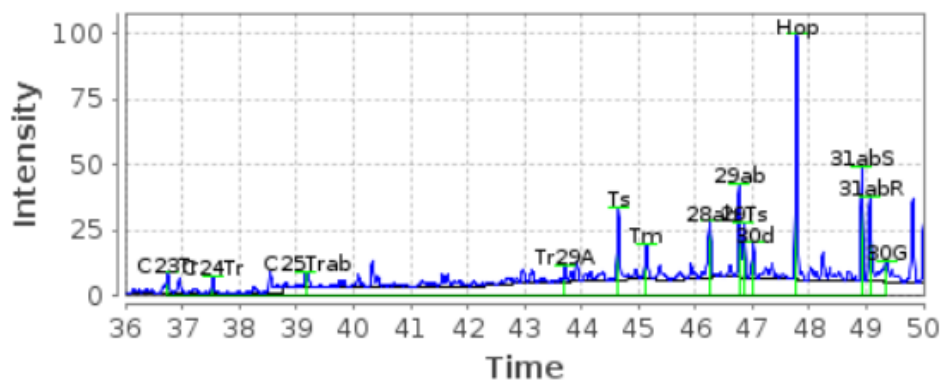


M/Z 192, No-1-18.73

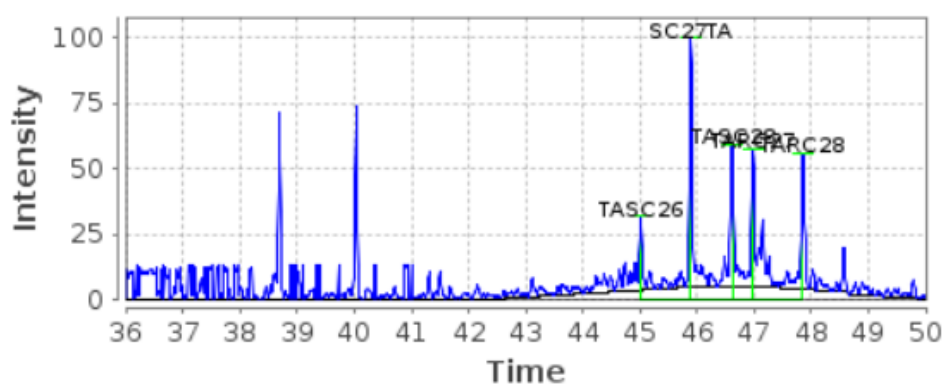


2009-0002 Alvheim Vilje

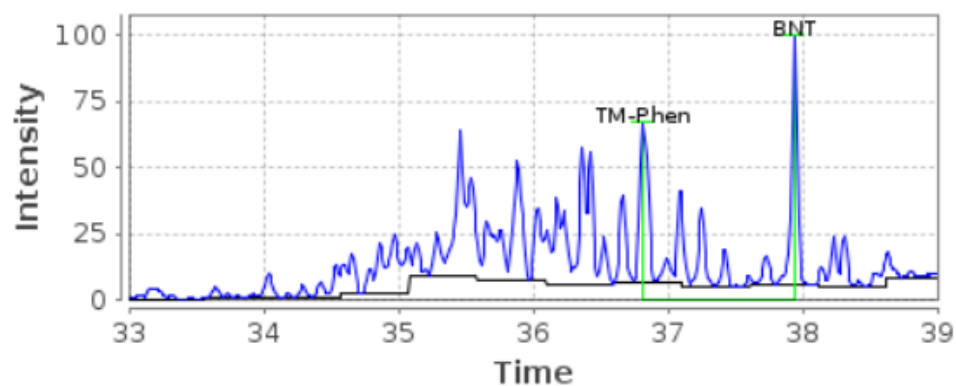
M/Z 191, No-1-18.74



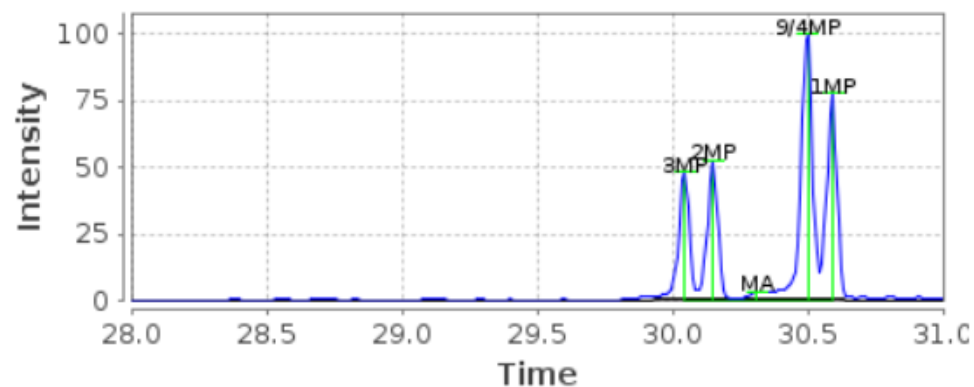
M/Z 231, No-1-18.74



M/Z 234, No-1-18.74

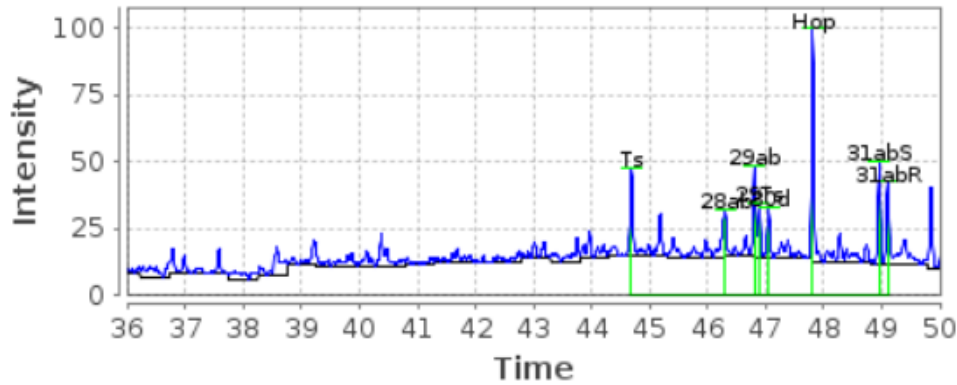


M/Z 192, No-1-18.74

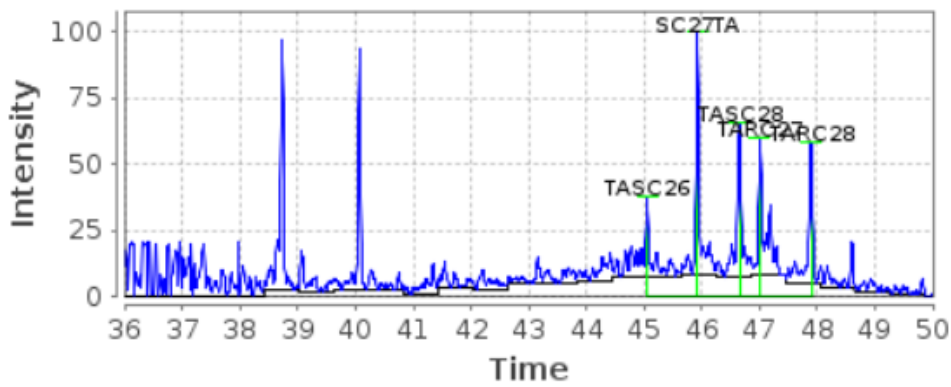


2009-0003 Alvheim Blend

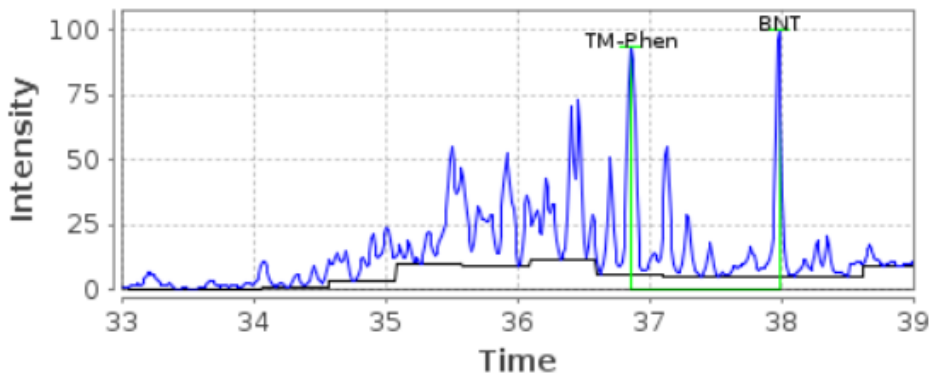
M/Z 191, No-1-18.76



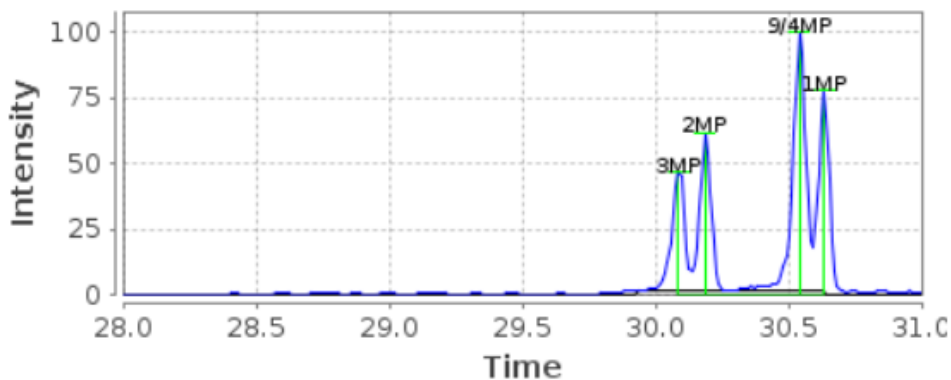
M/Z 231, No-1-18.76



M/Z 234, No-1-18.76

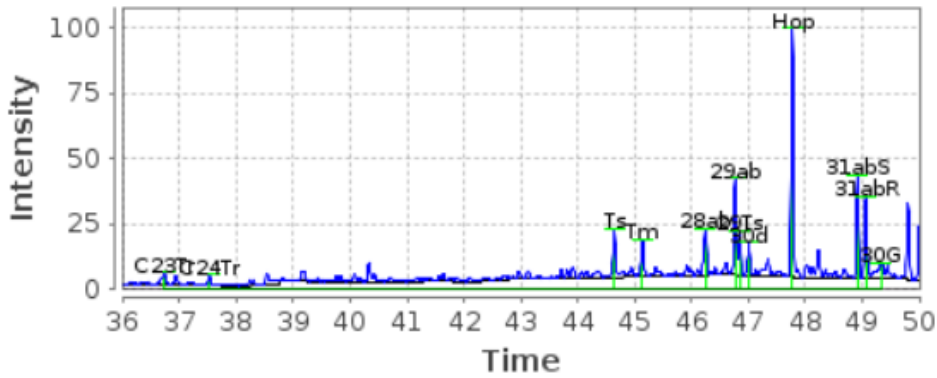


M/Z 192, No-1-18.76

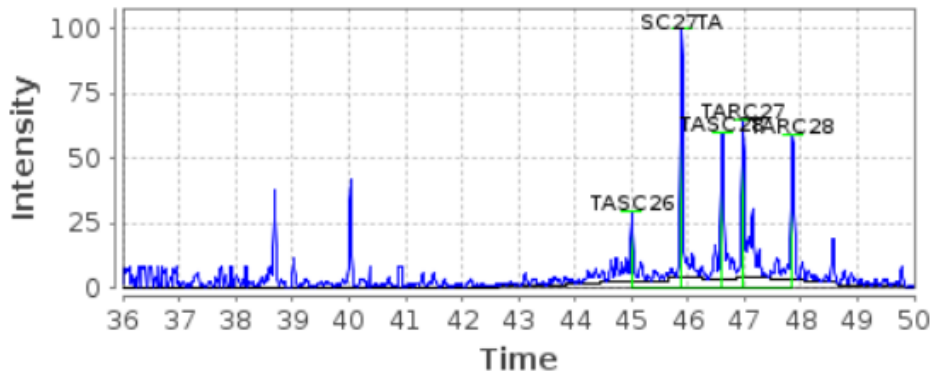


2009-0223 Gullfaks C

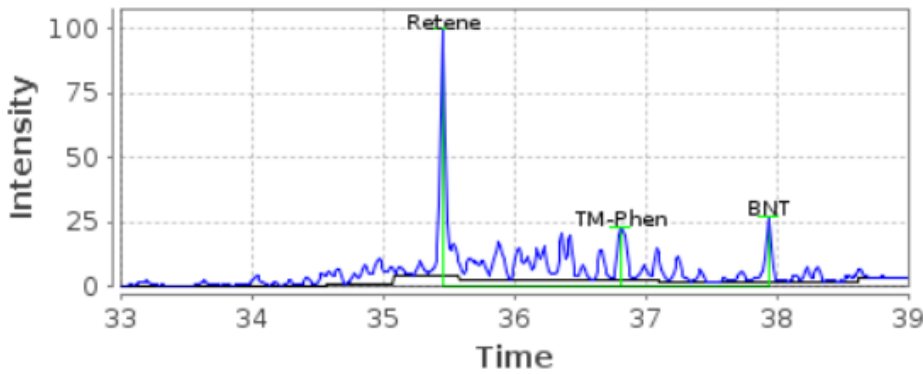
M/Z 191, No-1-18.78



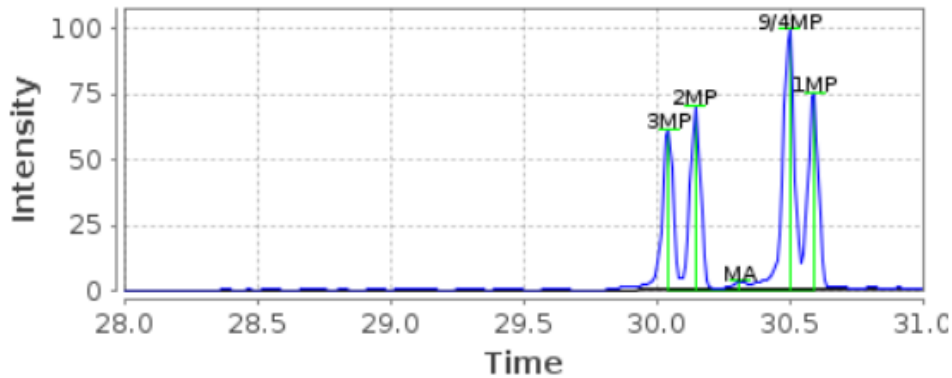
M/Z 231, No-1-18.78



M/Z 234, No-1-18.78

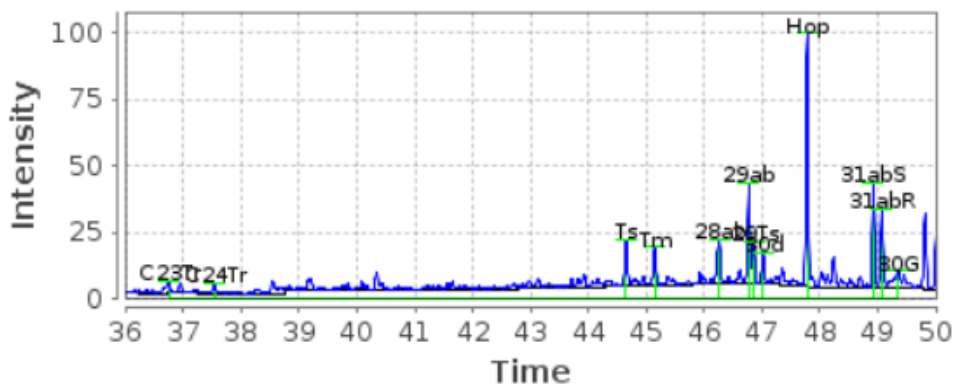


M/Z 192, No-1-18.78

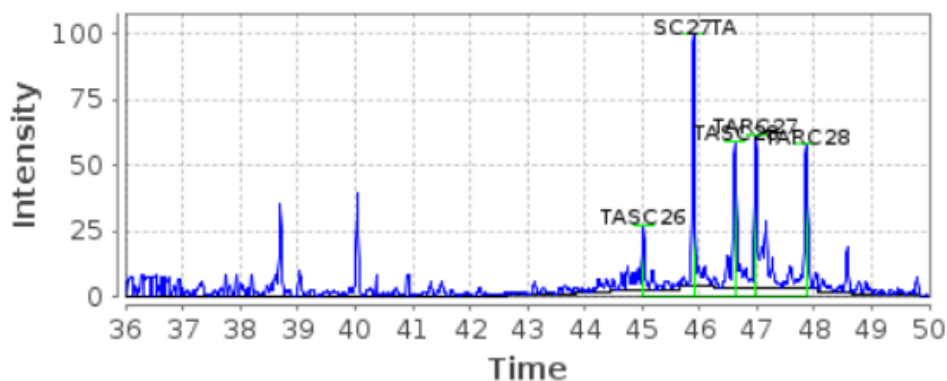


2009-0224 Gullfaks C

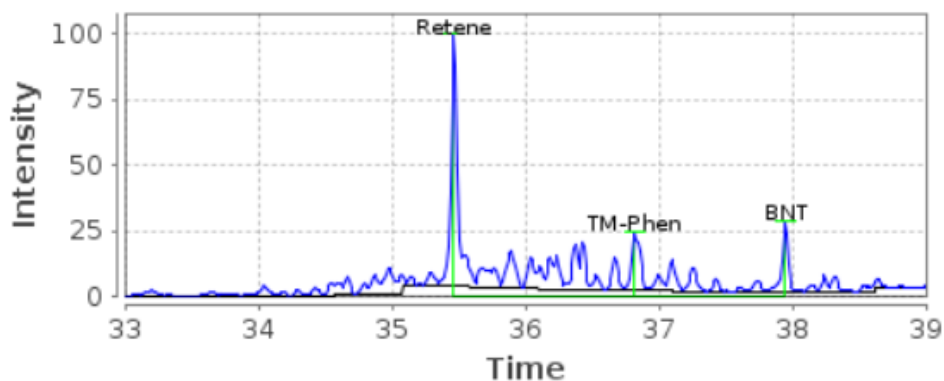
M/Z 191, No-1-18.79



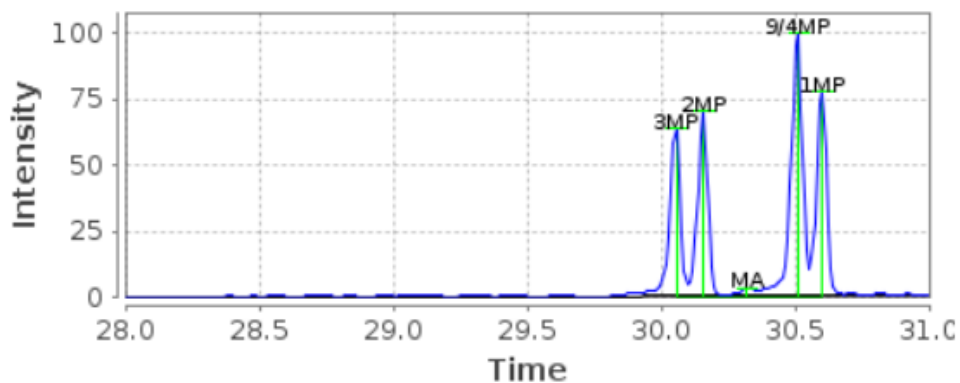
M/Z 231, No-1-18.79



M/Z 234, No-1-18.79

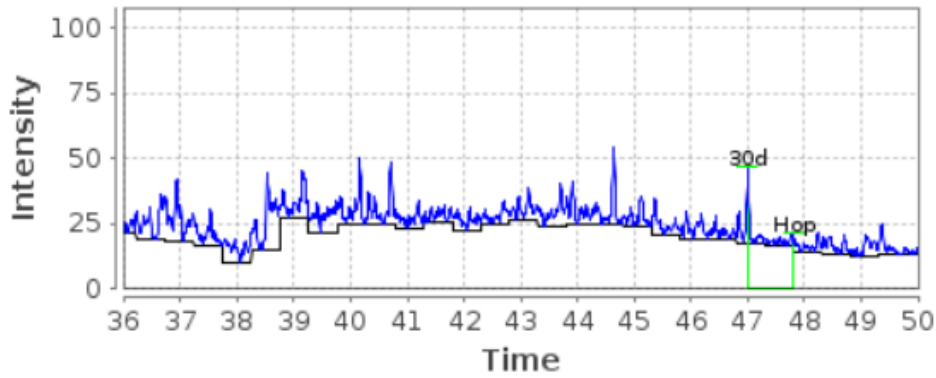


M/Z 192, No-1-18.79

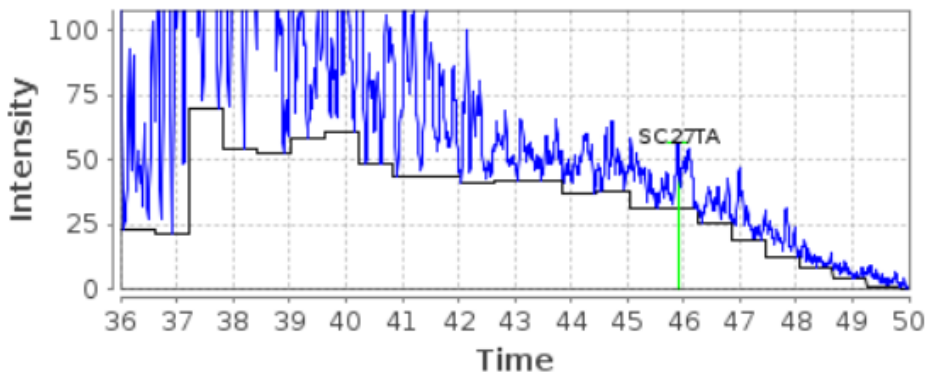


2009-0239 Kvitebjørn

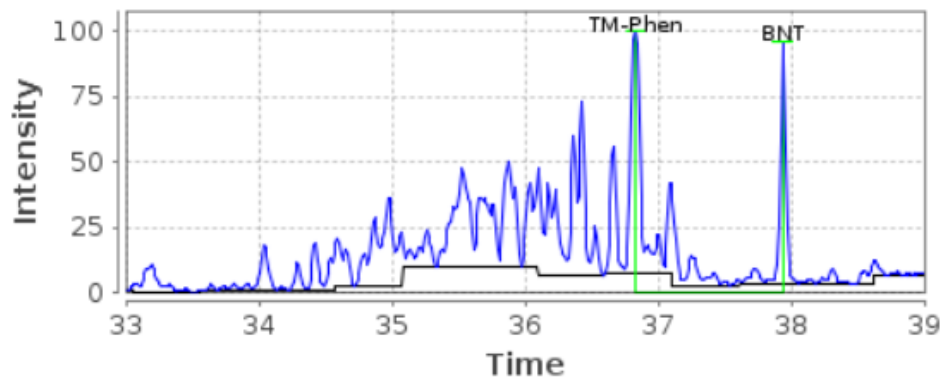
M/Z 191, No-1-18.80



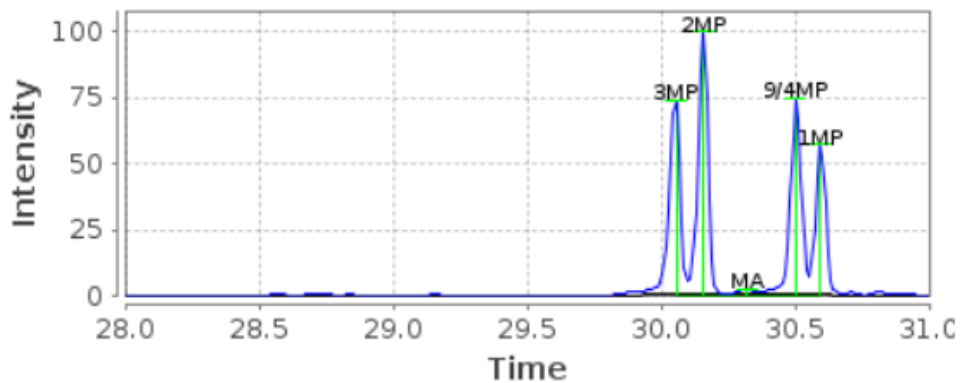
M/Z 231, No-1-18.80



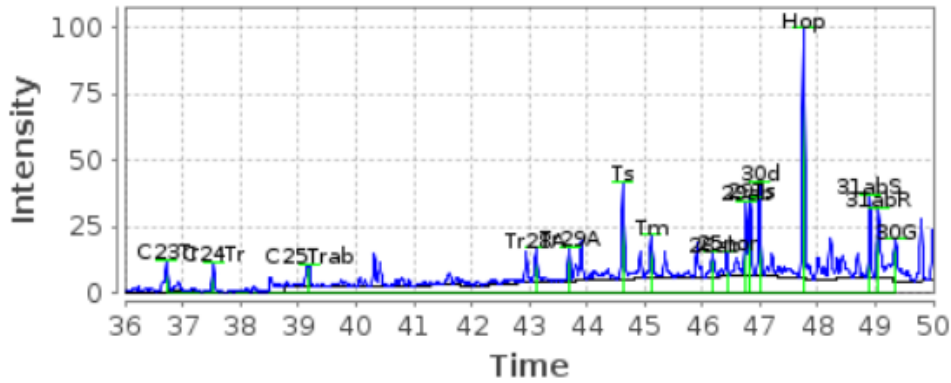
M/Z 234, No-1-18.80



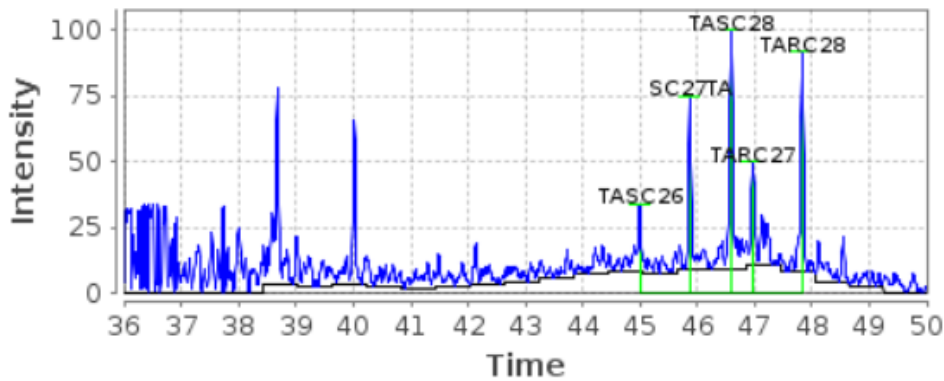
M/Z 192, No-1-18.80



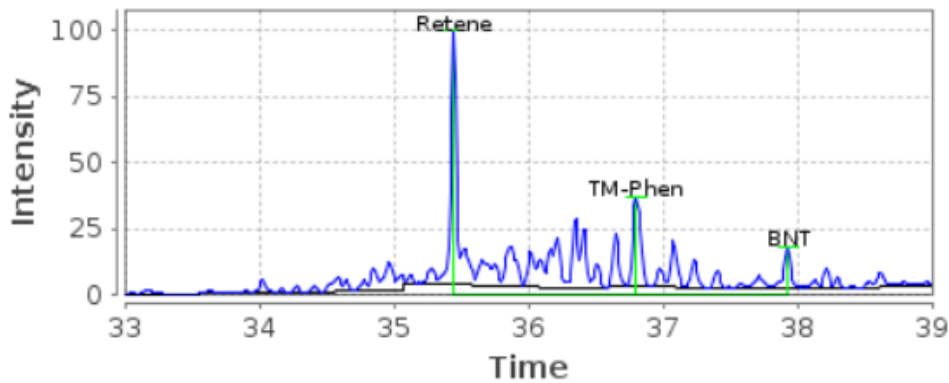
2009-0284 Kobbe
 M/Z 191, No-1-18.81



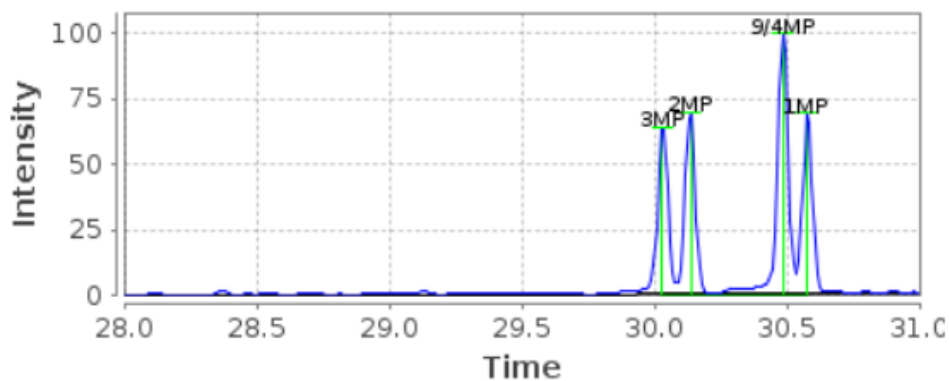
M/Z 231, No-1-18.81



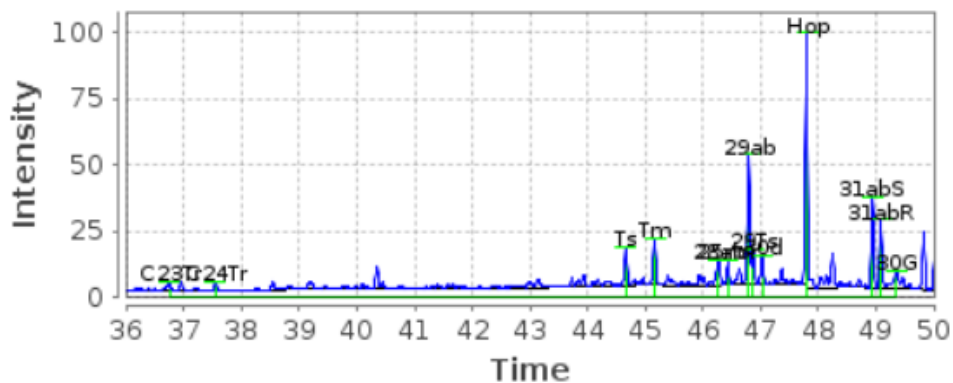
M/Z 234, No-1-18.81



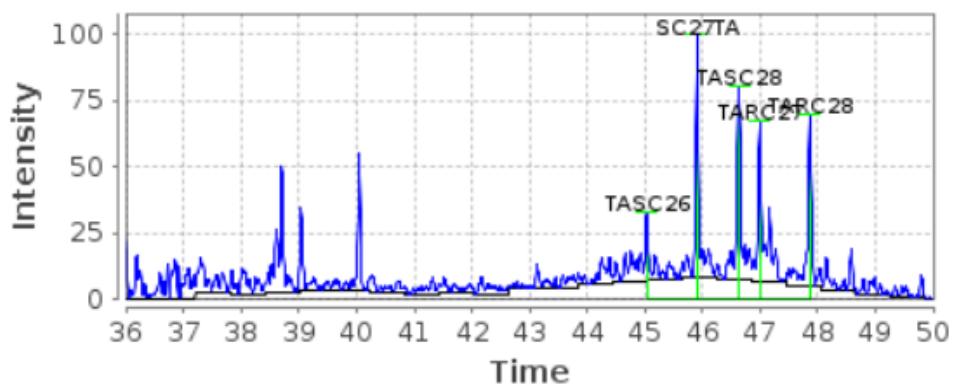
M/Z 192, No-1-18.81



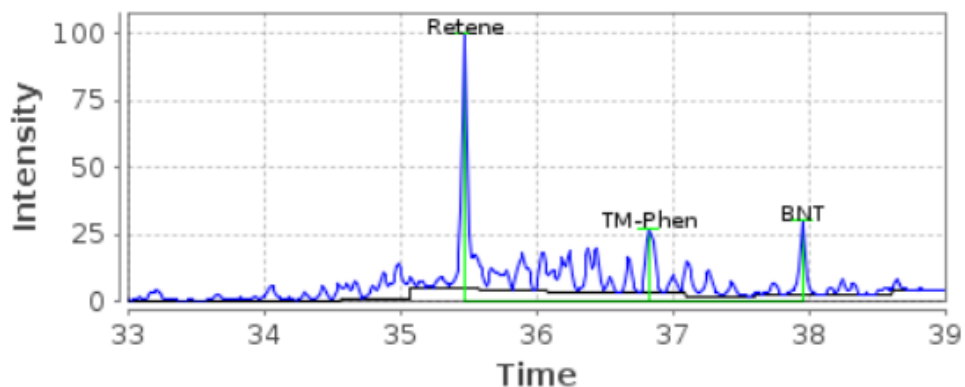
2009-0547 Svale
M/Z 191, No-1-18.82



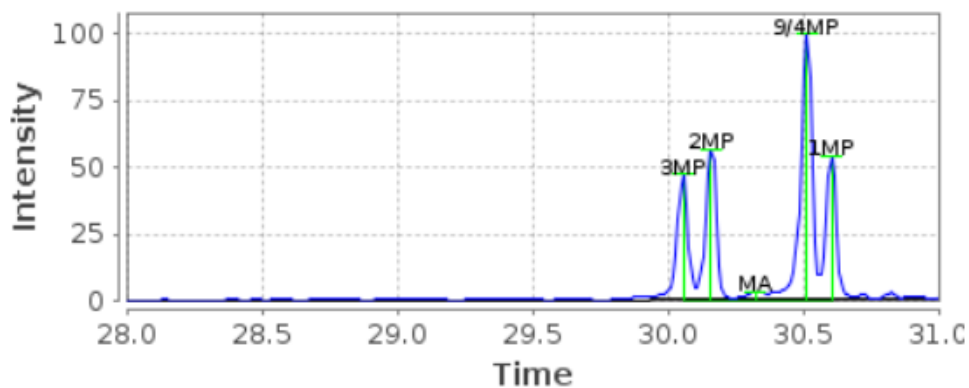
M/Z 231, No-1-18.82



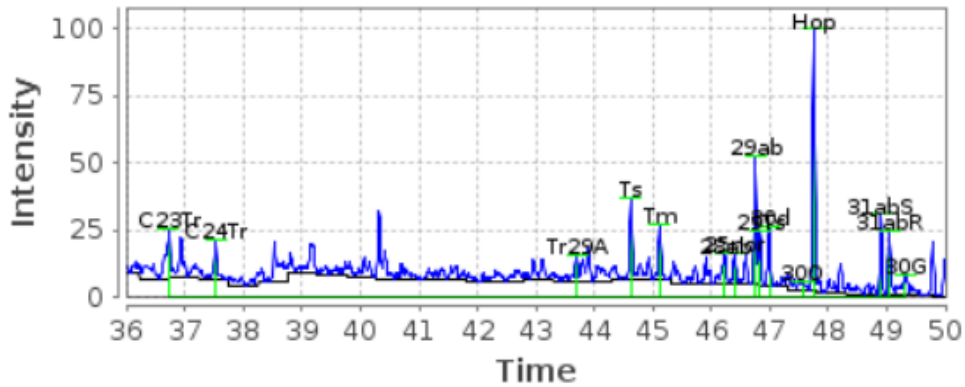
M/Z 234, No-1-18.82



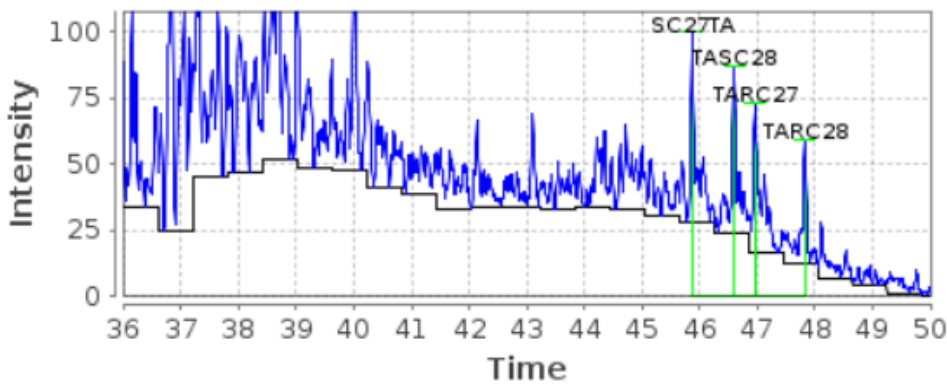
M/Z 192, No-1-18.82



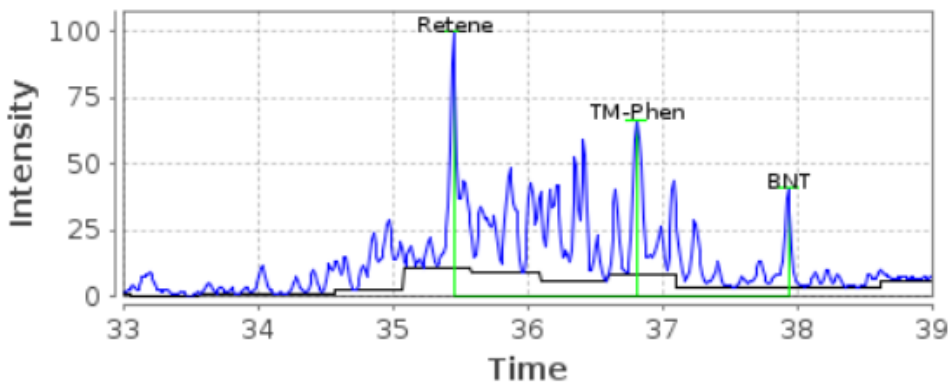
2009-0552 Alve
 M/Z 191, No-1-18.87



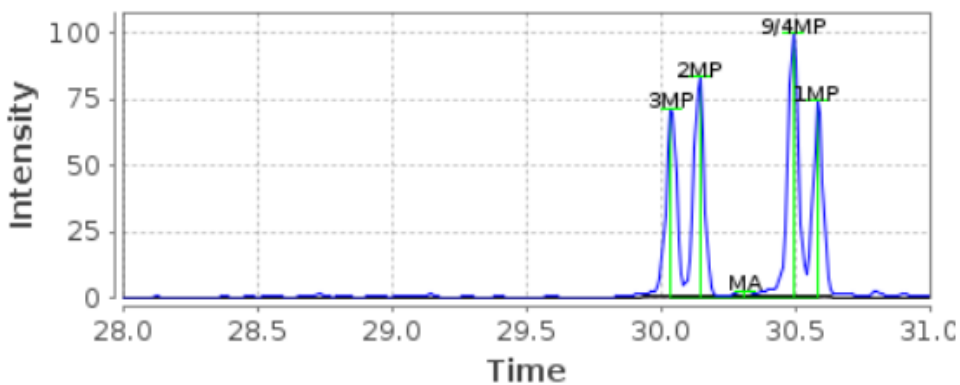
M/Z 231, No-1-18.87



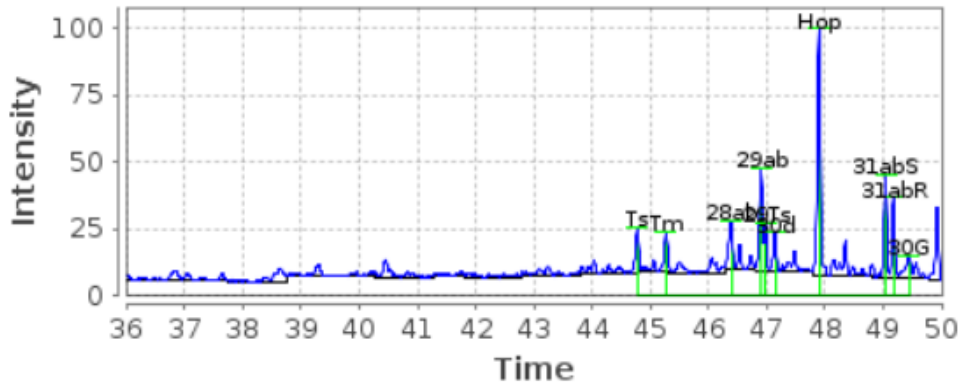
M/Z 234, No-1-18.87



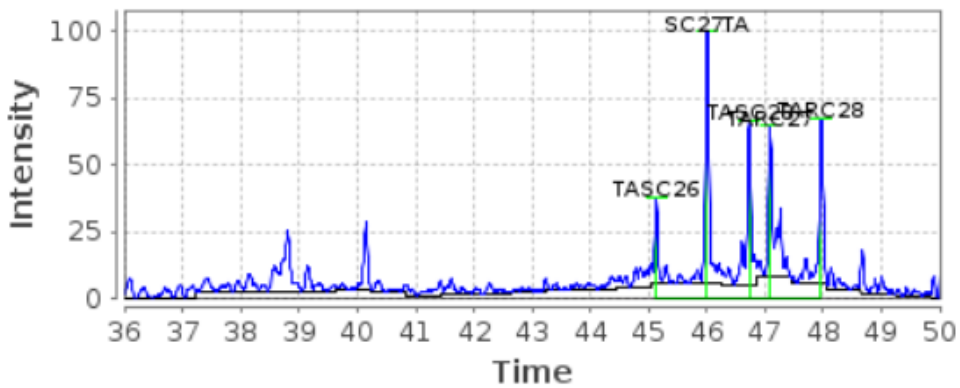
M/Z 192, No-1-18.87



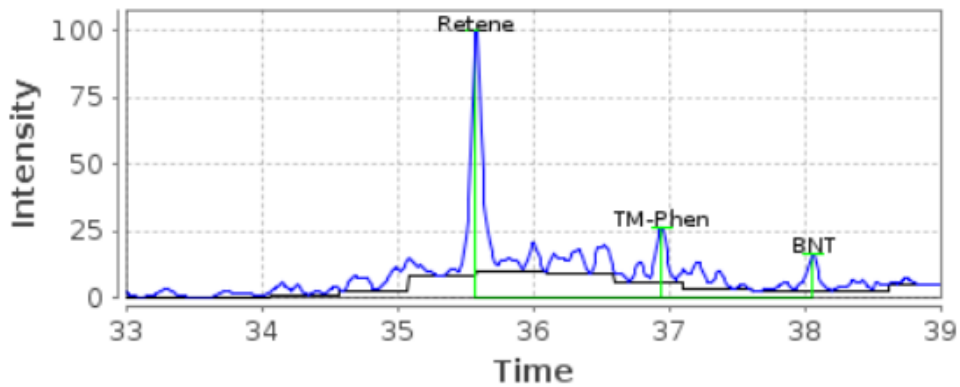
2009-0702 Troll
 M/Z 191, No-1-18.88



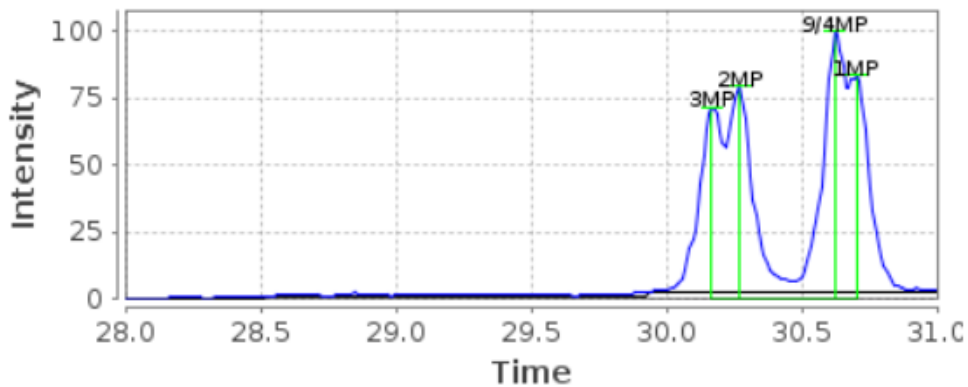
M/Z 231, No-1-18.88



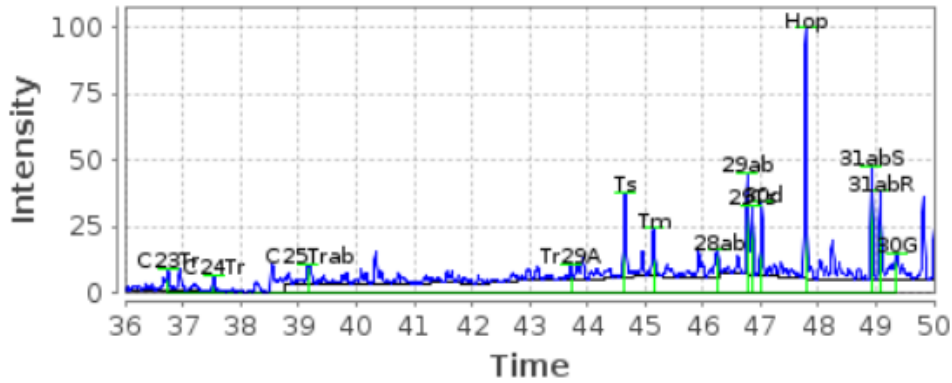
M/Z 234, No-1-18.88



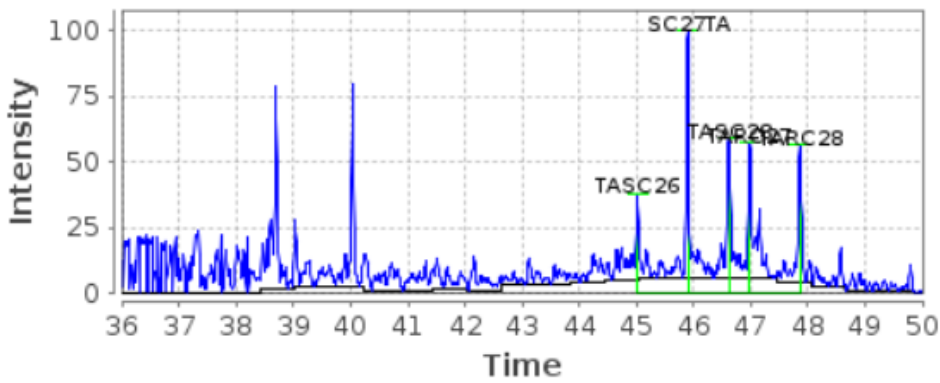
M/Z 192, No-1-18.88



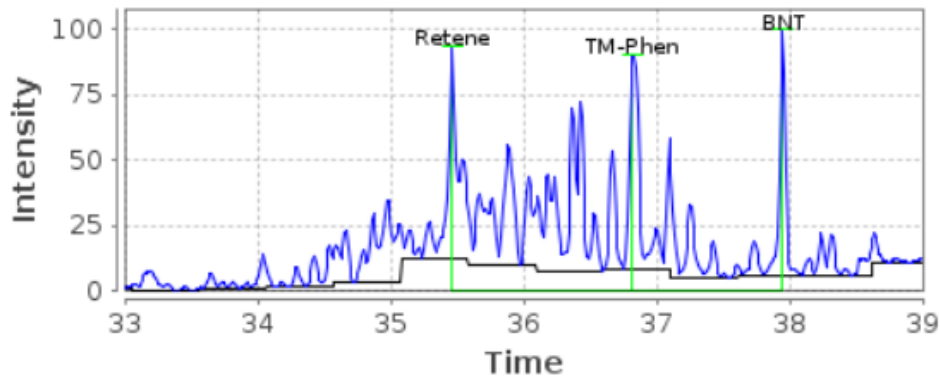
2009-0703 Volund
M/Z 191, No-1-18.89



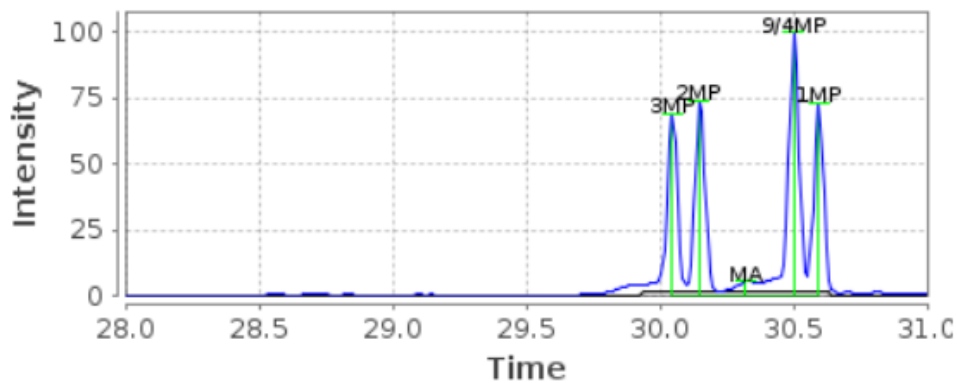
M/Z 231, No-1-18.89



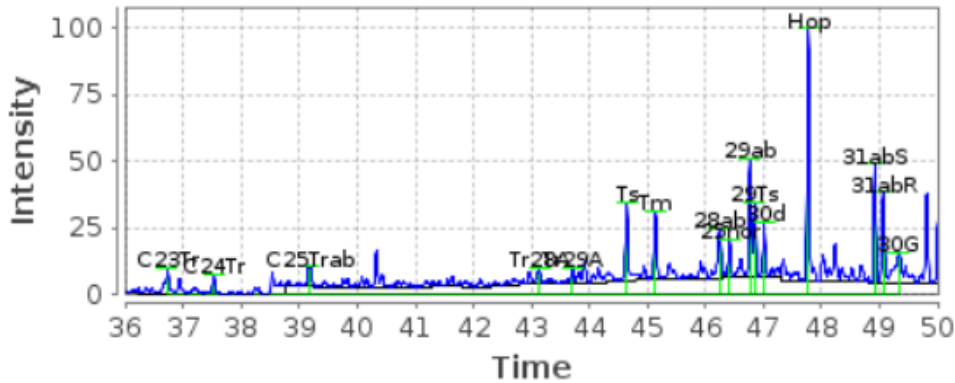
M/Z 234, No-1-18.89



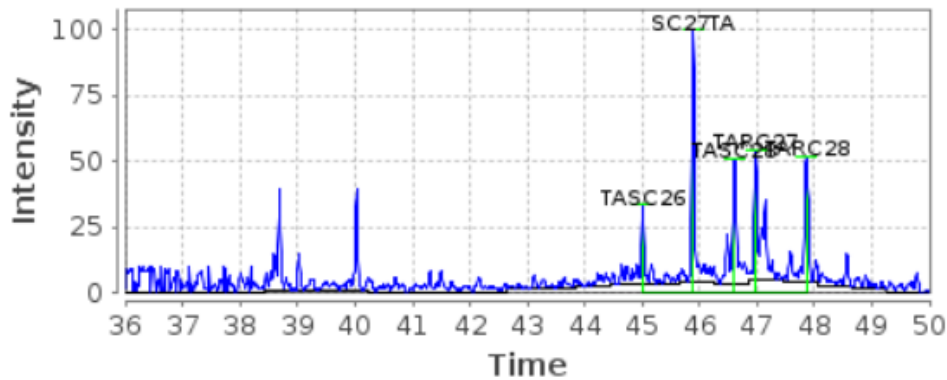
M/Z 192, No-1-18.89



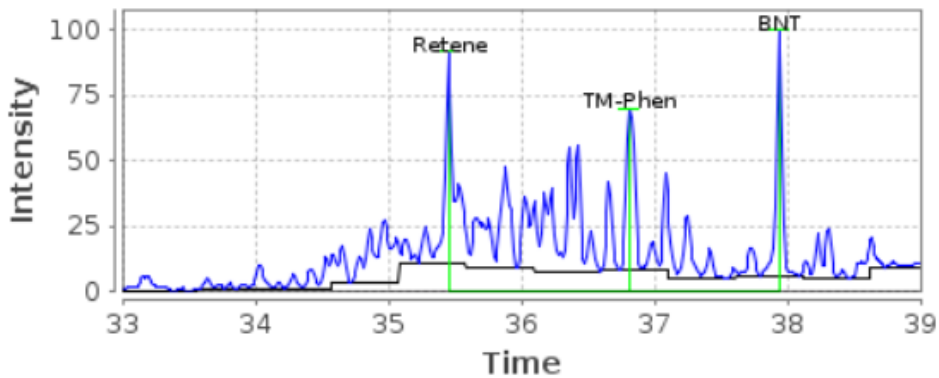
2010-0159 Balder
M/Z 191, No-1-18.92



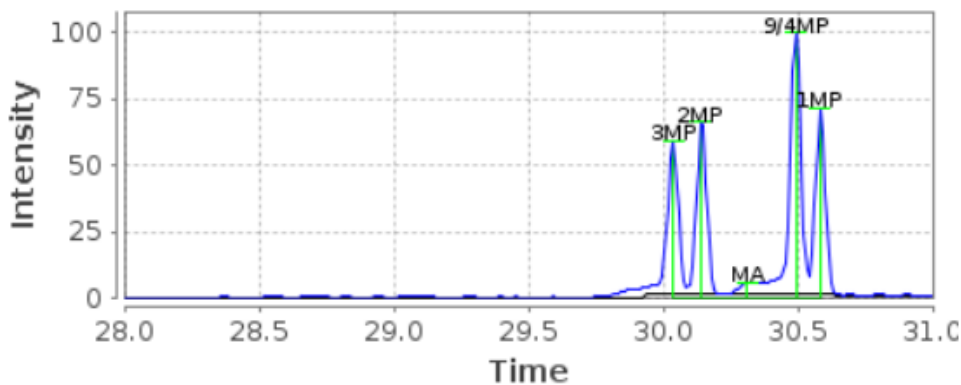
M/Z 231, No-1-18.92



M/Z 234, No-1-18.92

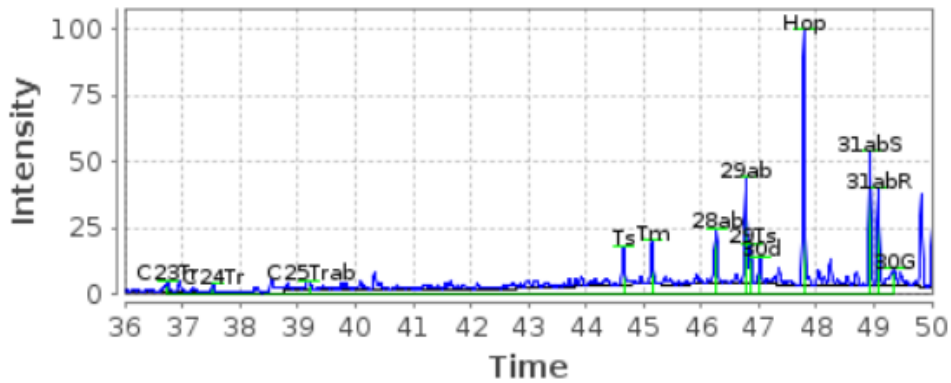


M/Z 192, No-1-18.92

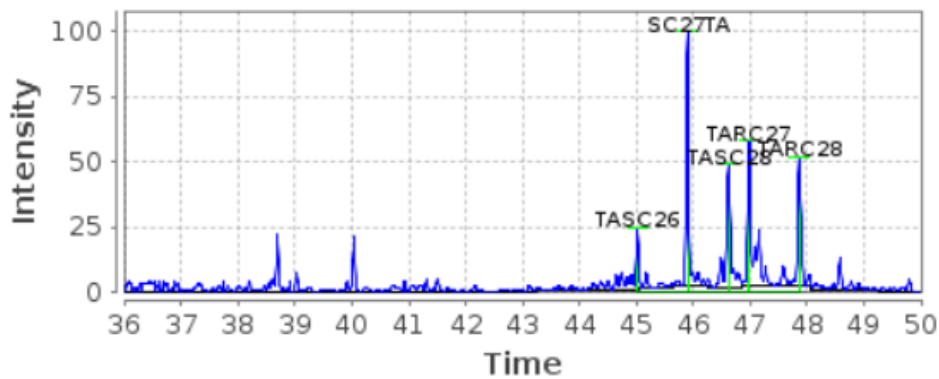


2010-0327 Luno

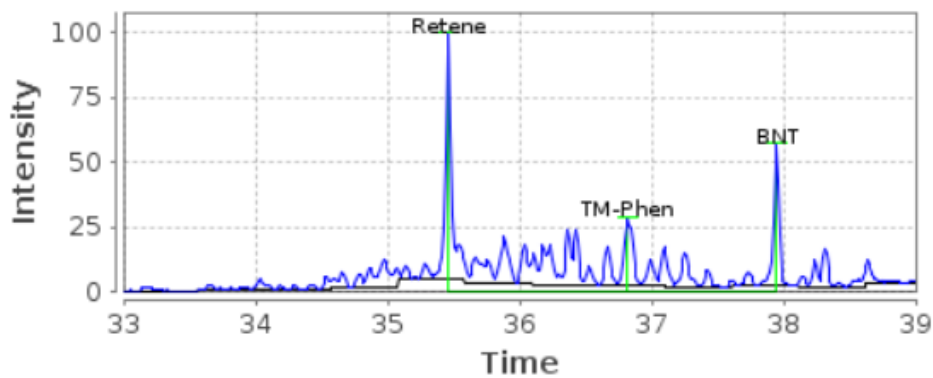
M/Z 191, No-1-18.93



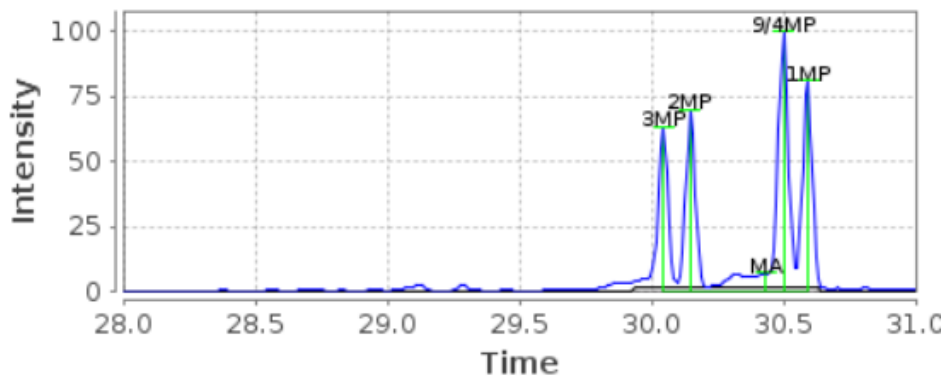
M/Z 231, No-1-18.93



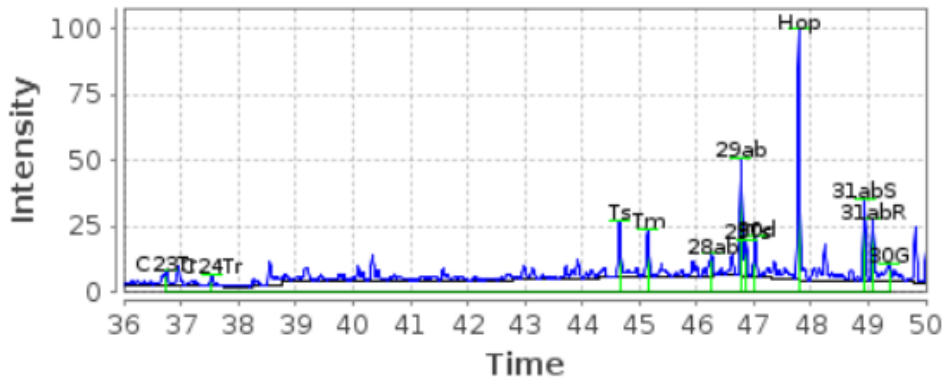
M/Z 234, No-1-18.93



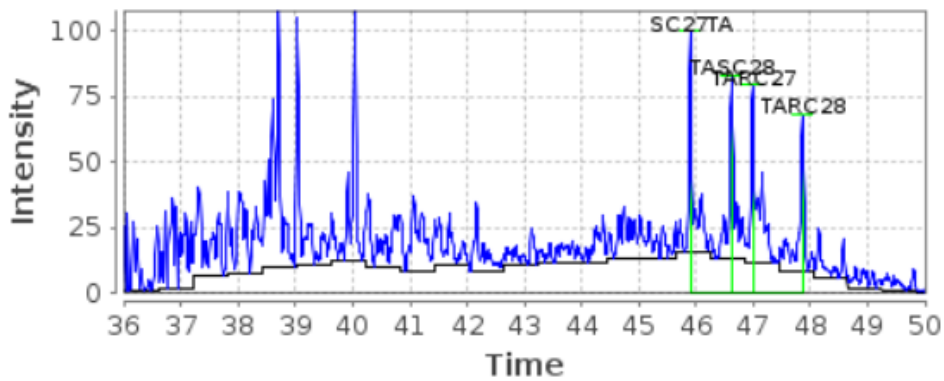
M/Z 192, No-1-18.93



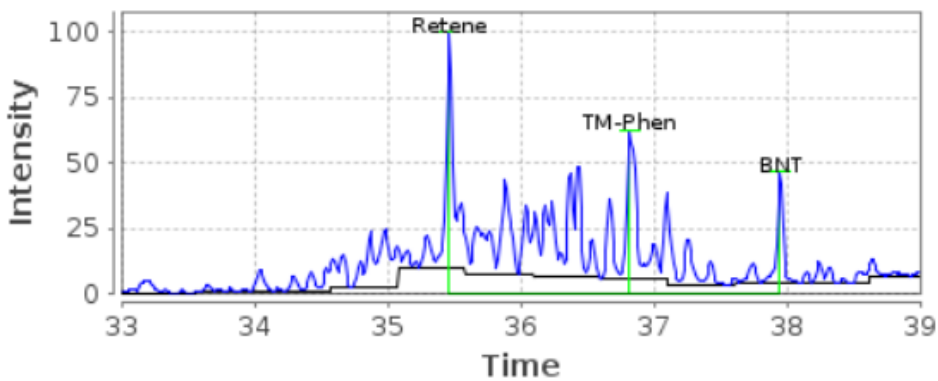
2010-0351 Jordbær
 M/Z 191, No-1-18.94



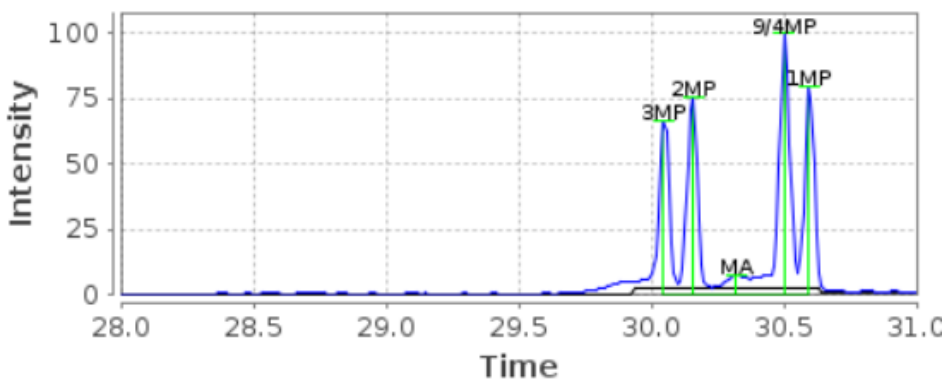
M/Z 231, No-1-18.94



M/Z 234, No-1-18.94

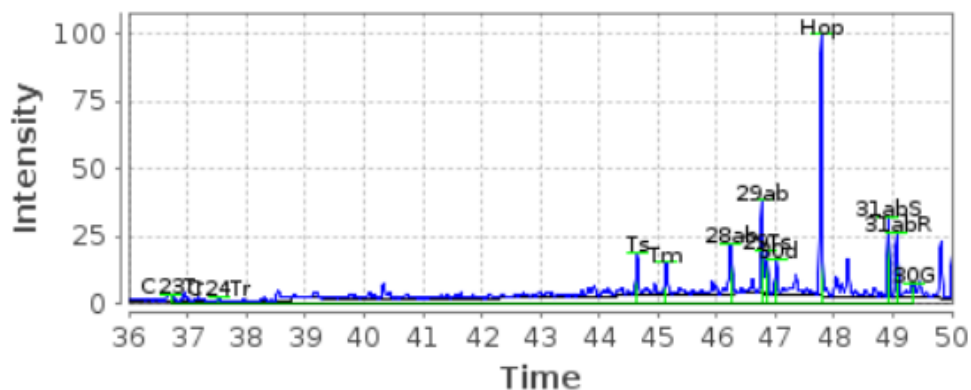


M/Z 192, No-1-18.94

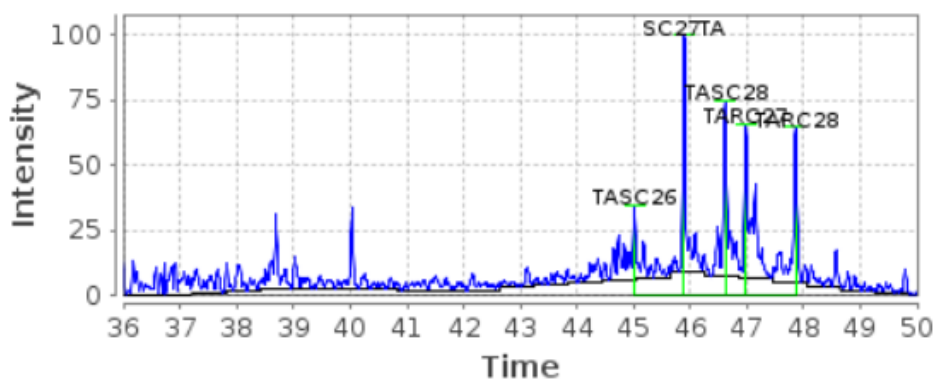


2010-0504 Gjøa

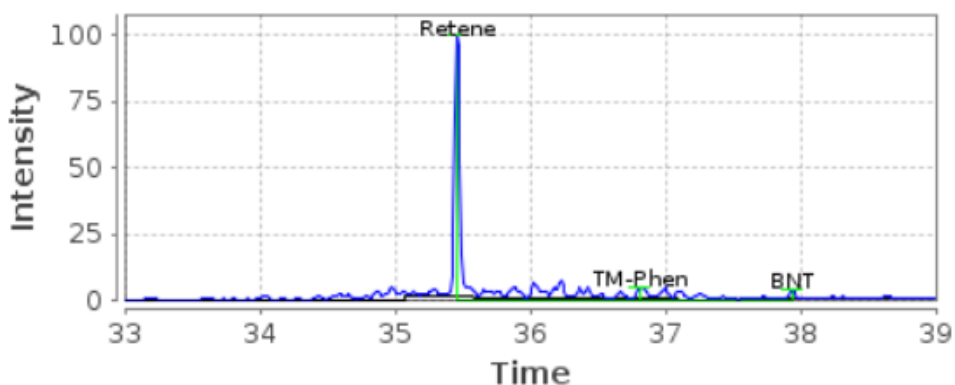
M/Z 191, No-1-18.95



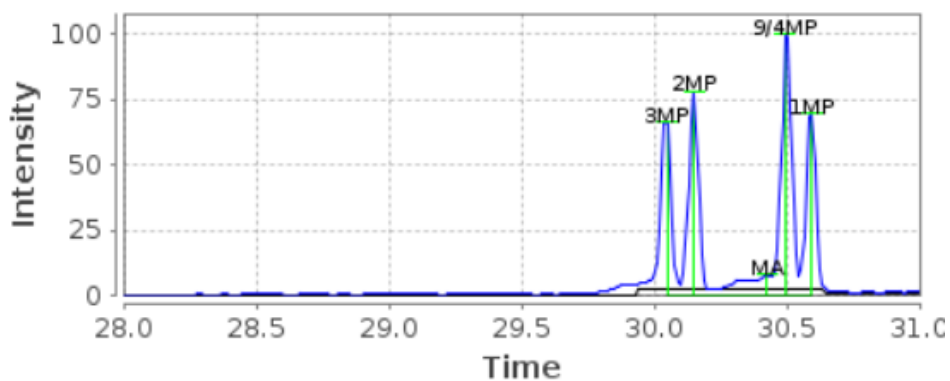
M/Z 231, No-1-18.95



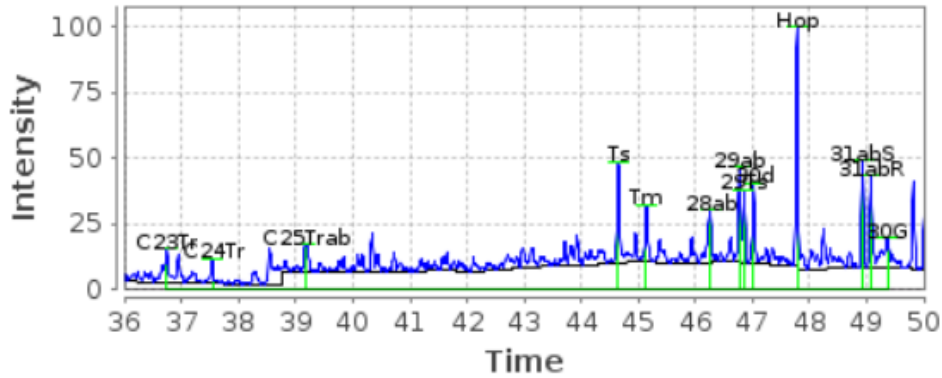
M/Z 234, No-1-18.95



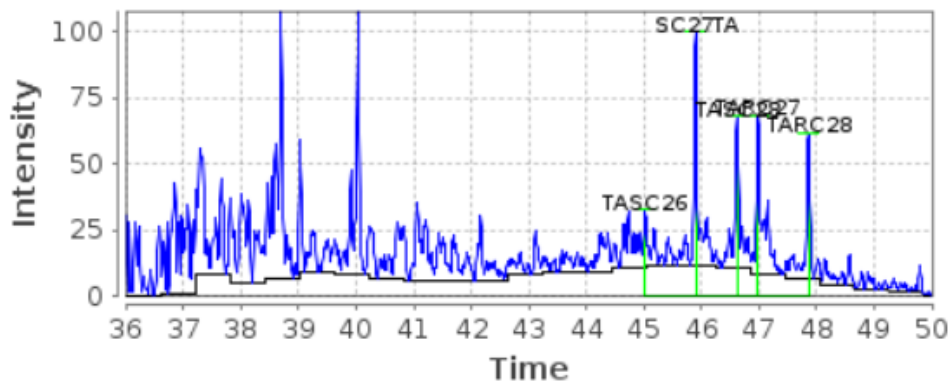
M/Z 192, No-1-18.95



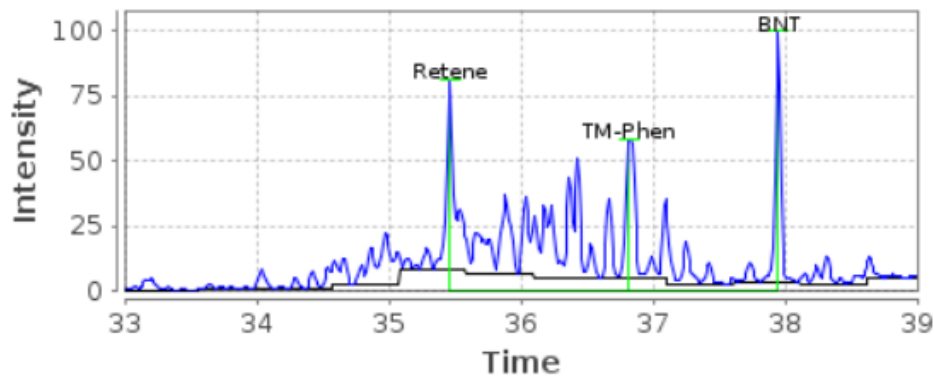
2011-0001 Draupne
M/Z 191, No-1-18.96



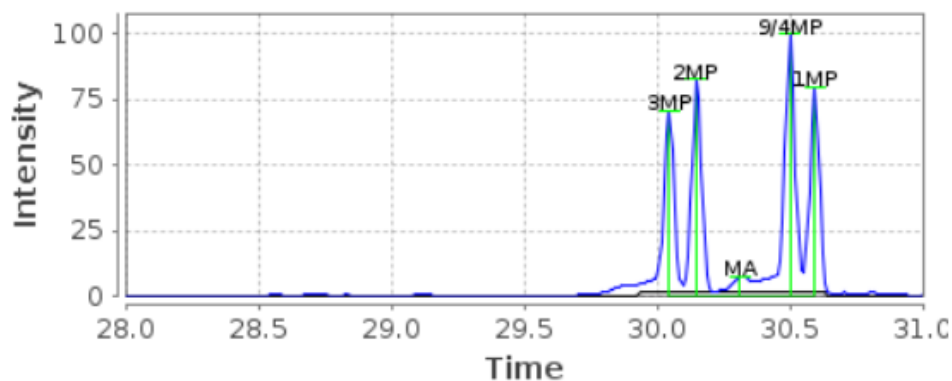
M/Z 231, No-1-18.96



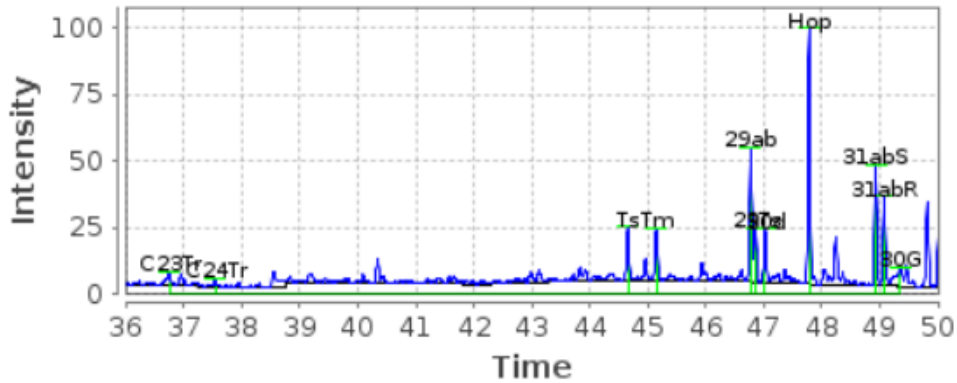
M/Z 234, No-1-18.96



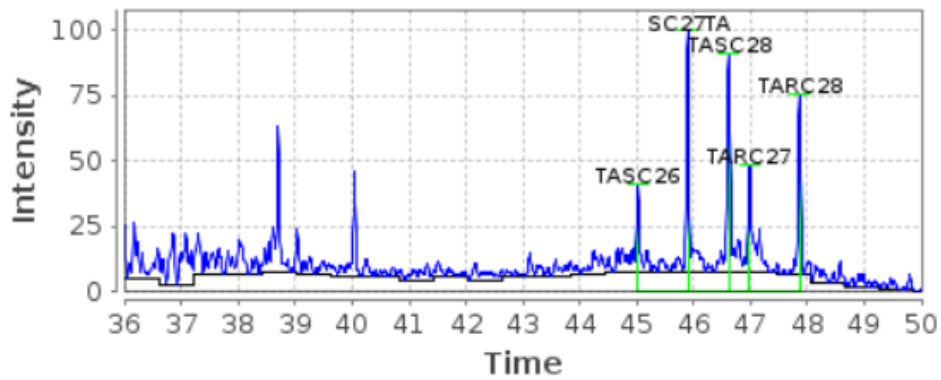
M/Z 192, No-1-18.96



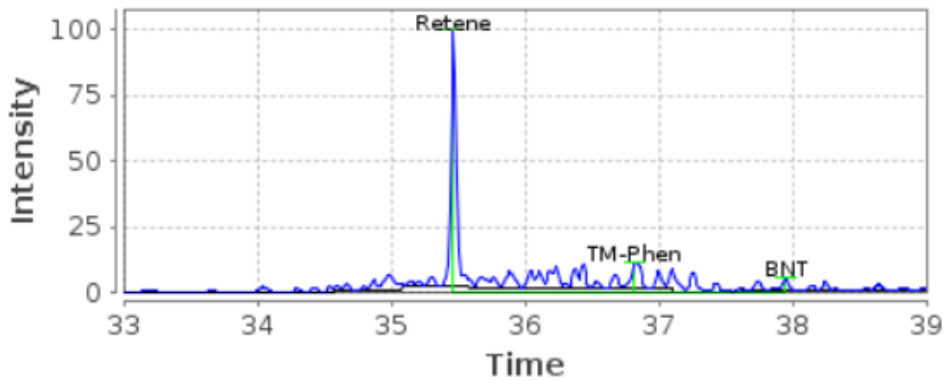
2011-0017 Trym
 M/Z 191, No-1-18.97



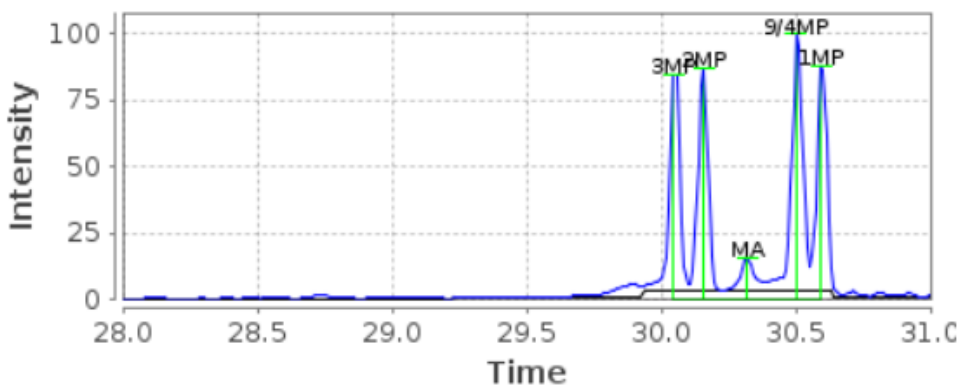
M/Z 231, No-1-18.97



M/Z 234, No-1-18.97

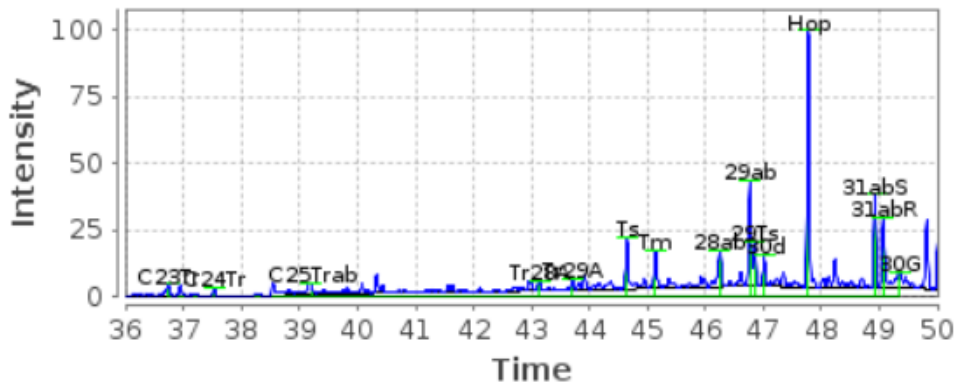


M/Z 192, No-1-18.97

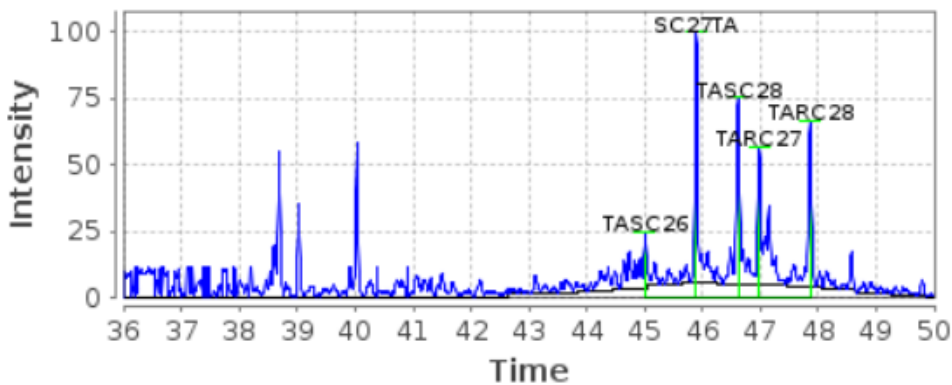


2011-0590 Veslefrikk

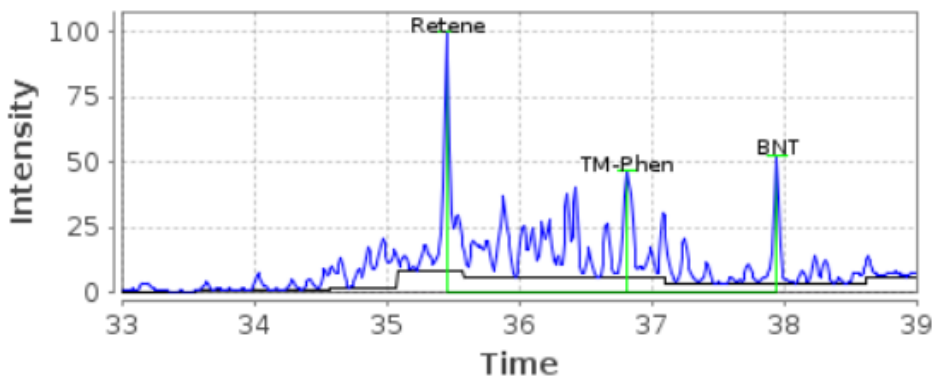
M/Z 191, No-1-18.99



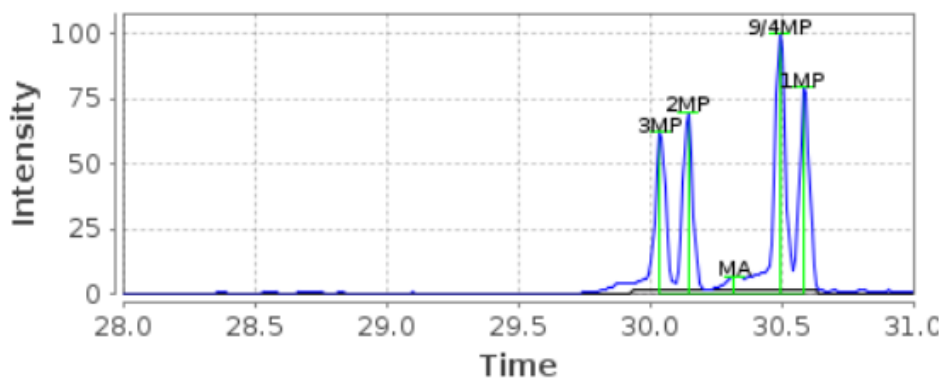
M/Z 231, No-1-18.99



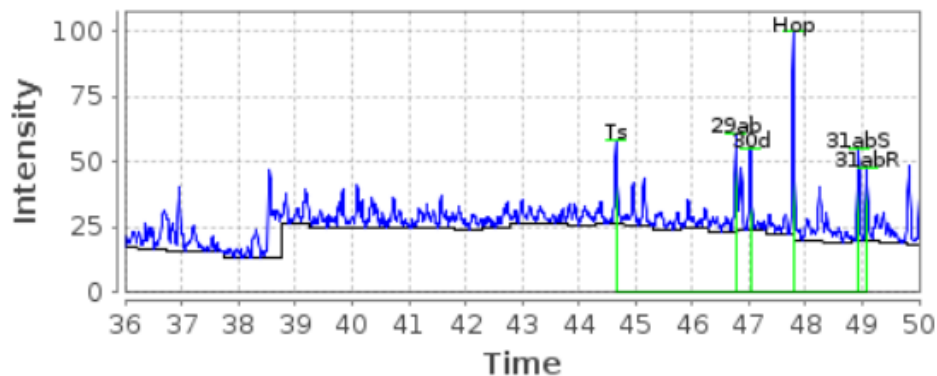
M/Z 234, No-1-18.99



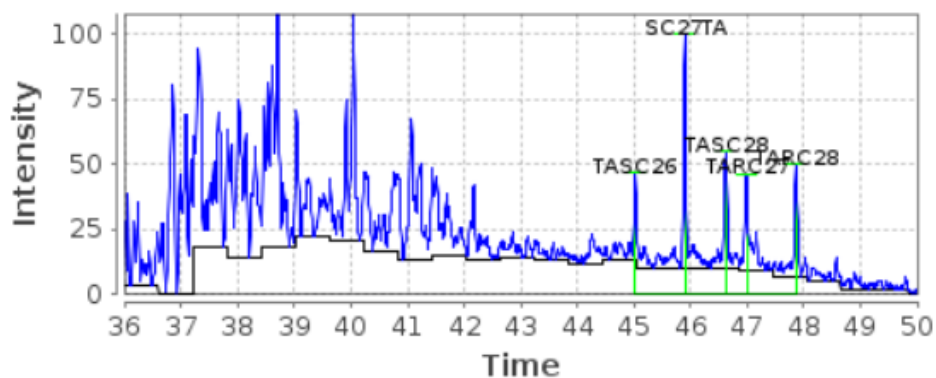
M/Z 192, No-1-18.99



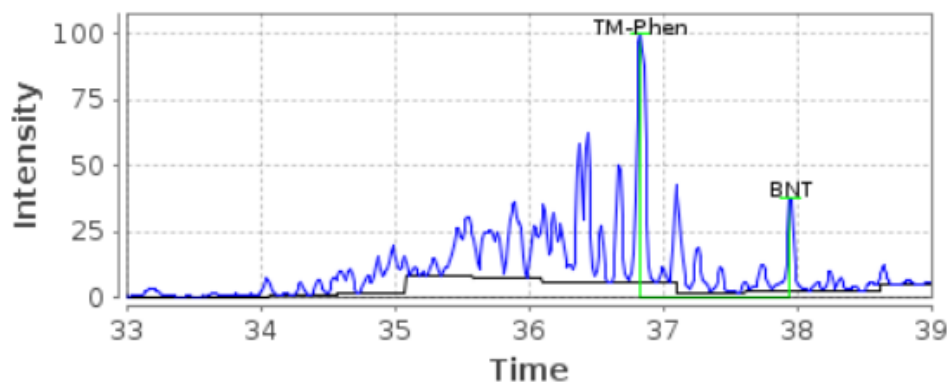
2011-0602 Oselvar
M/Z 191, No-1-18.100



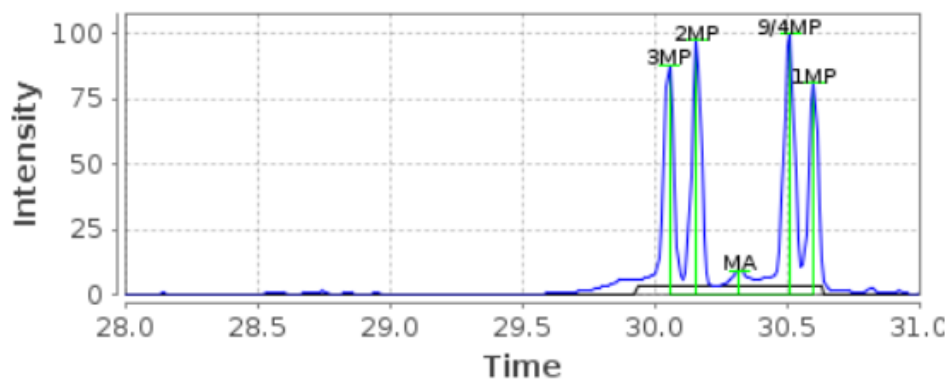
M/Z 231, No-1-18.100



M/Z 234, No-1-18.100

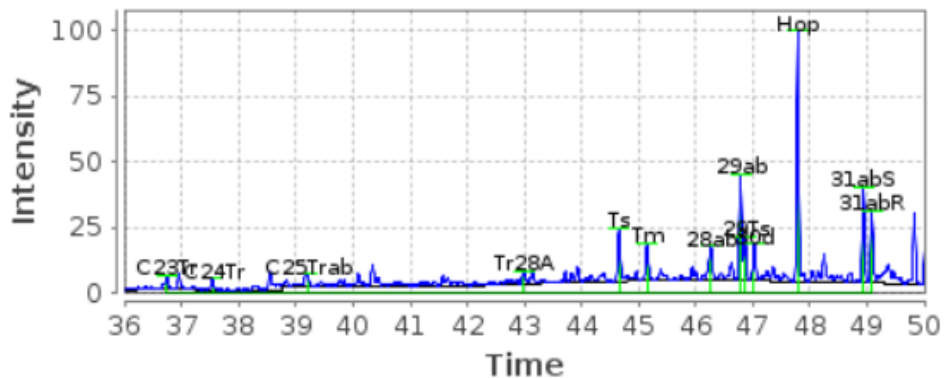


M/Z 192, No-1-18.100

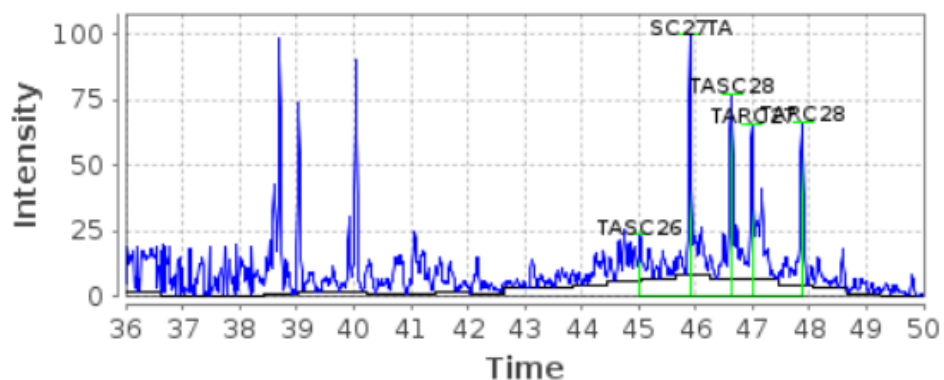


2012-0004 Veslefrikk

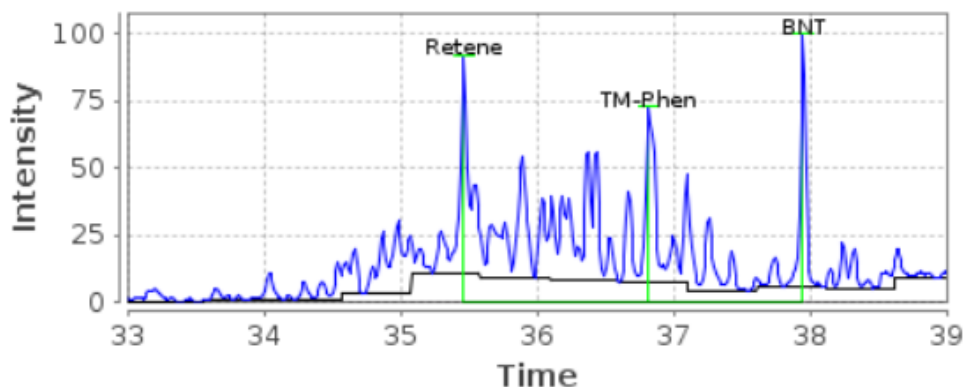
M/Z 191, No-1-18.101



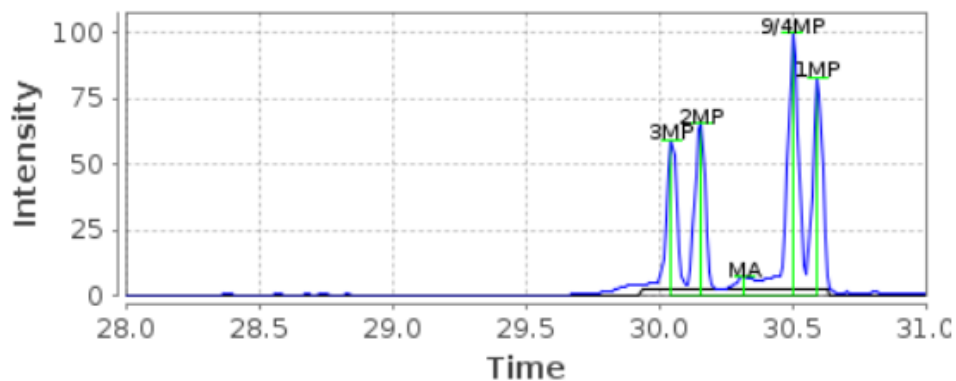
M/Z 231, No-1-18.101



M/Z 234, No-1-18.101

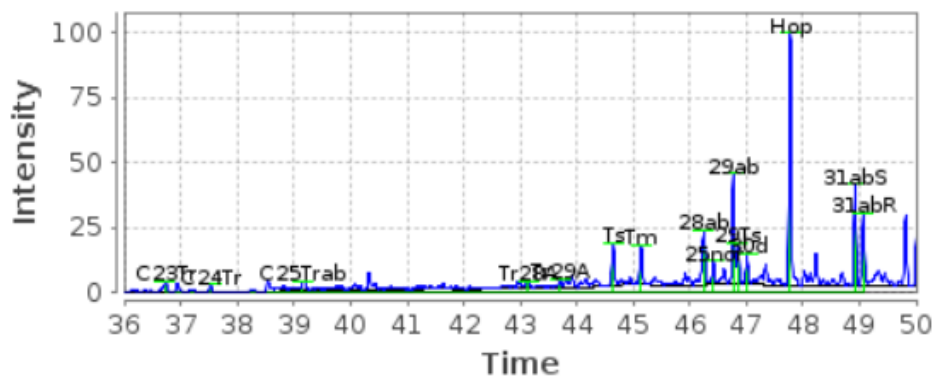


M/Z 192, No-1-18.101

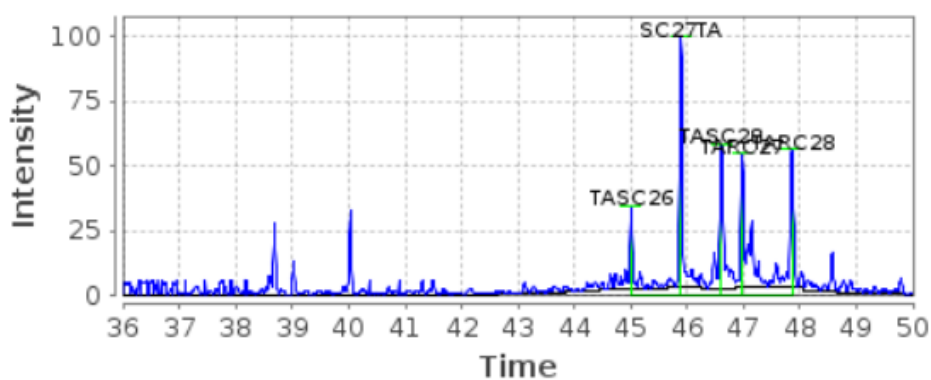


2012-0059 Oseberg Blend

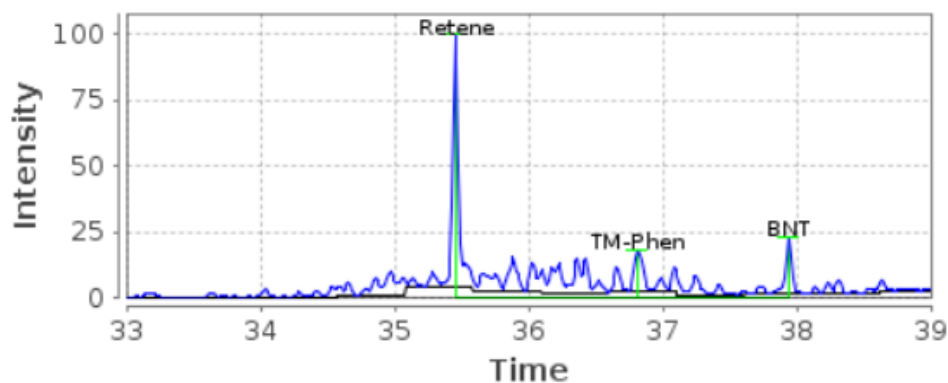
M/Z 191, No-1-18.103



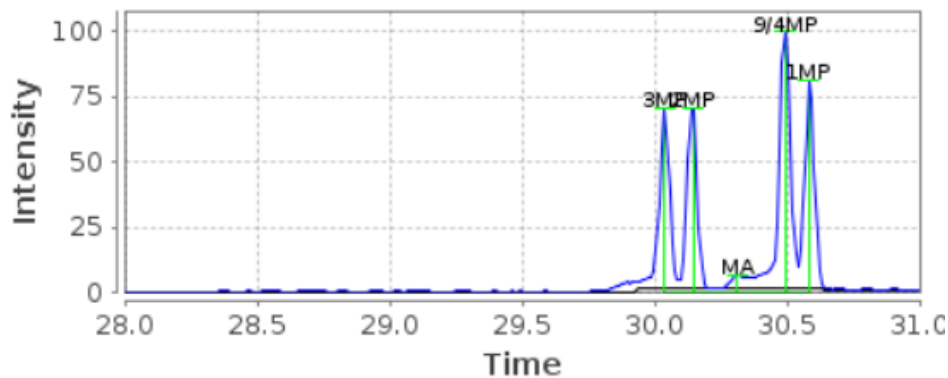
M/Z 231, No-1-18.103



M/Z 234, No-1-18.103

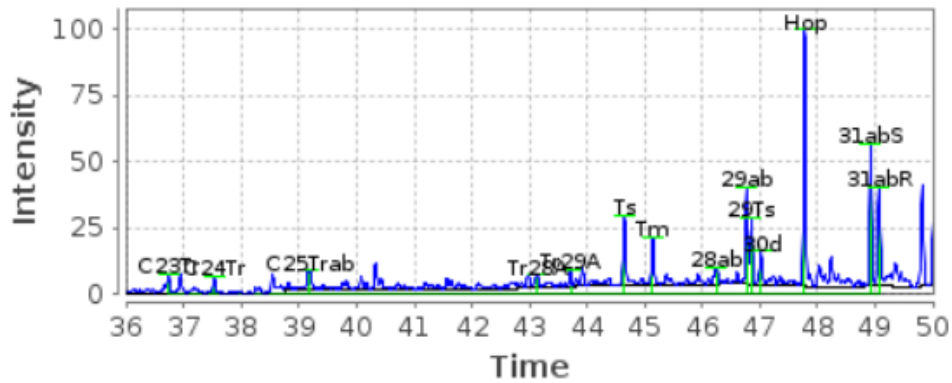


M/Z 192, No-1-18.103

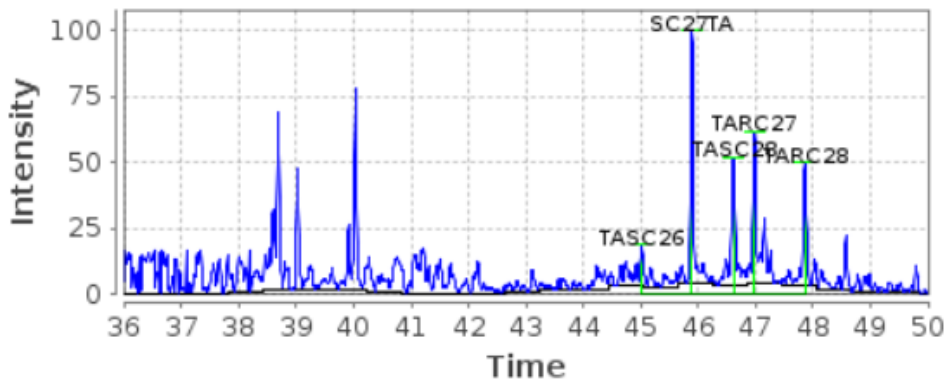


2012-0091 Maria

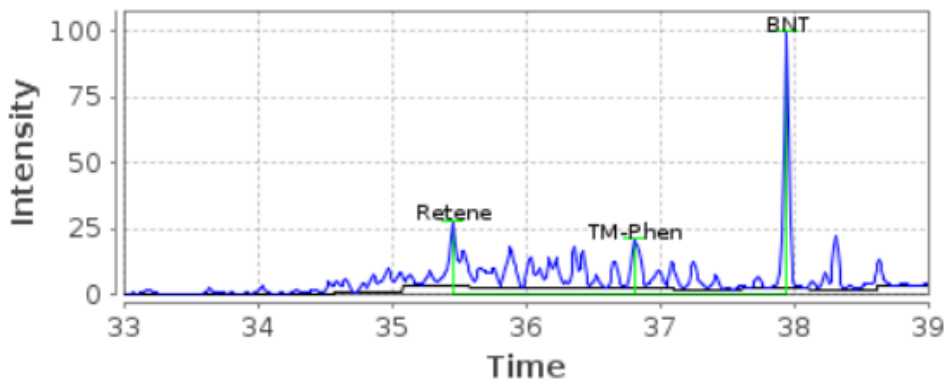
M/Z 191, No-1-18.105



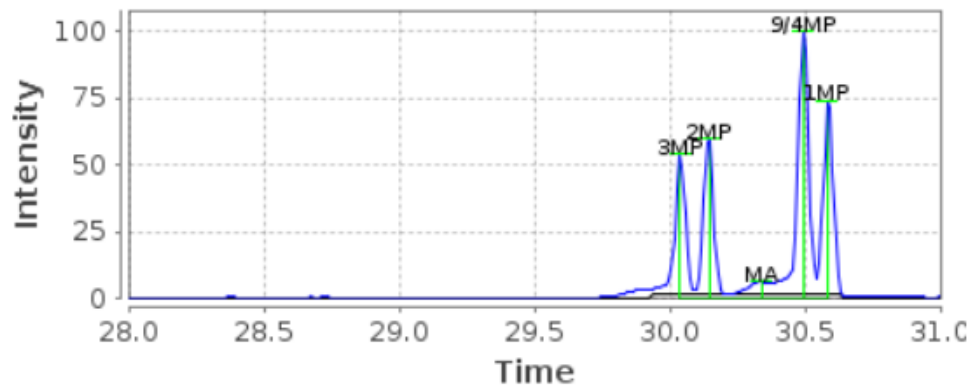
M/Z 231, No-1-18.105



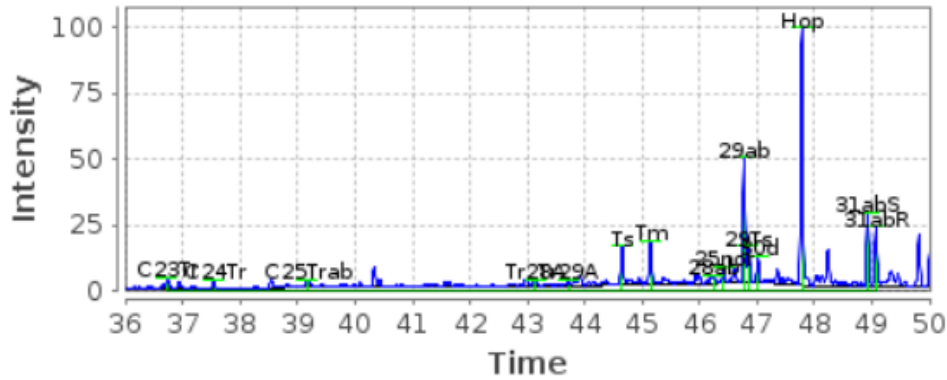
M/Z 234, No-1-18.105



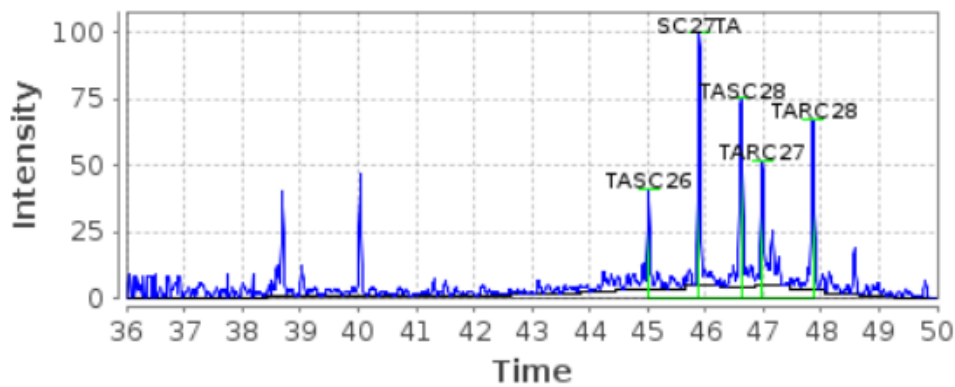
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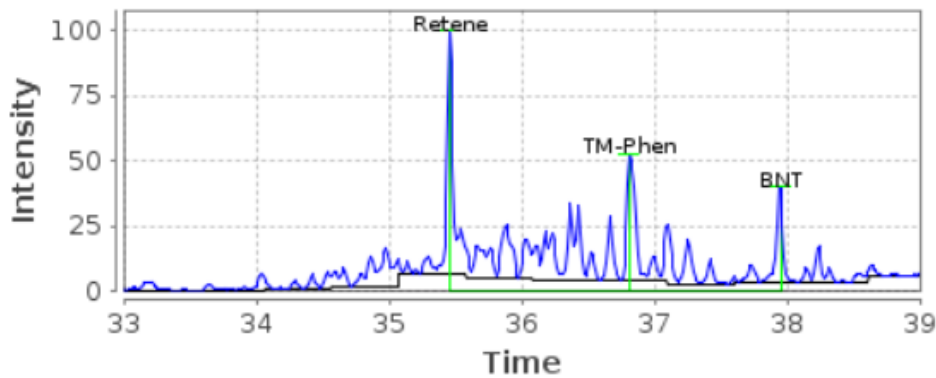
2012-0243 Havis
M/Z 191, No-1-18.106



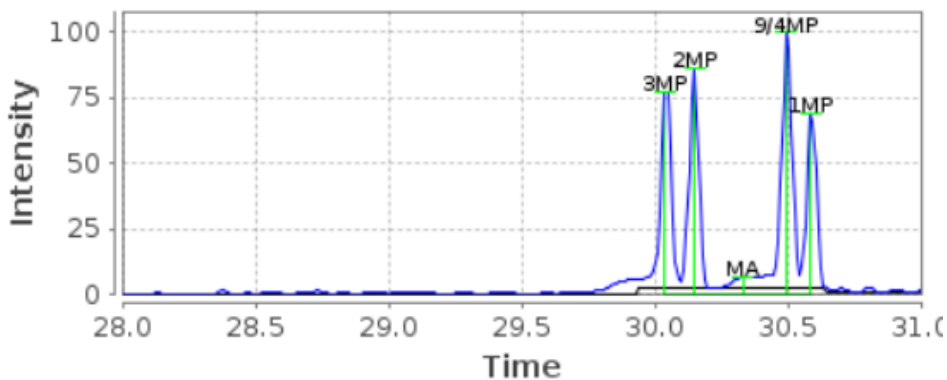
M/Z 231, No-1-18.106



M/Z 234, No-1-18.106

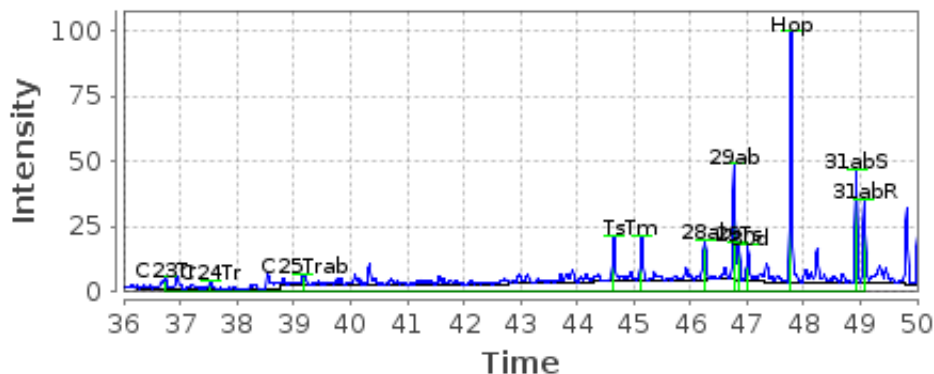


M/Z 192, No-1-18.106

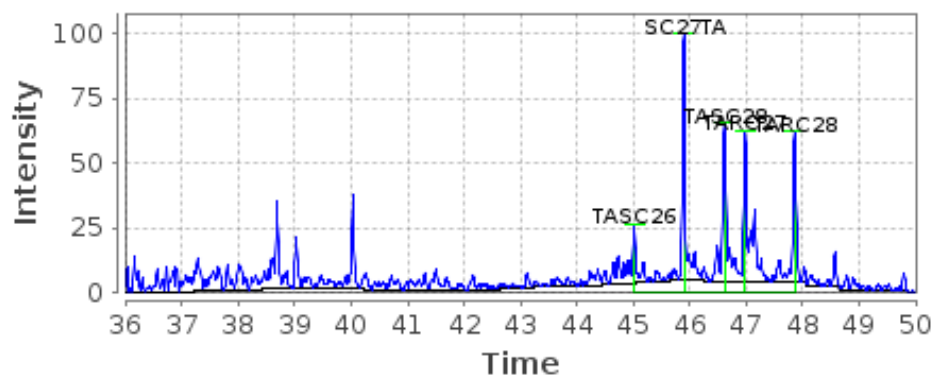


2012-0245 Oseberg Sør

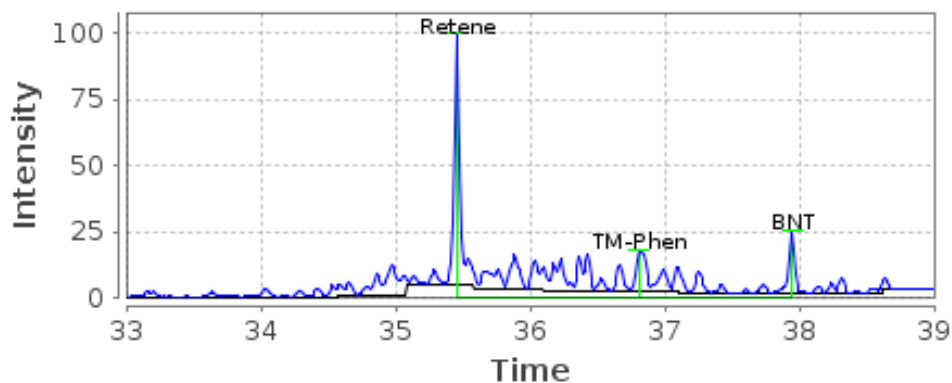
M/Z 191, No-1-18.107



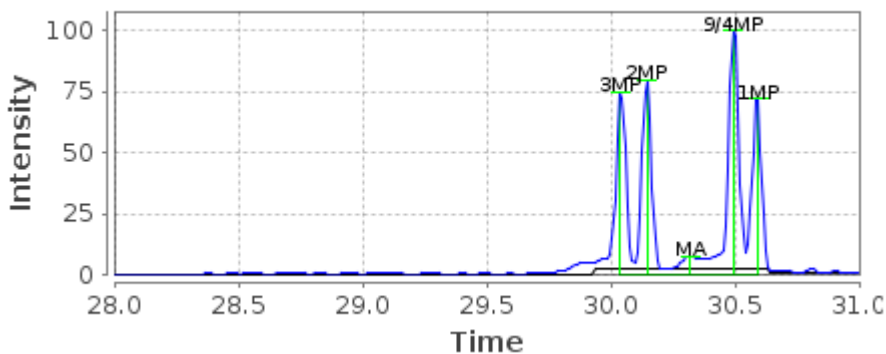
M/Z 231, No-1-18.107



M/Z 234, No-1-18.107

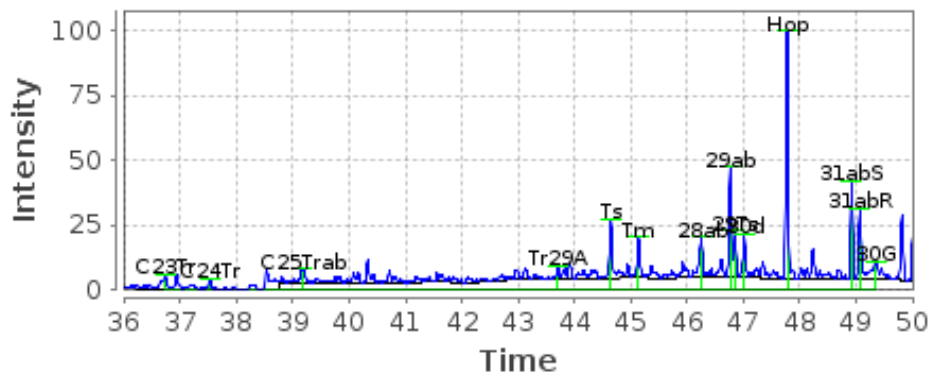


M/Z 192, No-1-18.107

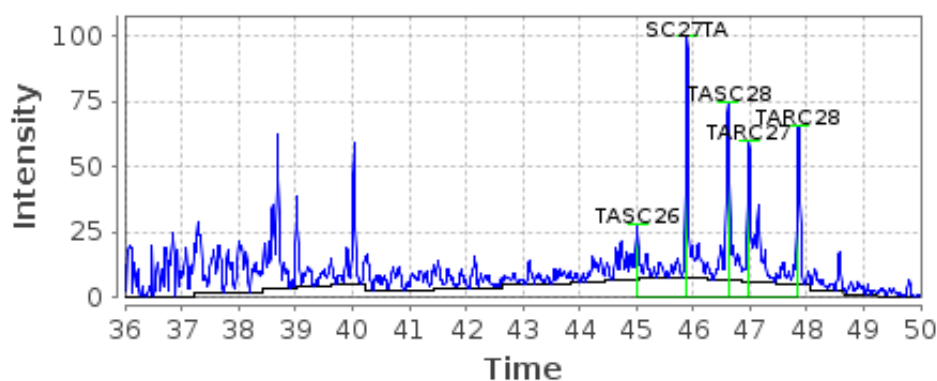


2012-0246 Brage

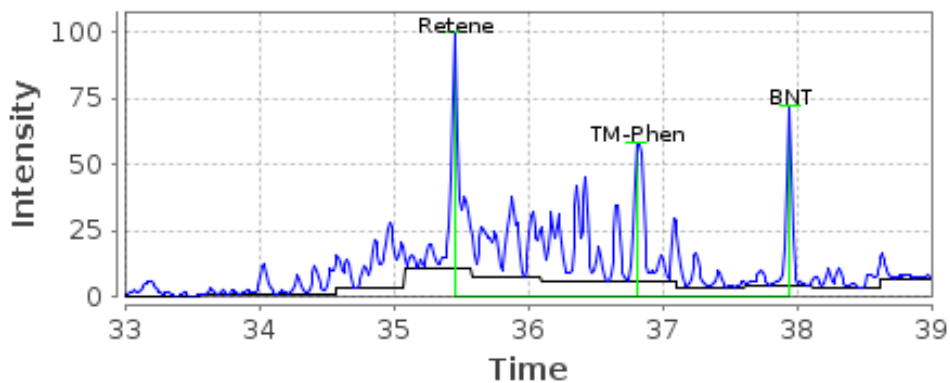
M/Z 191, No-1-18.108



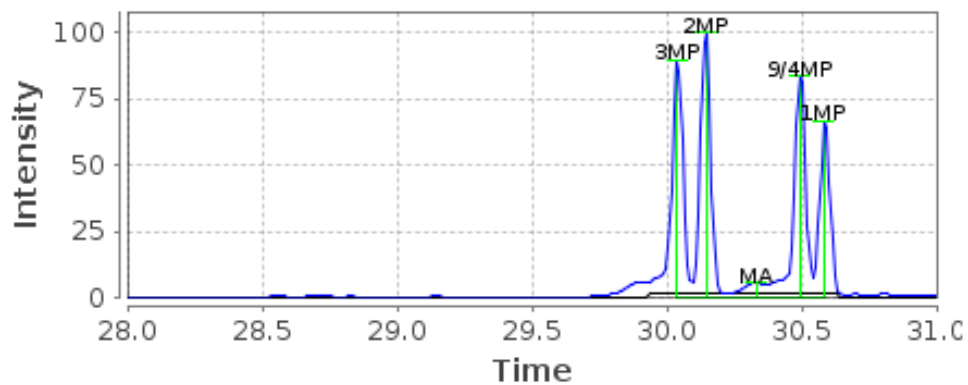
M/Z 231, No-1-18.108



M/Z 234, No-1-18.108

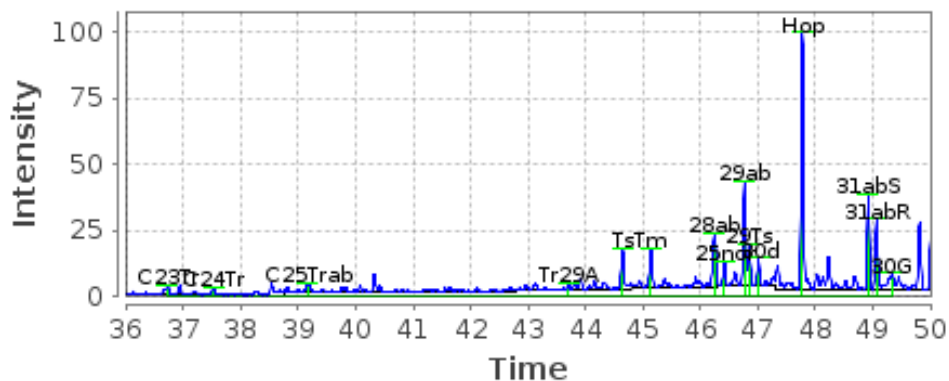


M/Z 192, No-1-18.108

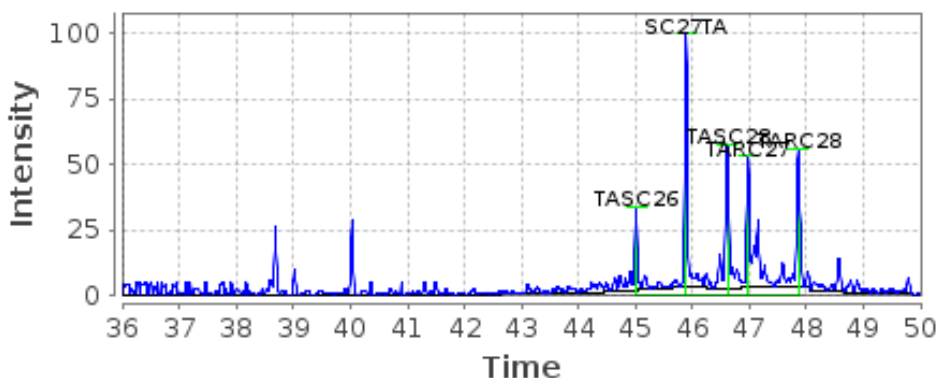


2012-0247 Oseberg Sør

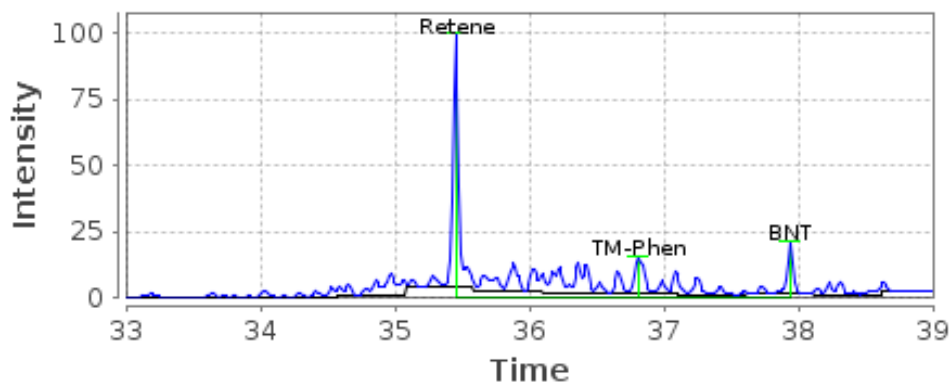
M/Z 191, No-1-18.109



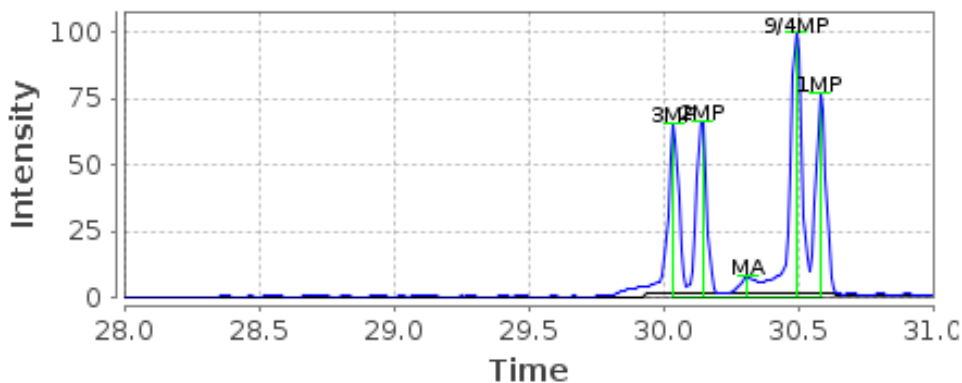
M/Z 231, No-1-18.109



M/Z 234, No-1-18.109

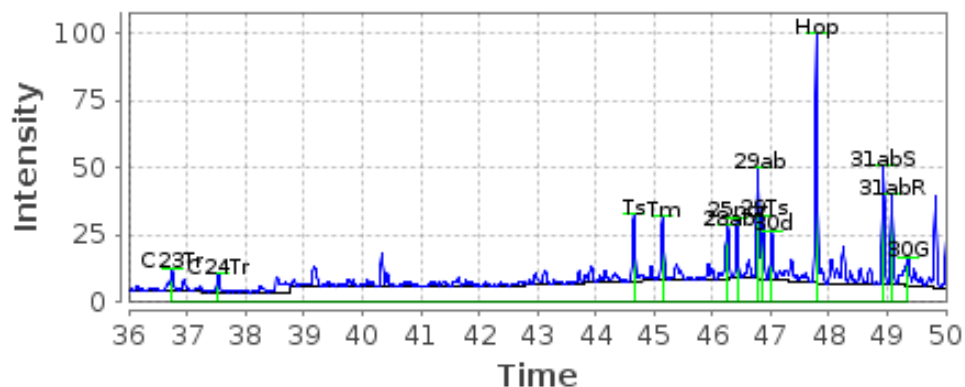


M/Z 192, No-1-18.109

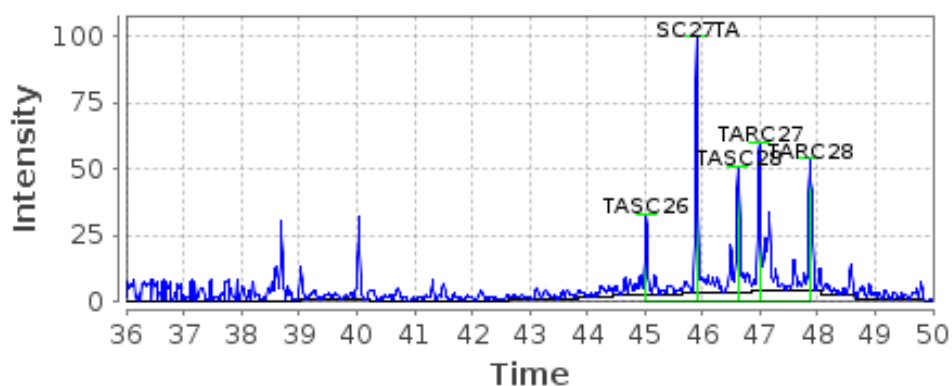


2012-0331 Grane

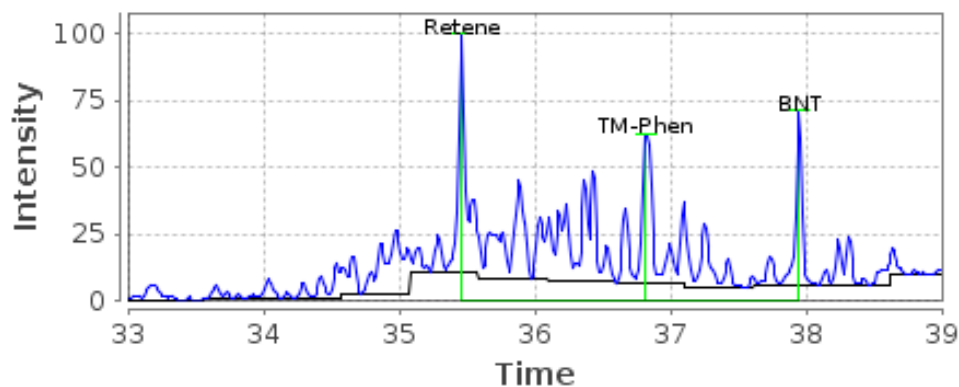
M/Z 191, No-1-18.110



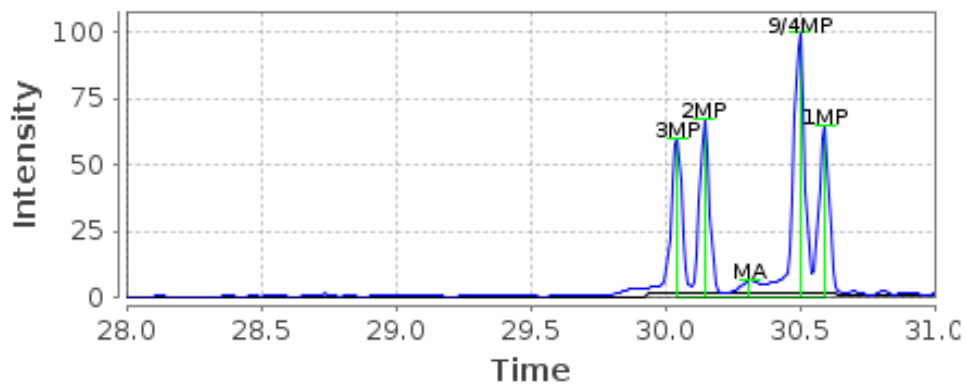
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M/Z 234, No-1-18.110

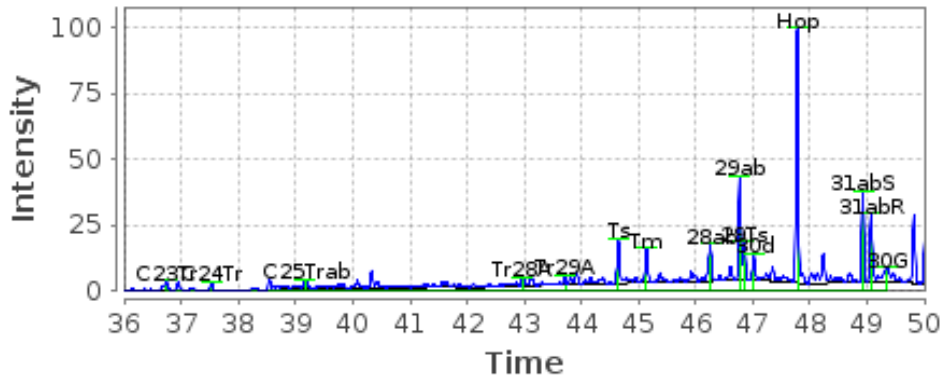


M/Z 192, No-1-18.110

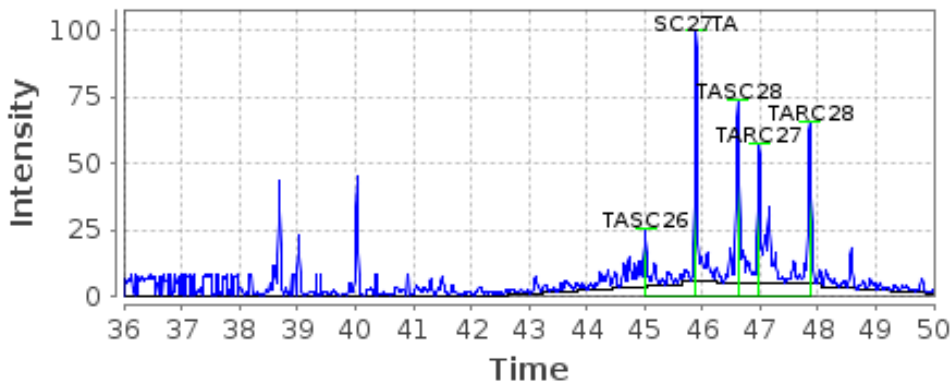


2012-0333 Oseberg Øst

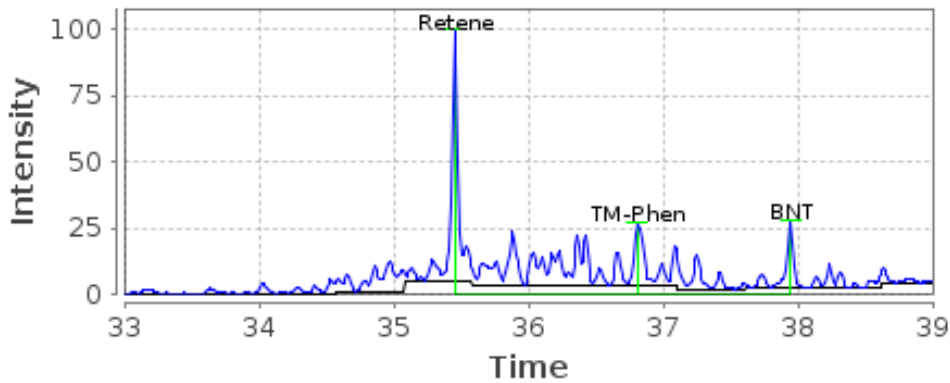
M/Z 191, No-1-18.111



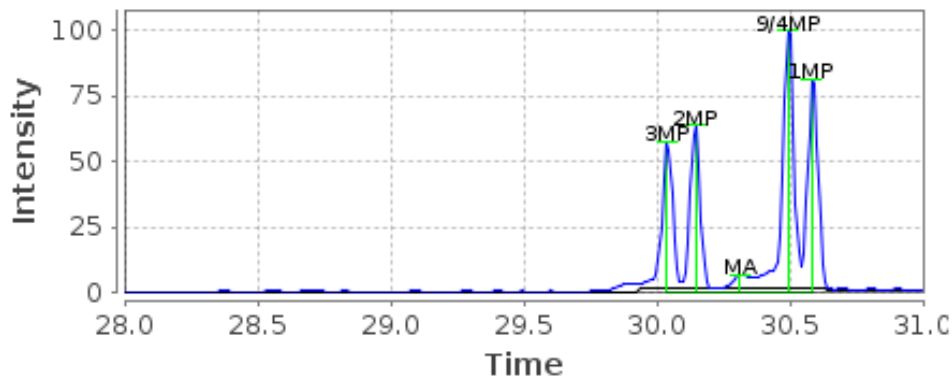
M/Z 231, No-1-18.111



M/Z 234, No-1-18.111

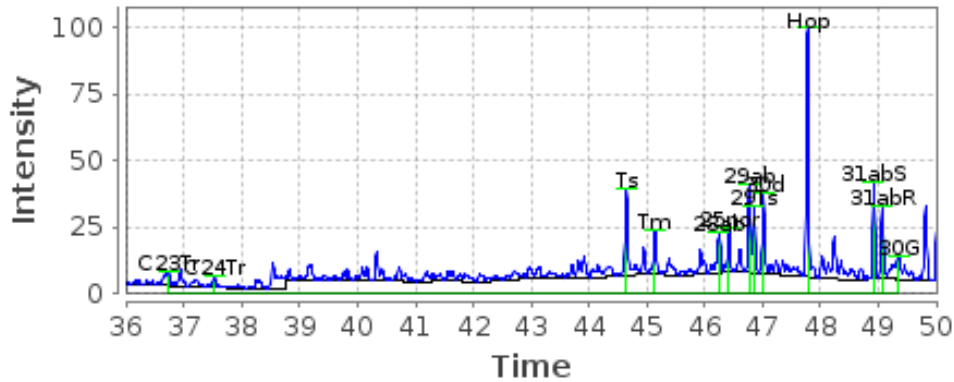


M/Z 192, No-1-18.111

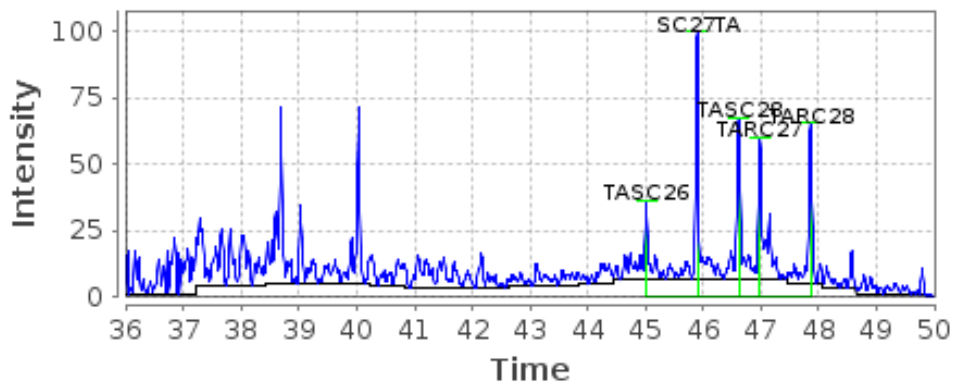


2012-0340 Fram

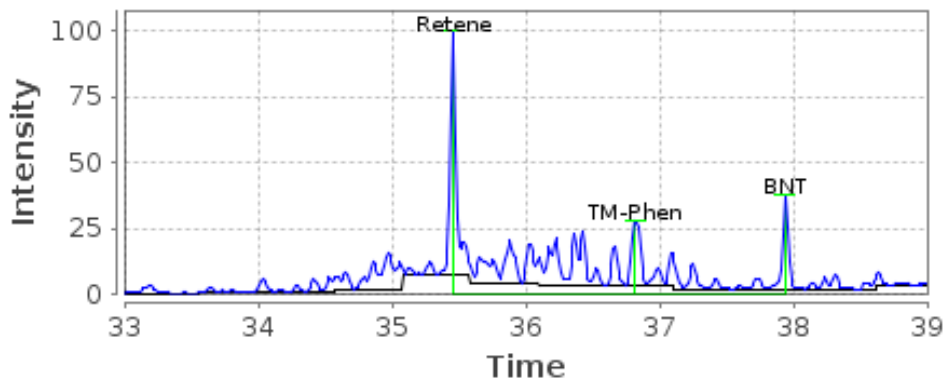
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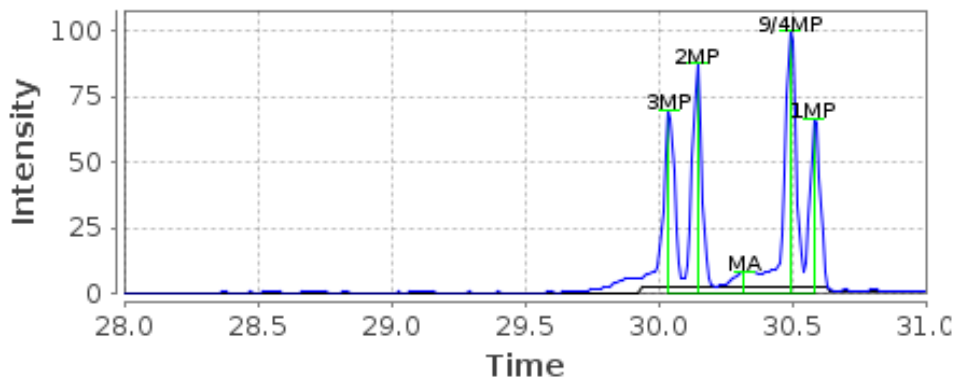
M/Z 231, No-1-18.112



M/Z 234, No-1-18.112

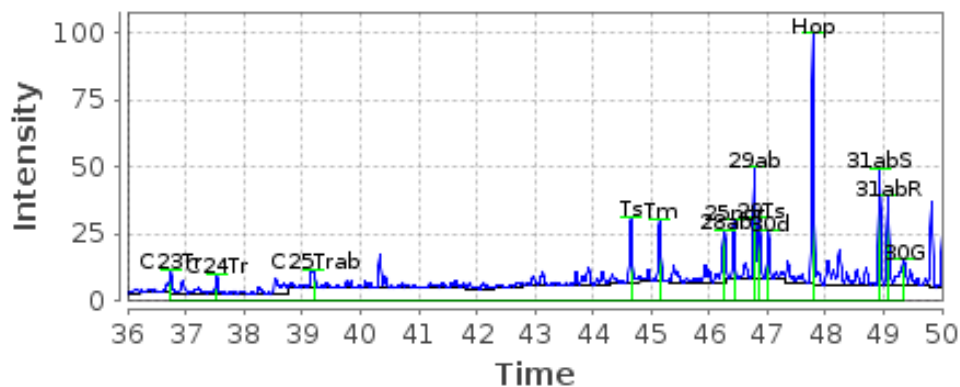


M/Z 192, No-1-18.112

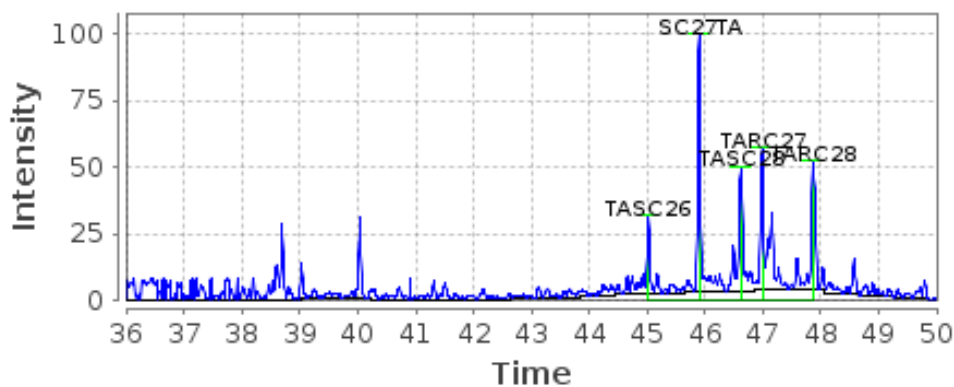


2012-0556 Grane

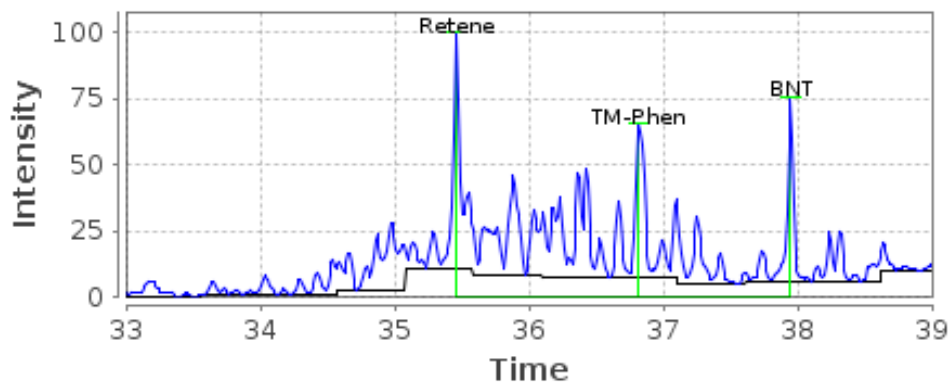
M/Z 191, No-1-18.115



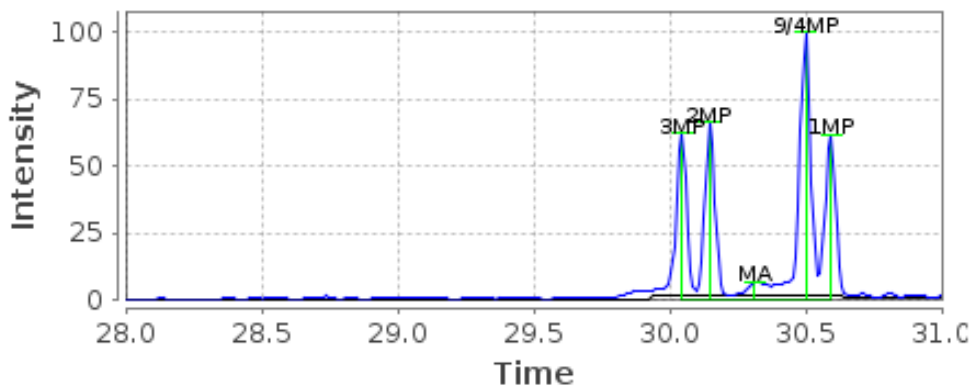
M/Z 231, No-1-18.115



M/Z 234, No-1-18.115

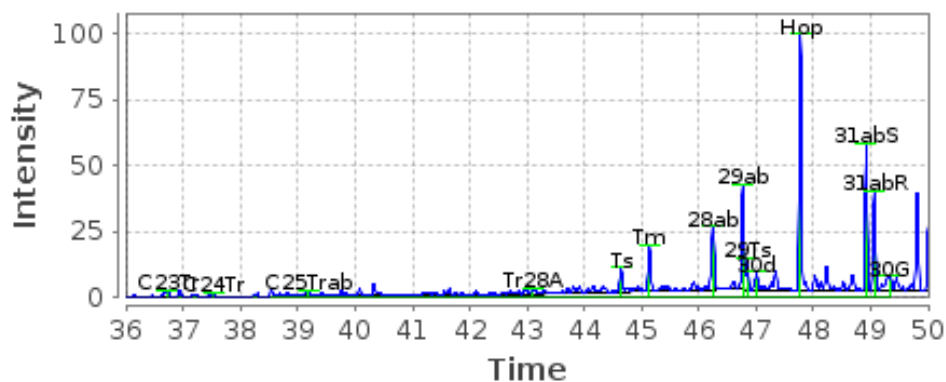


M/Z 192, No-1-18.115

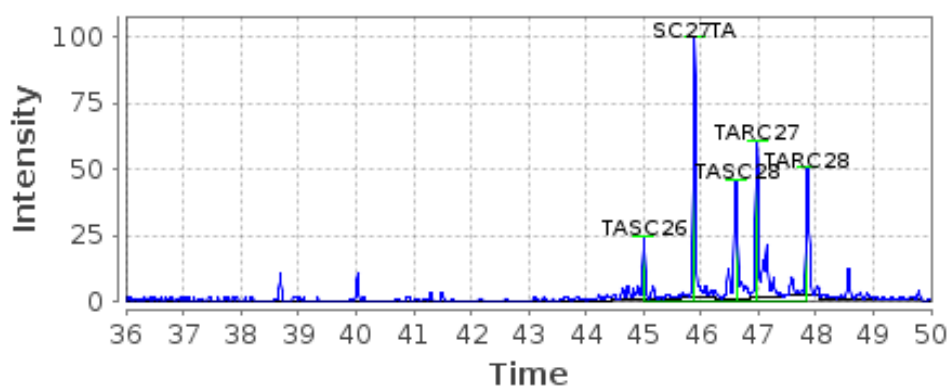


2013-0580 Luno II

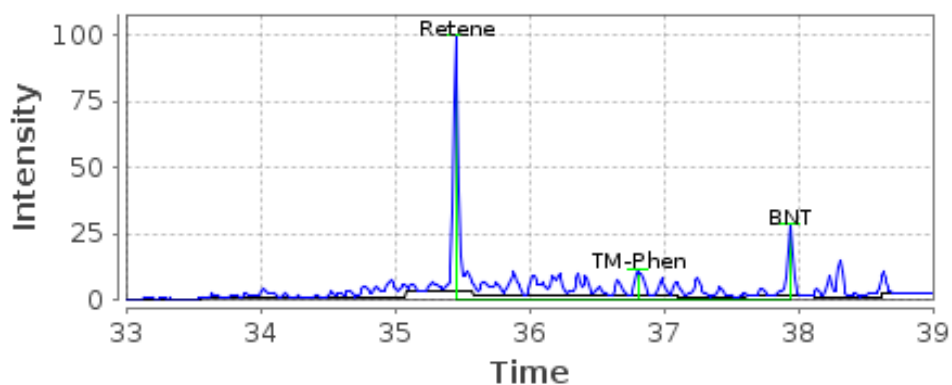
M/Z 191, No-1-18.117



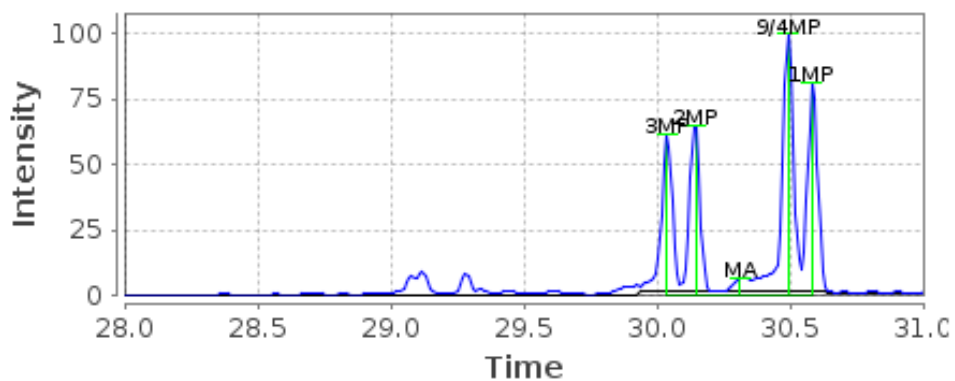
M/Z 231, No-1-18.117



M/Z 234, No-1-18.117

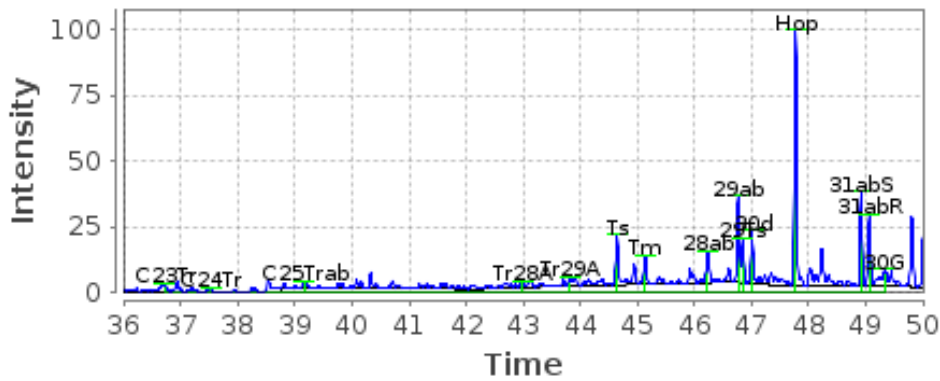


M/Z 192, No-1-18.117

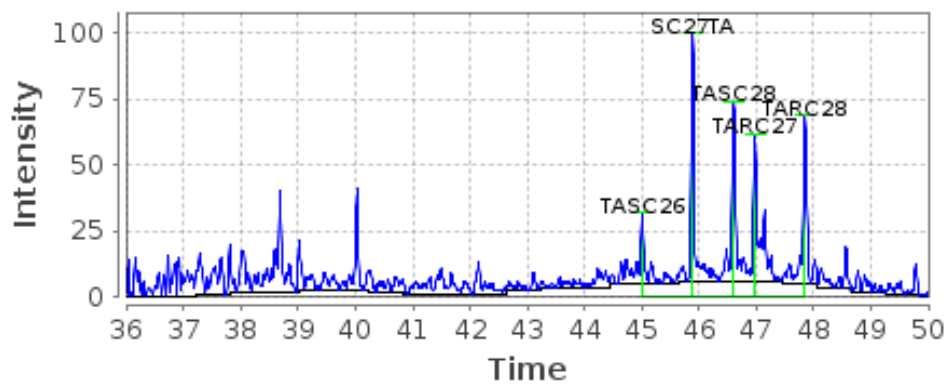


2013-0595 Skarvfjell

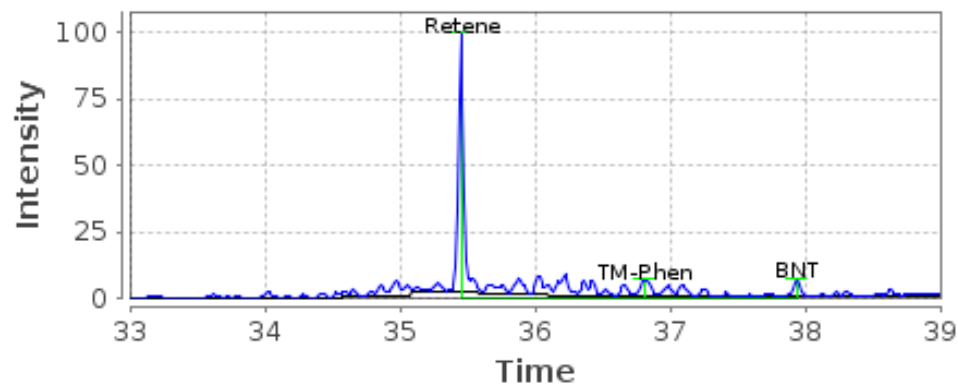
M/Z 191, No-1-18.119



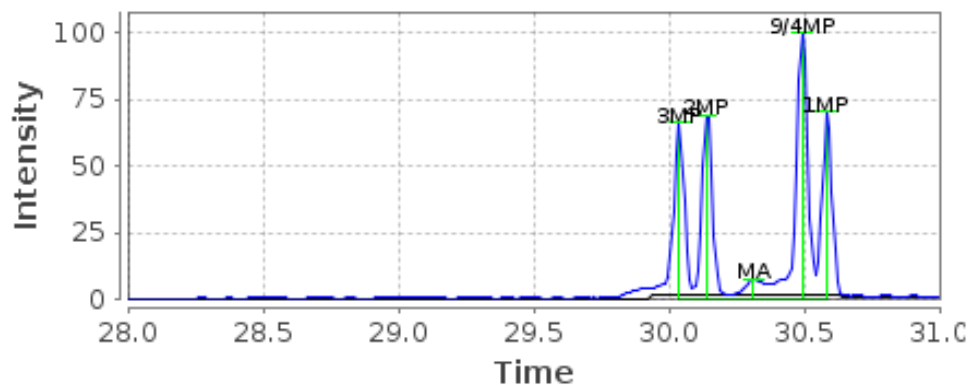
M/Z 231, No-1-18.119



M/Z 234, No-1-18.119

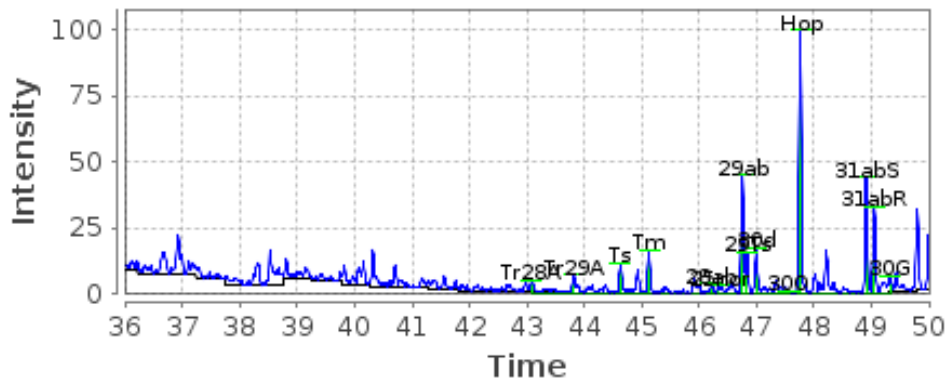


M/Z 192, No-1-18.119

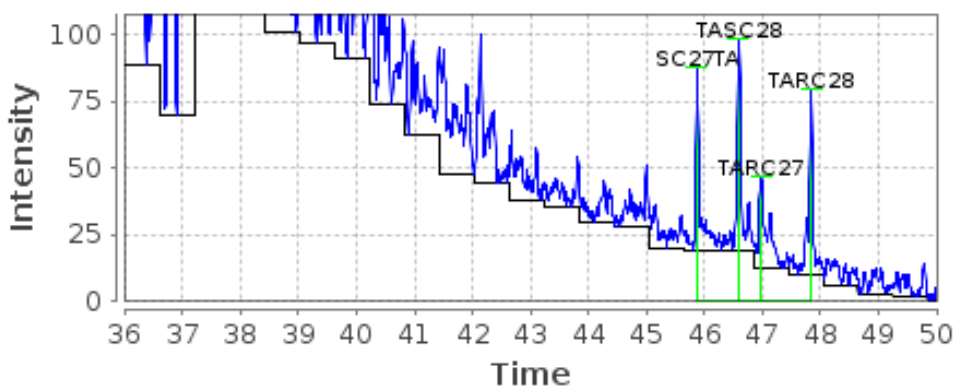


2013-0833 Skarv

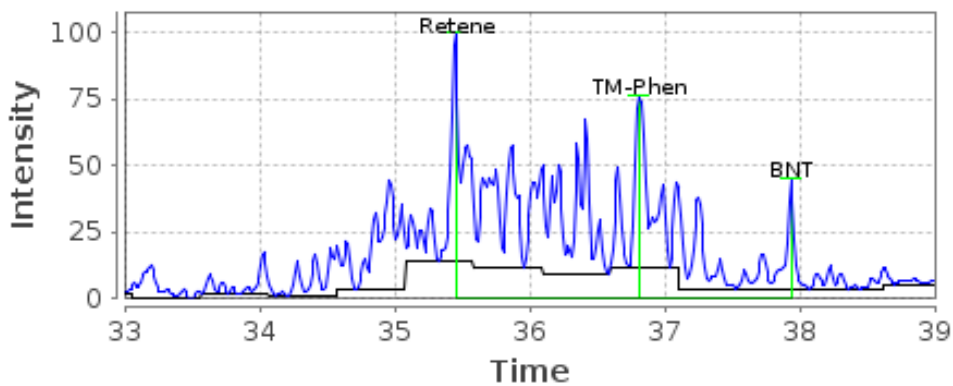
M/Z 191, No-1-18.120



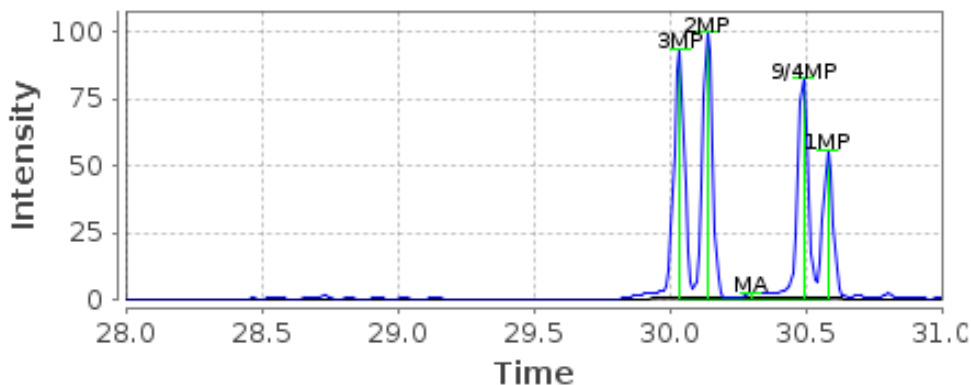
M/Z 231, No-1-18.120



M/Z 234, No-1-18.120

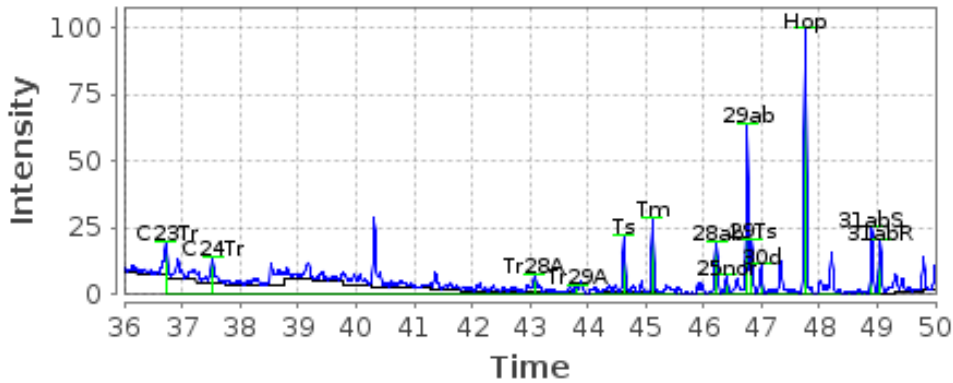


M/Z 192, No-1-18.120

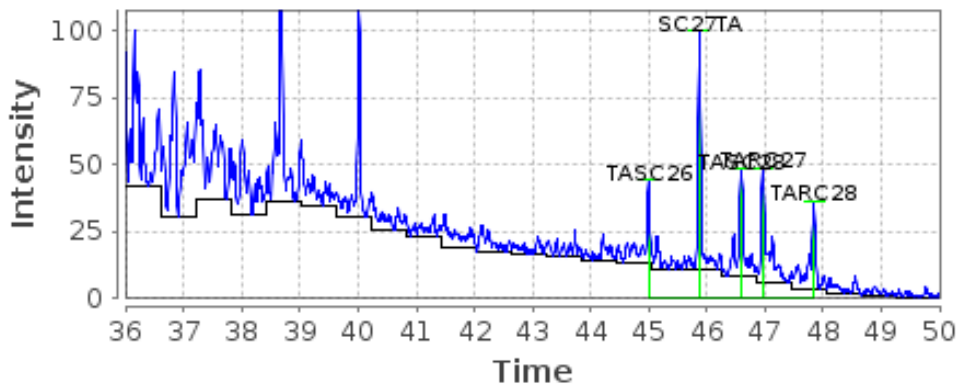


2014-0076 Marulk

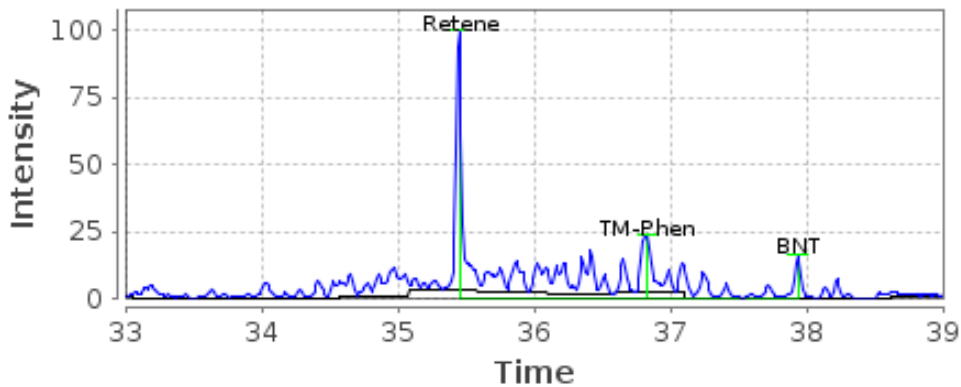
M/Z 191, No-1-18.121



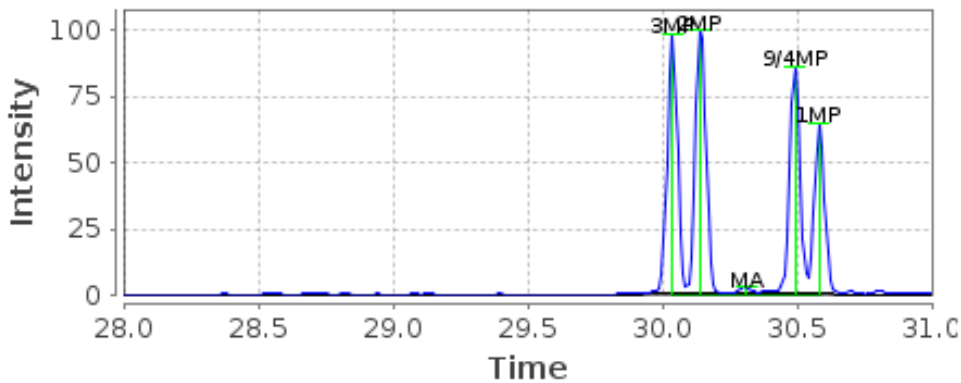
M/Z 231, No-1-18.121



M/Z 234, No-1-18.121

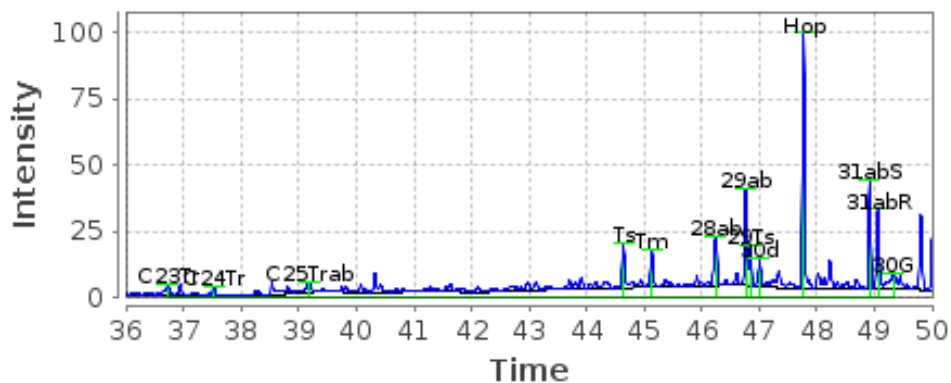


M/Z 192, No-1-18.121

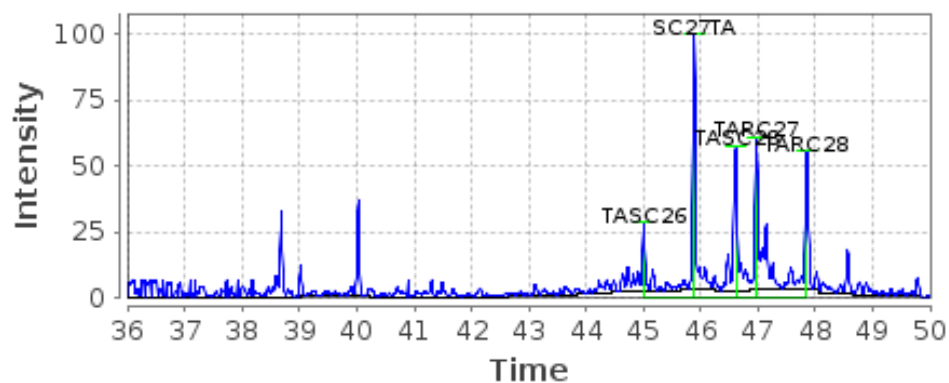


2014-0081 Statfjord

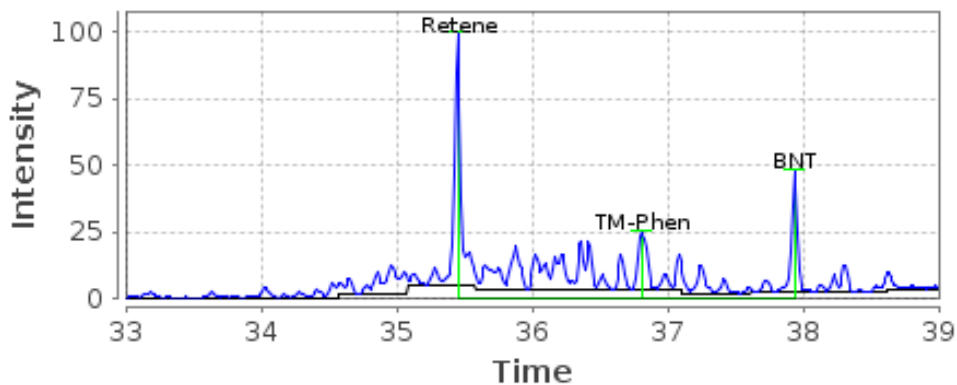
M/Z 191, No-1-18.122



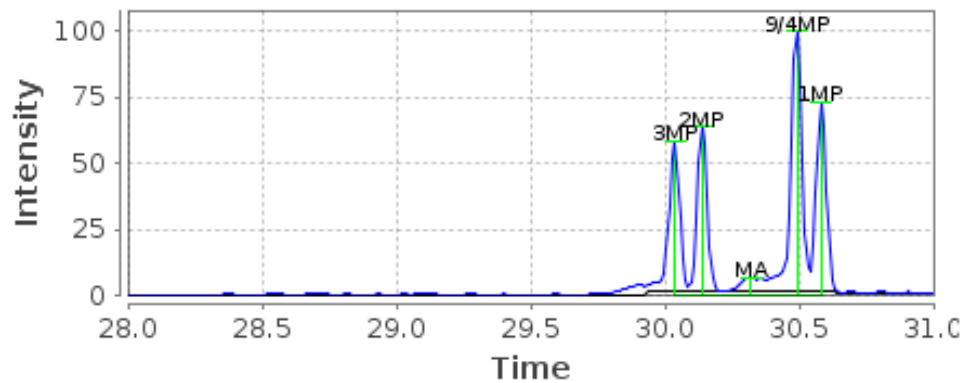
M/Z 231, No-1-18.122



M/Z 234, No-1-18.122

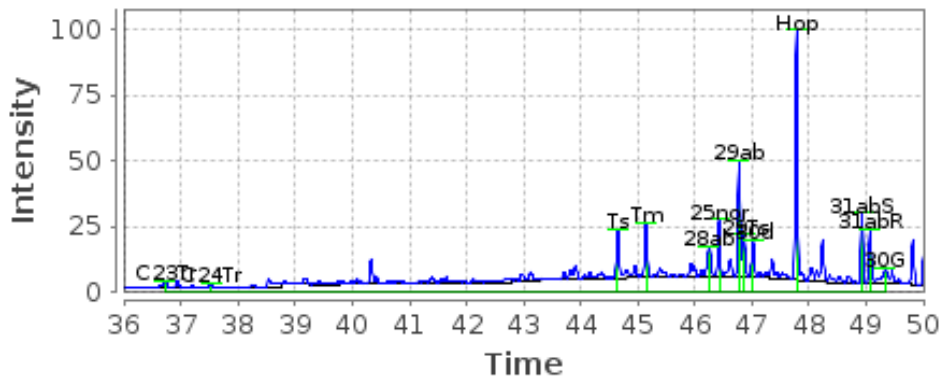


M/Z 192, No-1-18.122

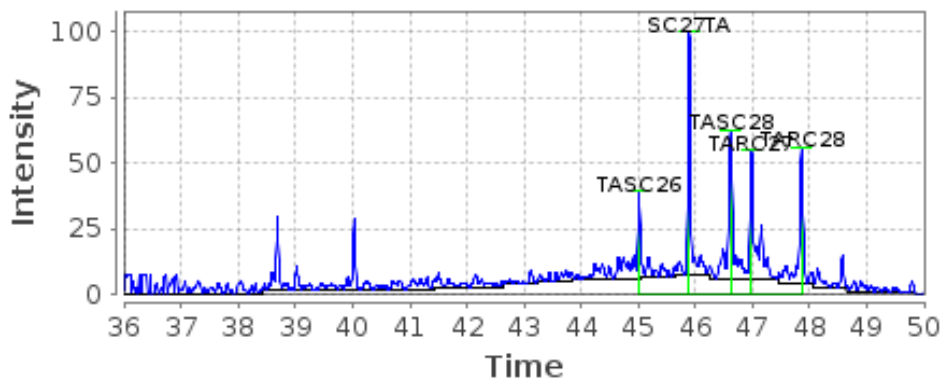


2014-0094 Pil

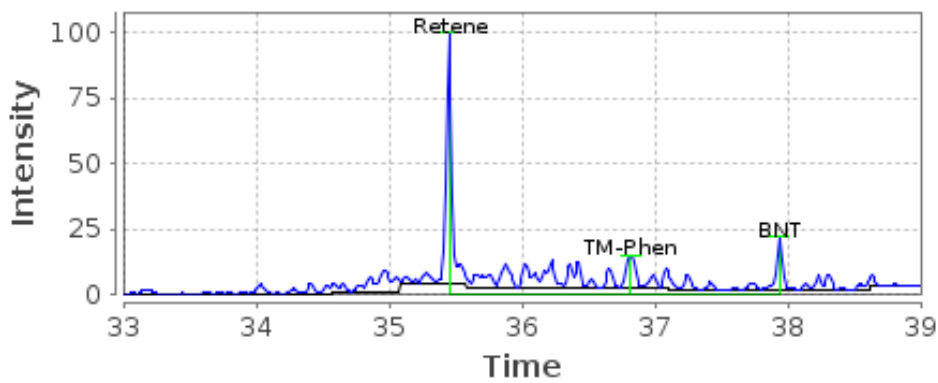
M/Z 191, No-1-18.124



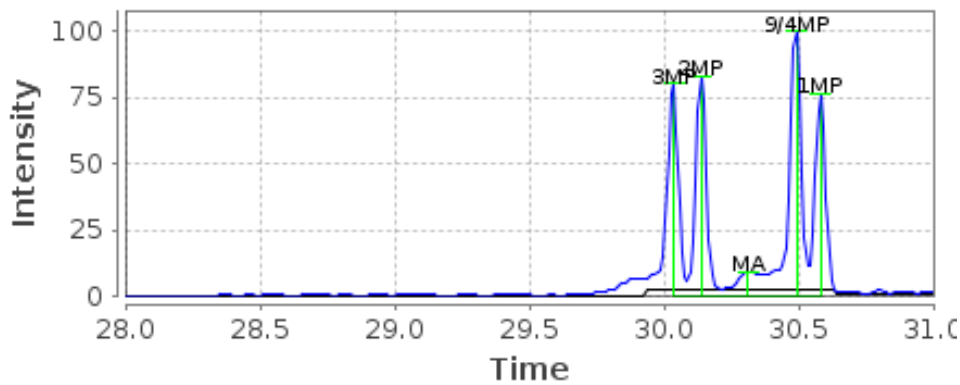
M/Z 231, No-1-18.124



M/Z 234, No-1-18.124

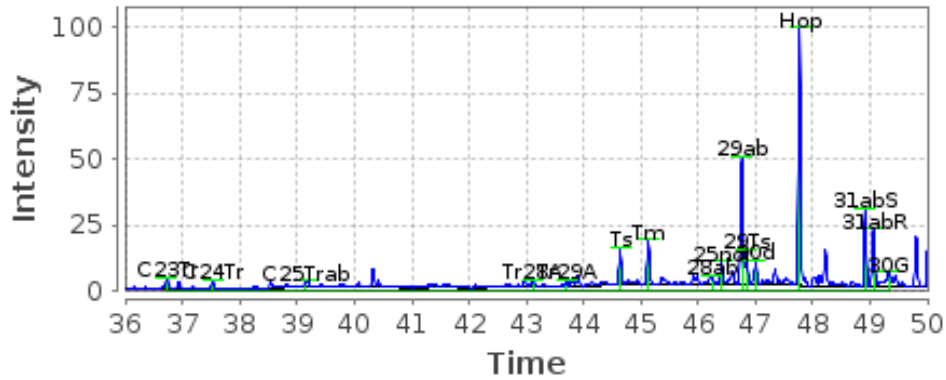


M/Z 192, No-1-18.124

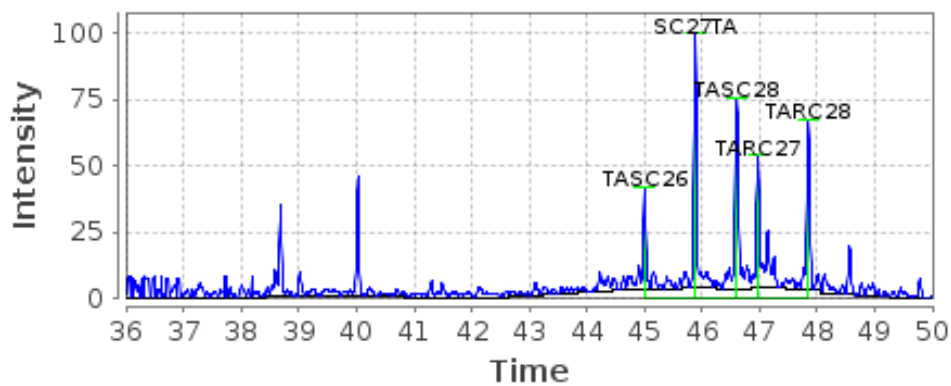


2014-0116 Drivis

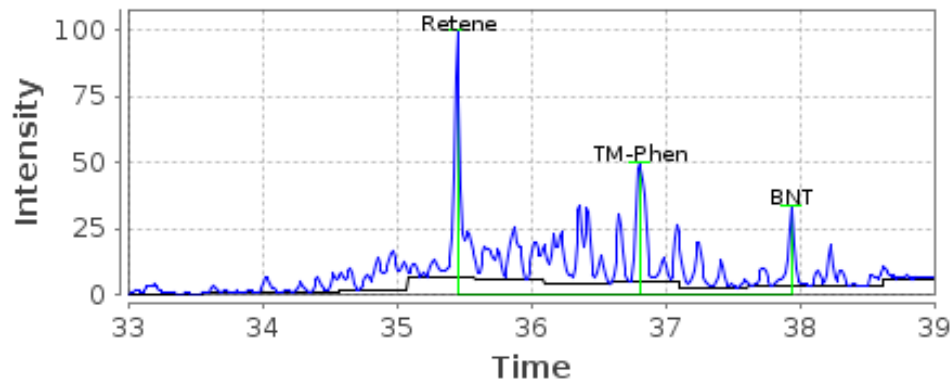
M/Z 191, No-1-18.125



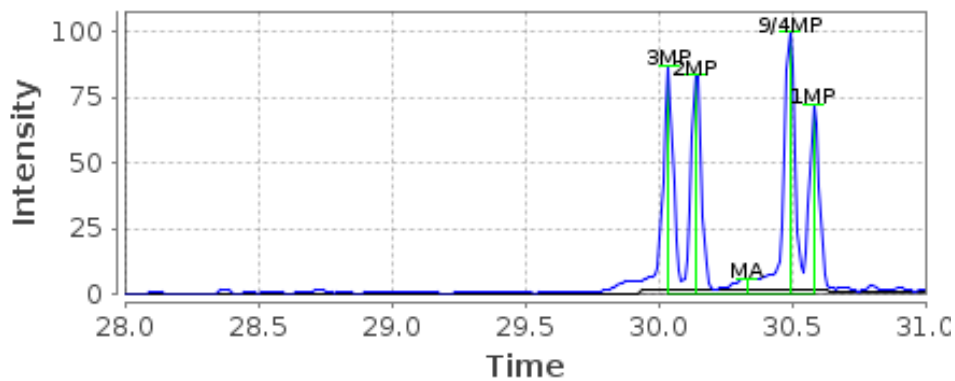
M/Z 231, No-1-18.125



M/Z 234, No-1-18.125

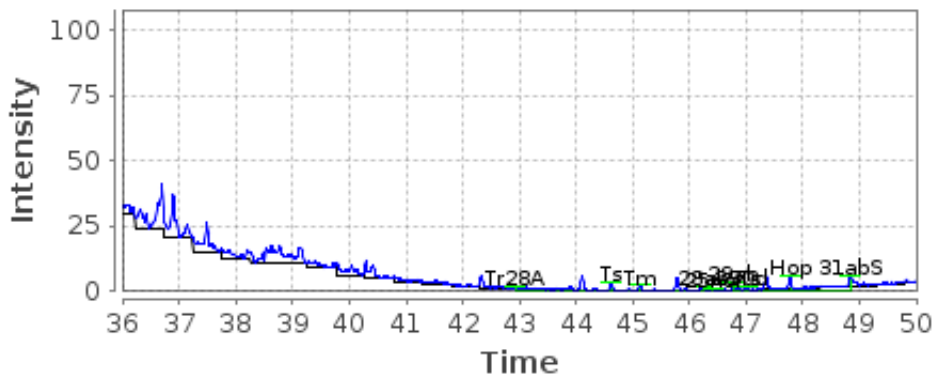


M/Z 192, No-1-18.125

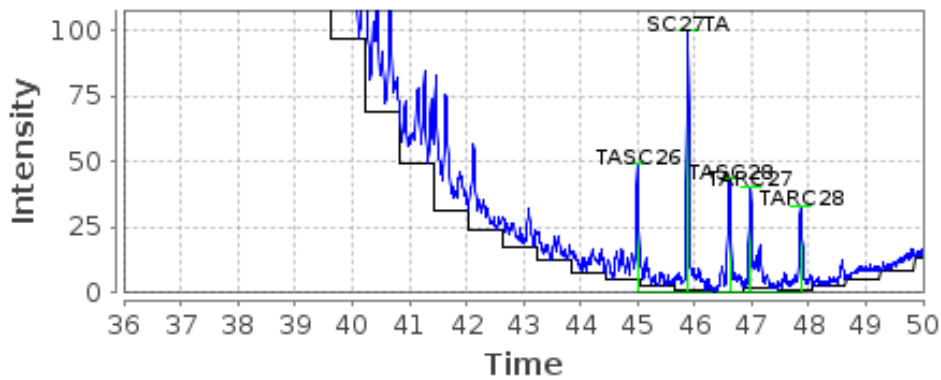


2014-0551 T-03

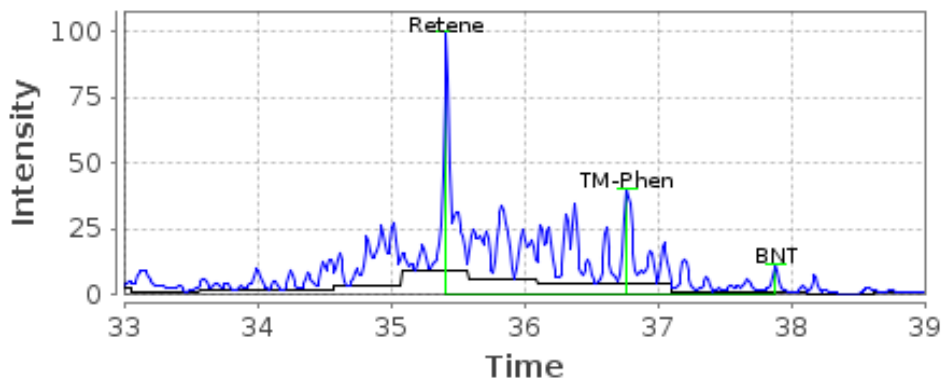
M/Z 191, No-1-18.147



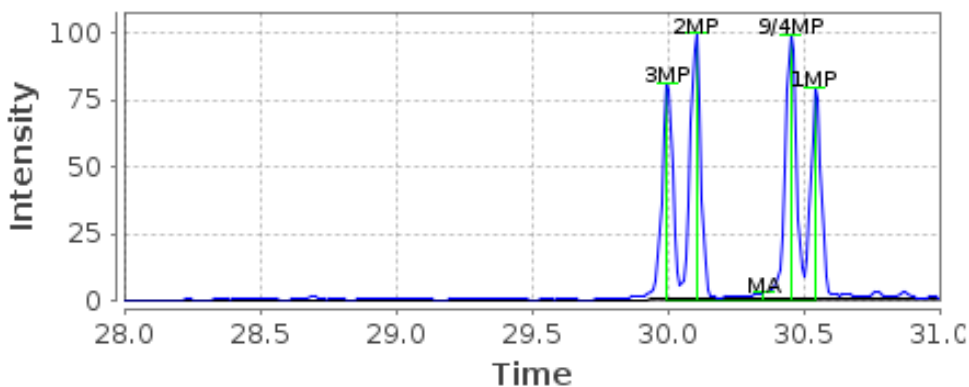
M/Z 231, No-1-18.147



M/Z 234, No-1-18.147

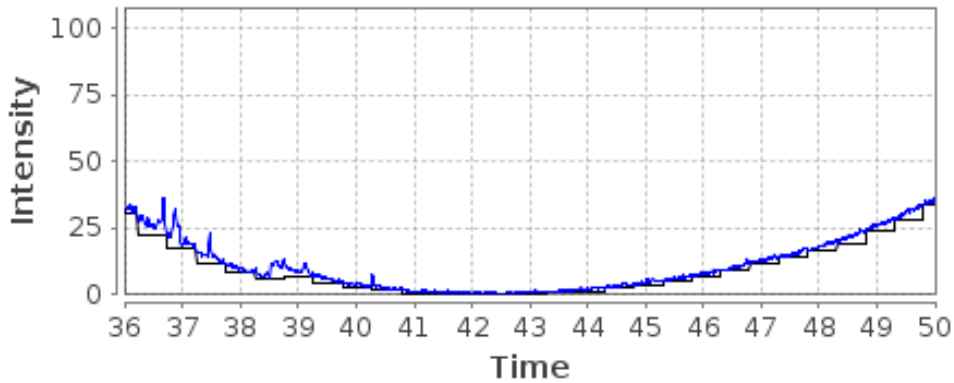


M/Z 192, No-1-18.147

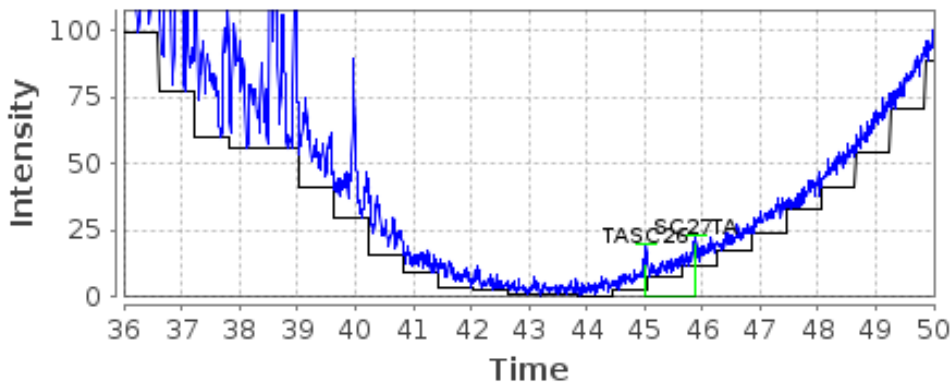


2014-0552 T-32

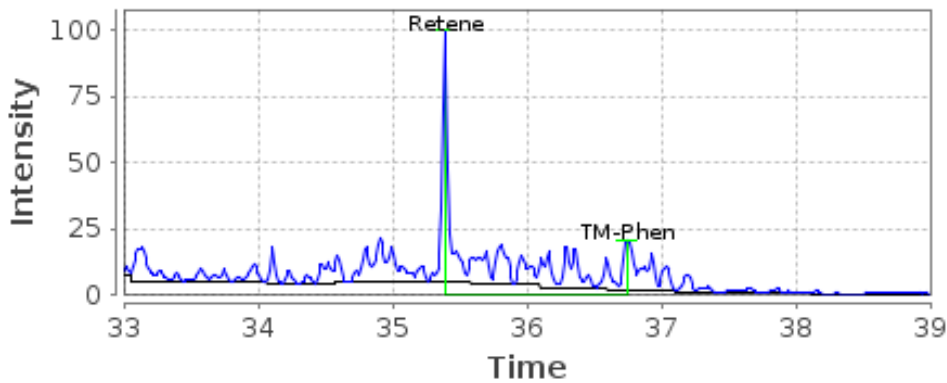
M/Z 191, No-1-18.148



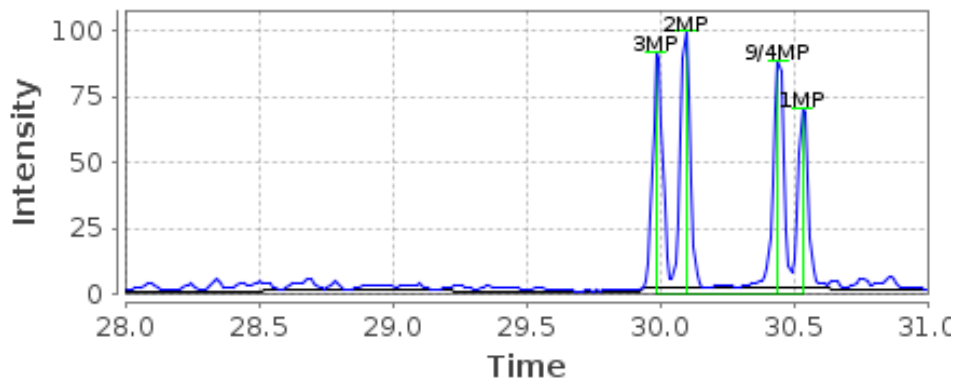
M/Z 231, No-1-18.148



M/Z 234, No-1-18.148

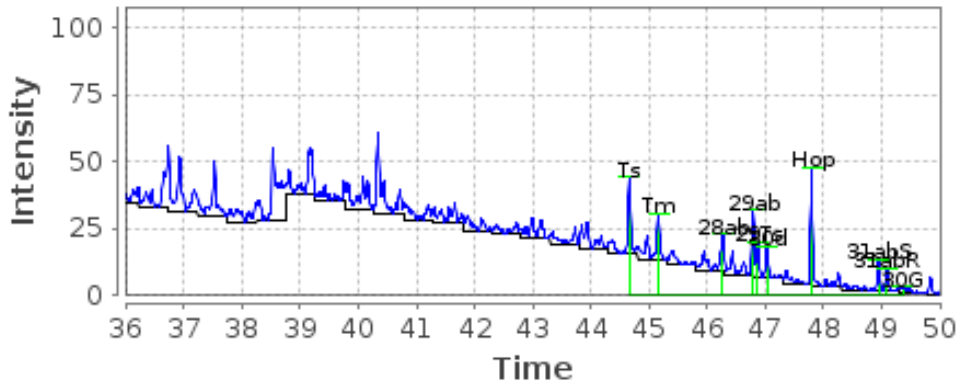


M/Z 192, No-1-18.148

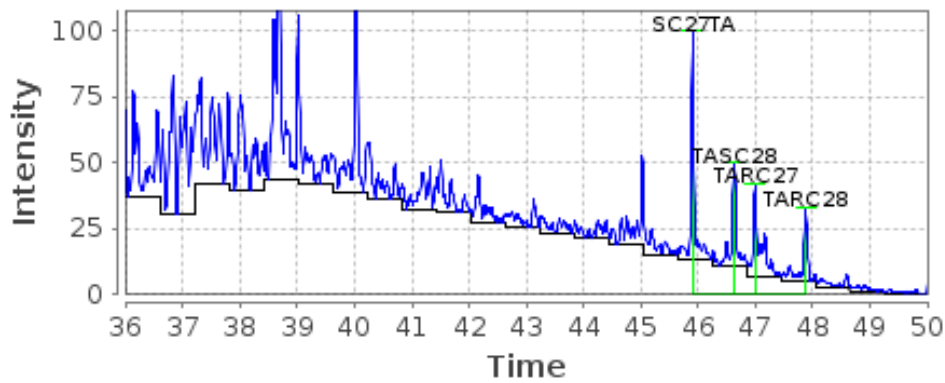


2014-0553 WRG

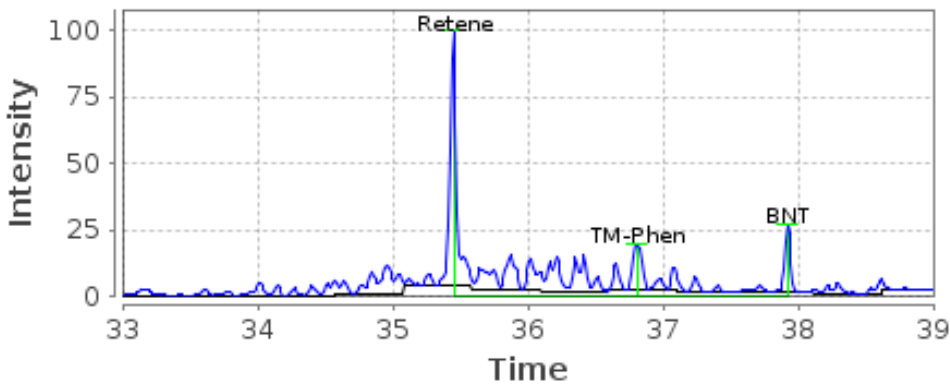
M/Z 191, No-1-18.149



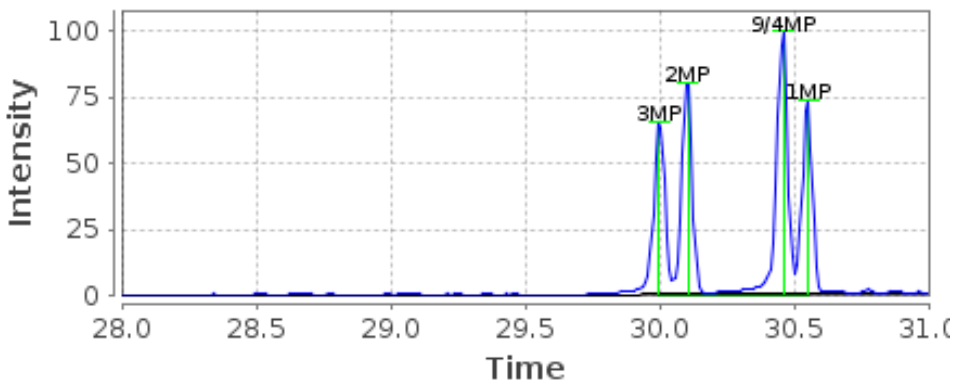
M/Z 231, No-1-18.149



M/Z 234, No-1-18.149

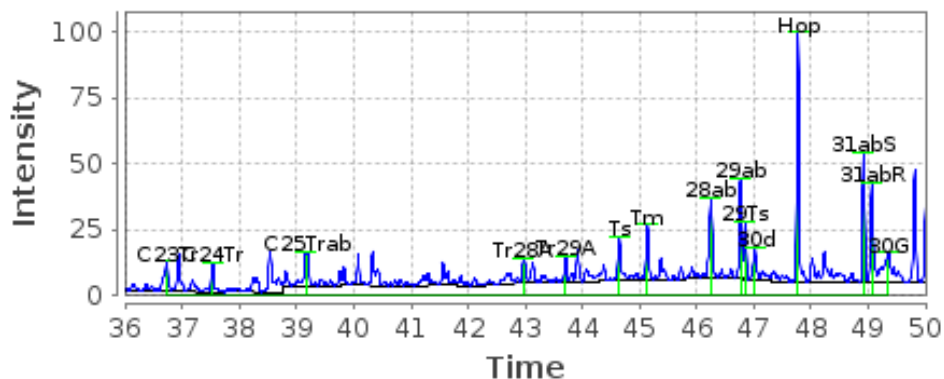


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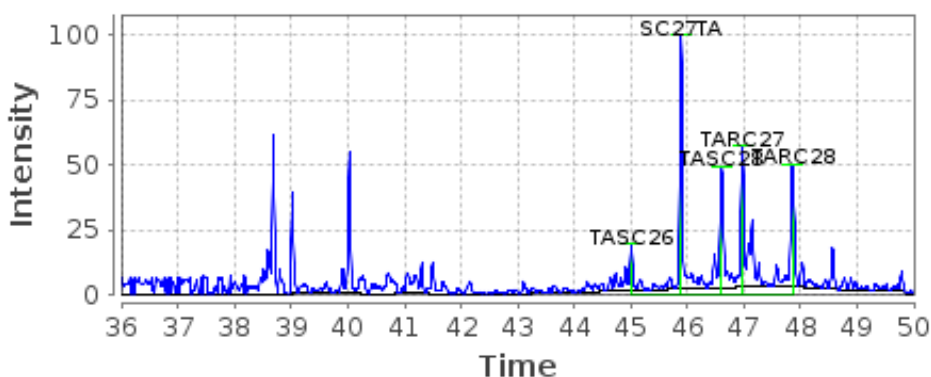


2017-0336 Brynhild

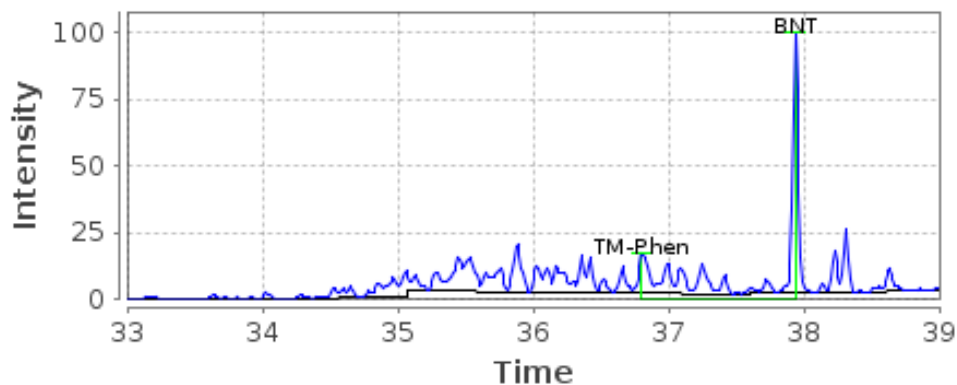
M/Z 191, No-1-18.126



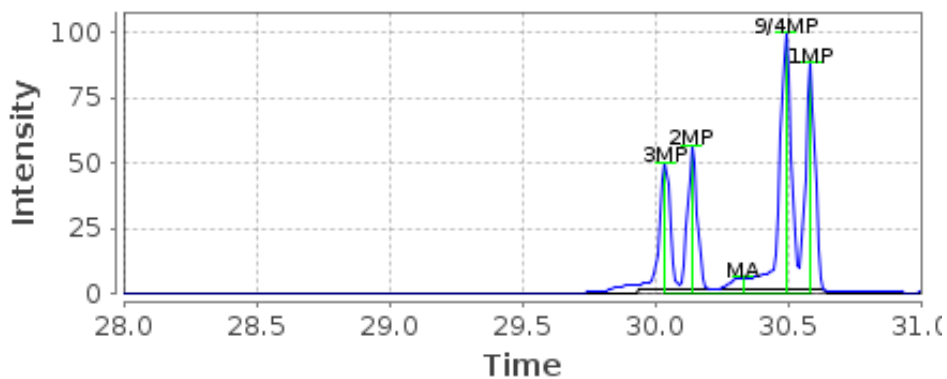
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M/Z 234, No-1-18.126

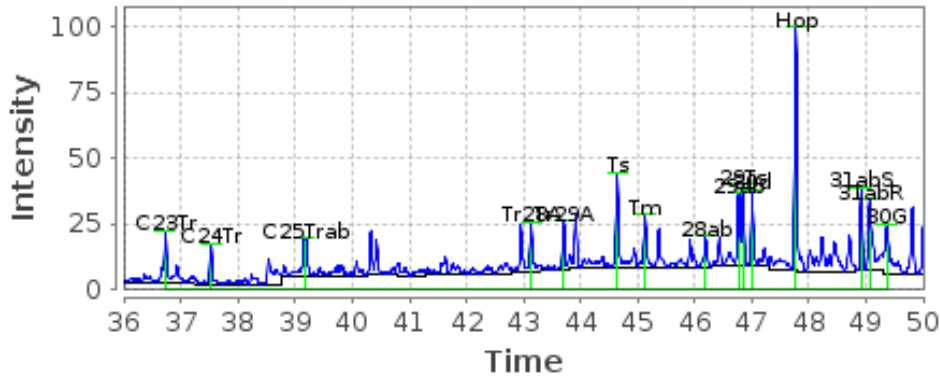


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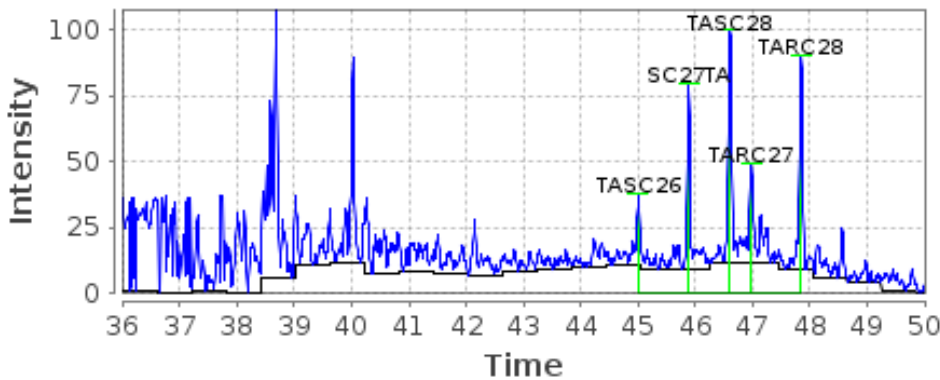


2015-0029 Alta

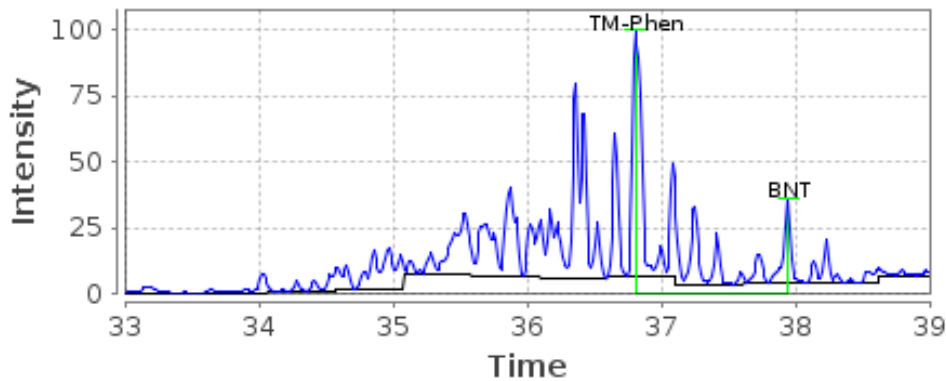
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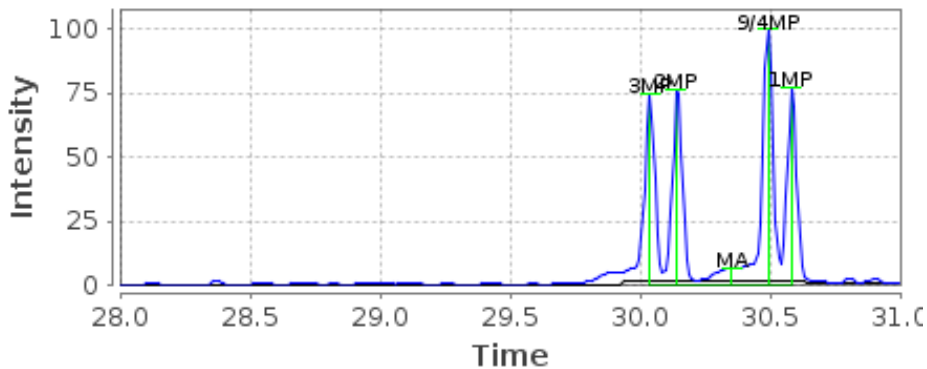
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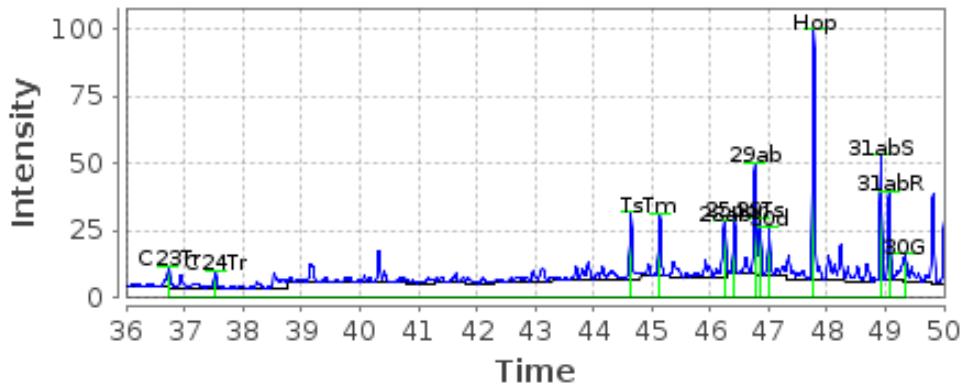
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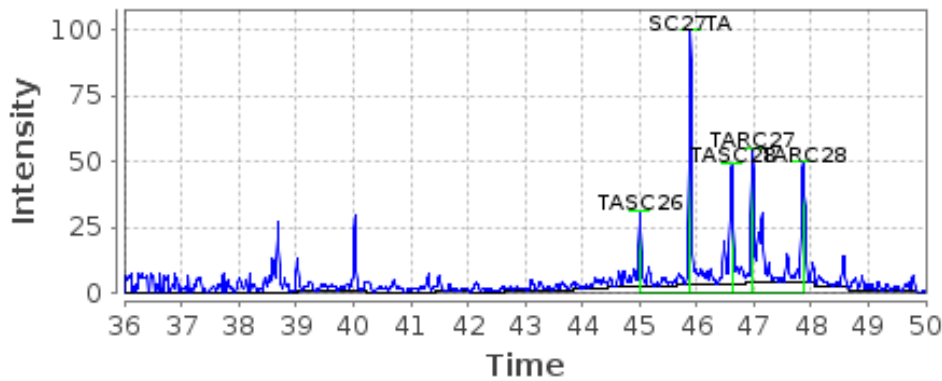
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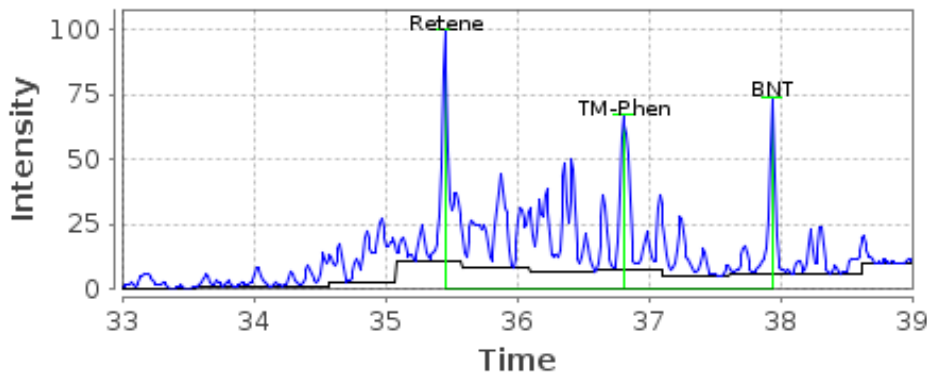
2015-0061 Grane
M/Z 191, No-1-18.129



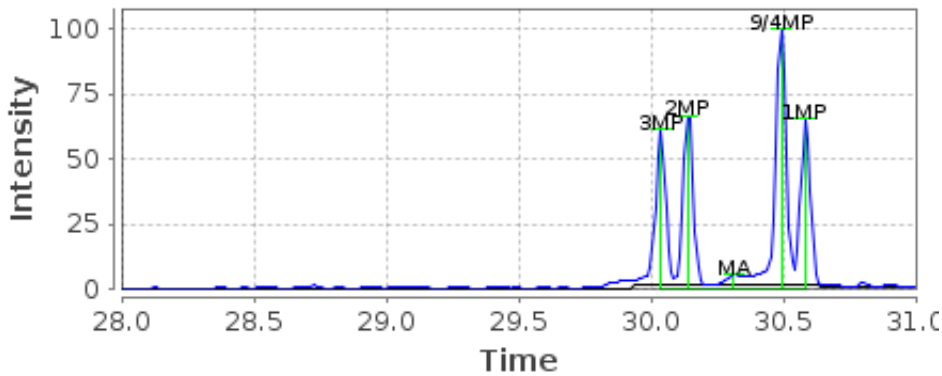
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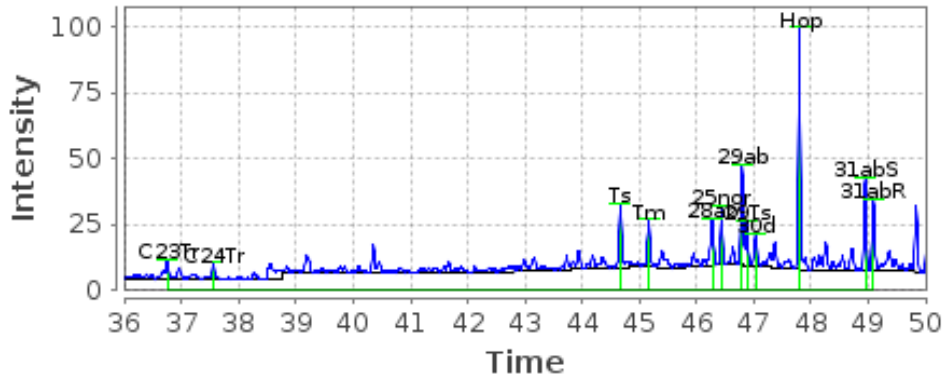


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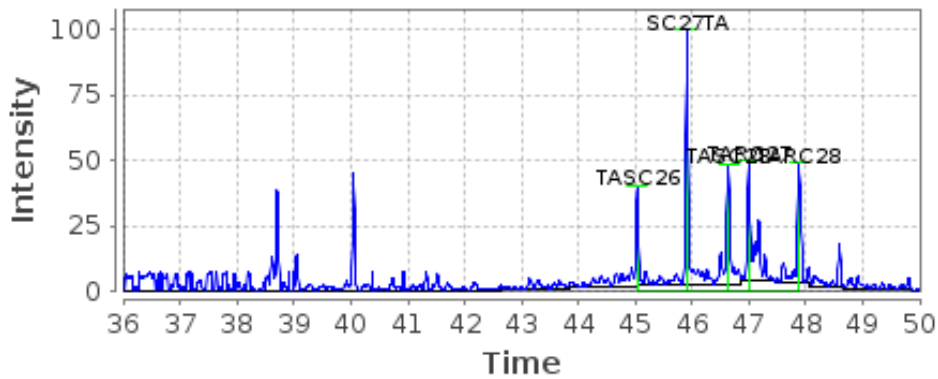


2015-0063 Bøyla

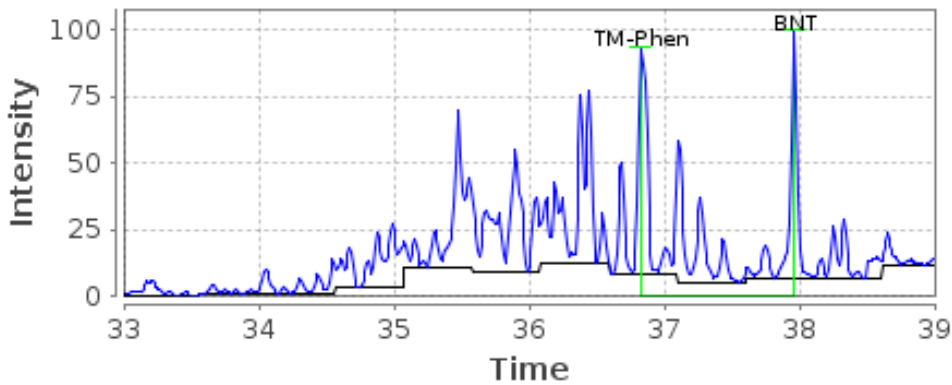
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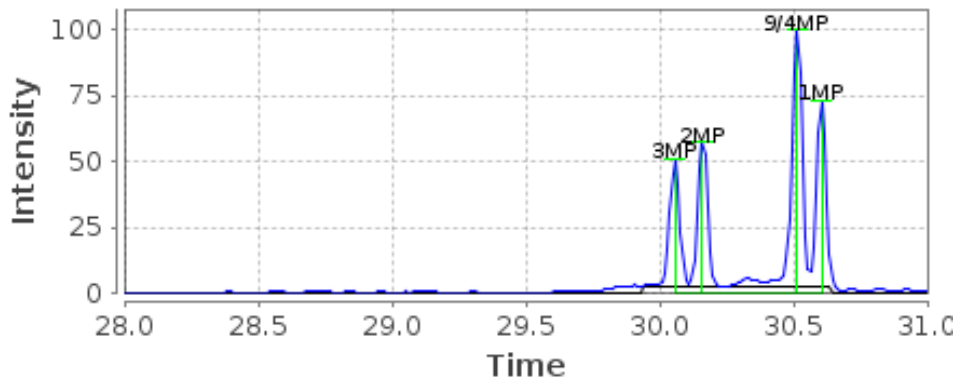
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M/Z 234, No-1-18.130

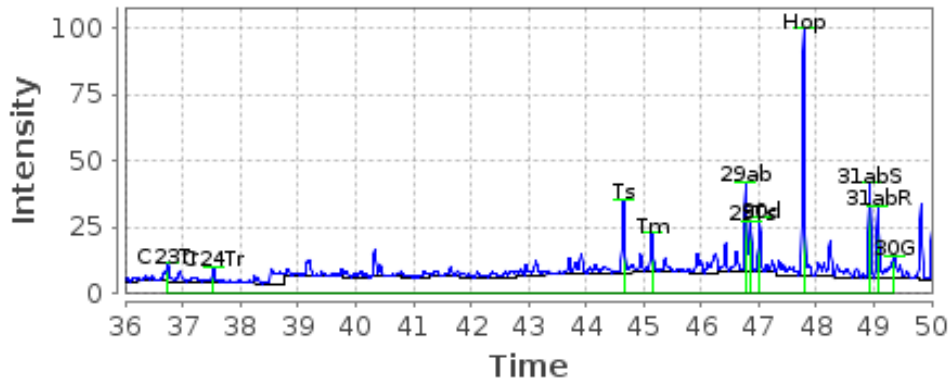


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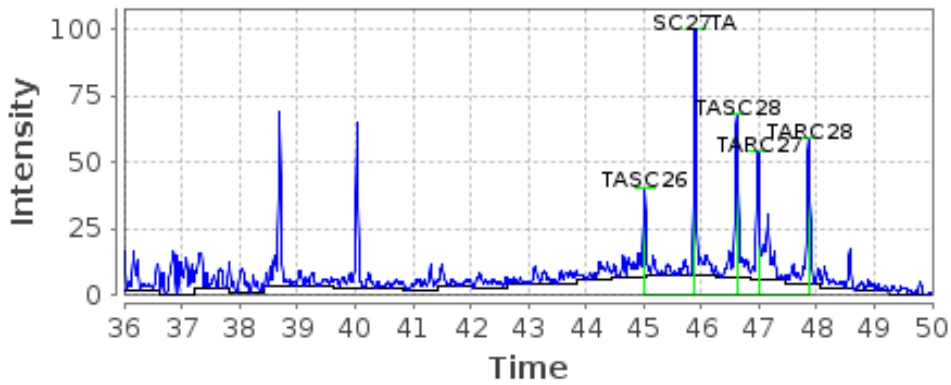


2015-0546 Martin Linge

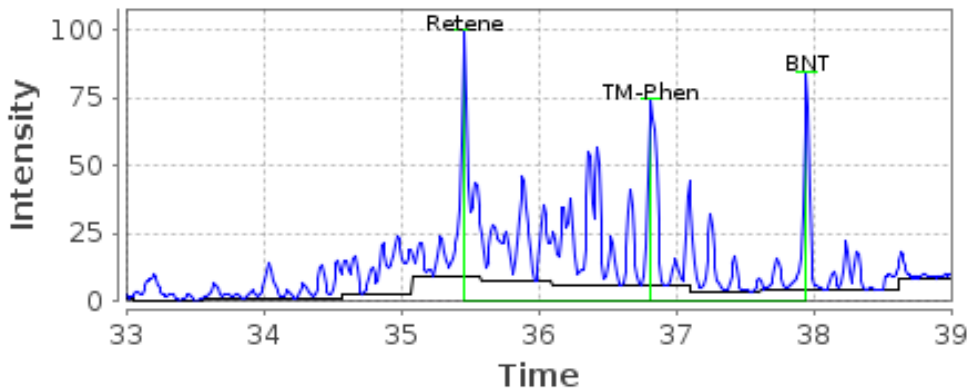
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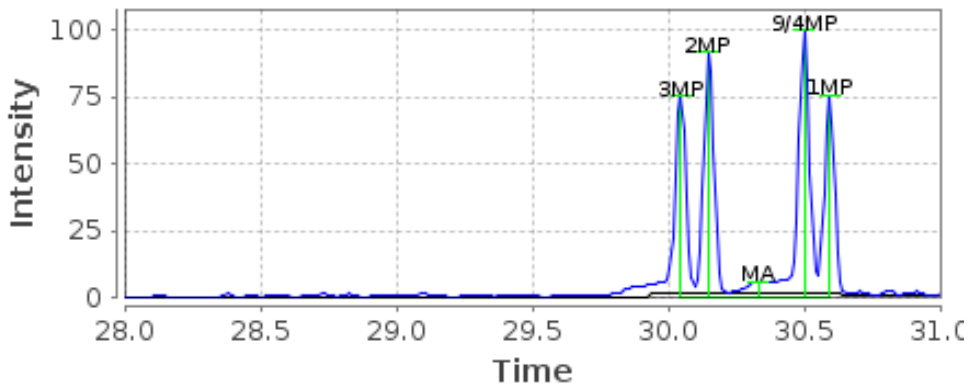
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M/Z 234, No-1-18.131

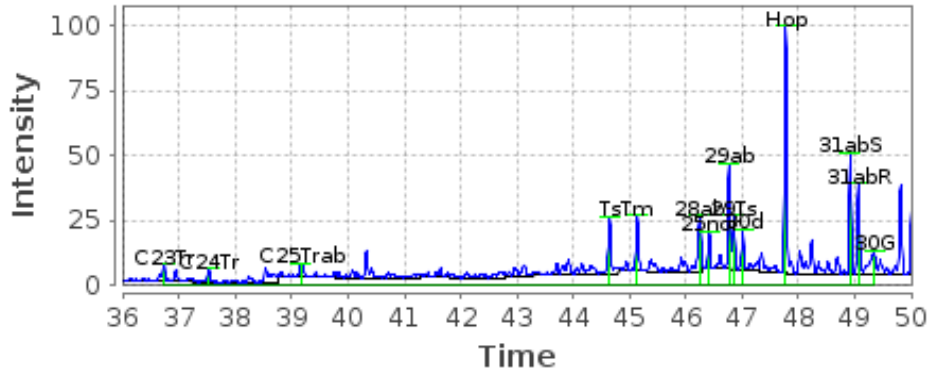


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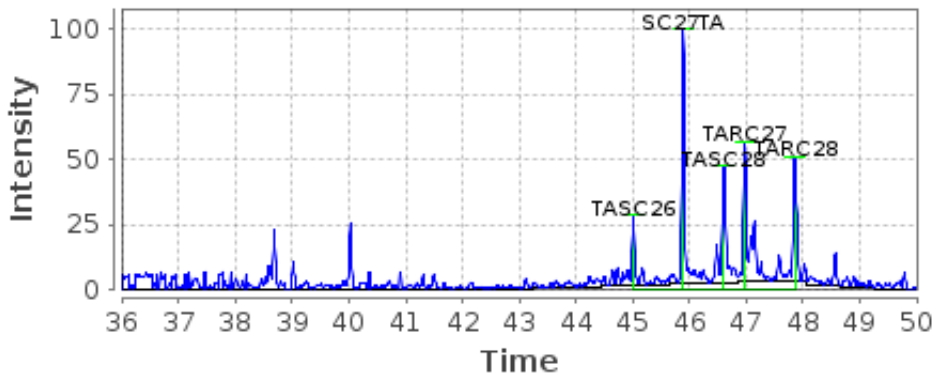


MC-2016-84-S2-S5-S1 Grane Blend

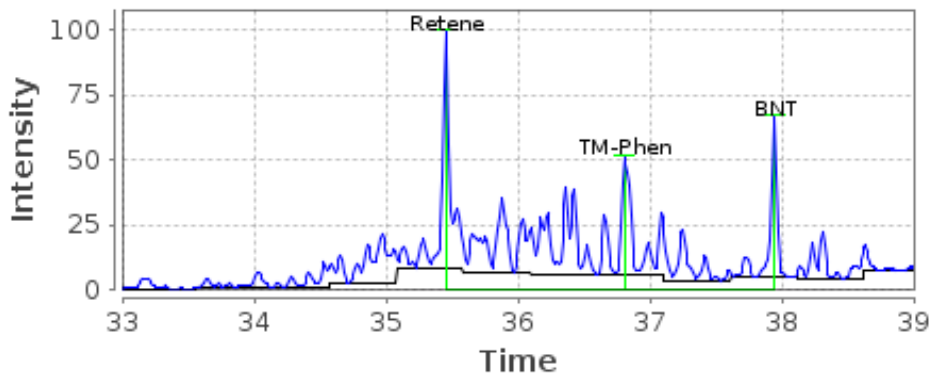
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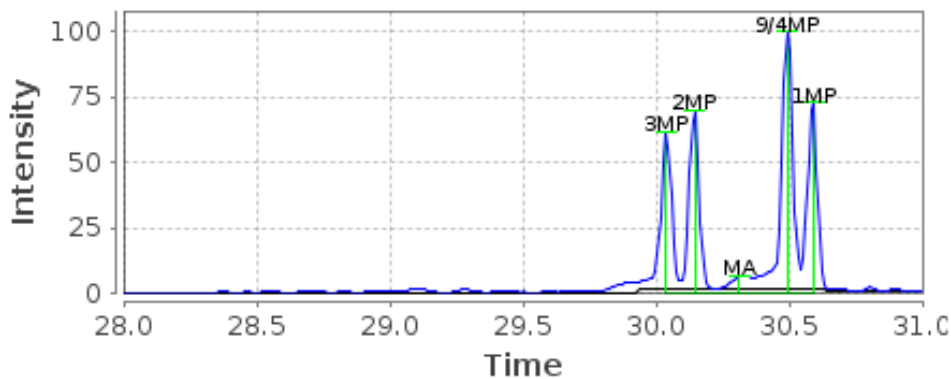
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M/Z 234, No-1-18.132

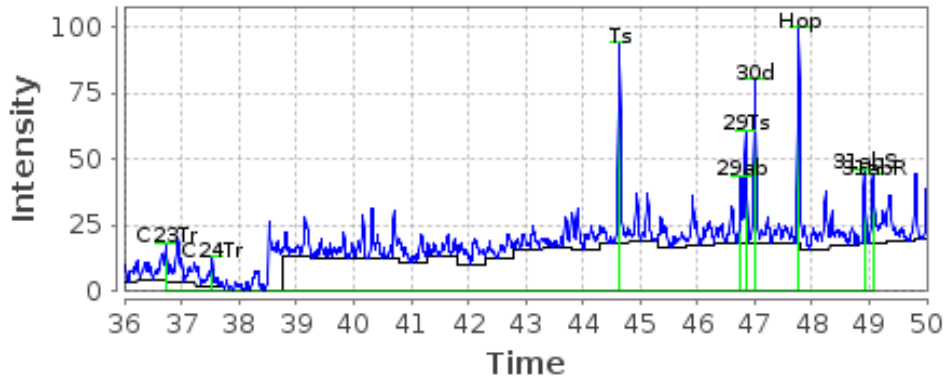


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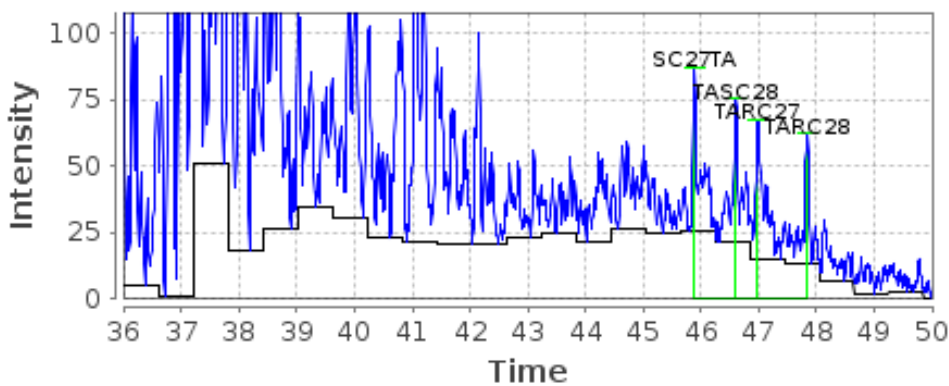


MC-2016-194 Martin Linge kondensat

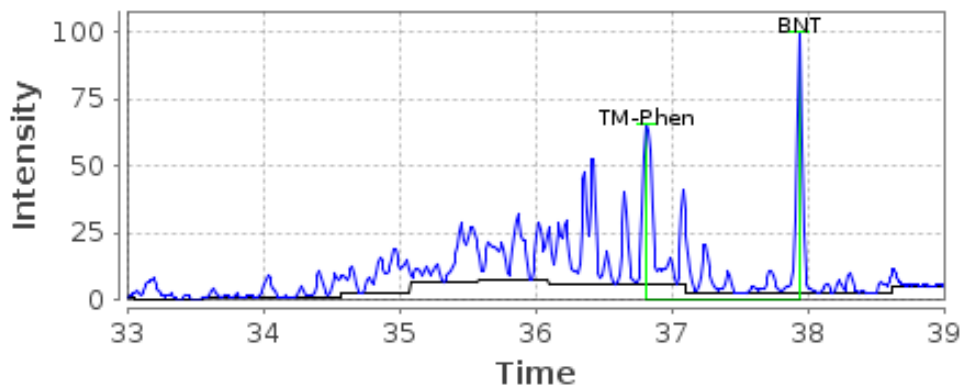
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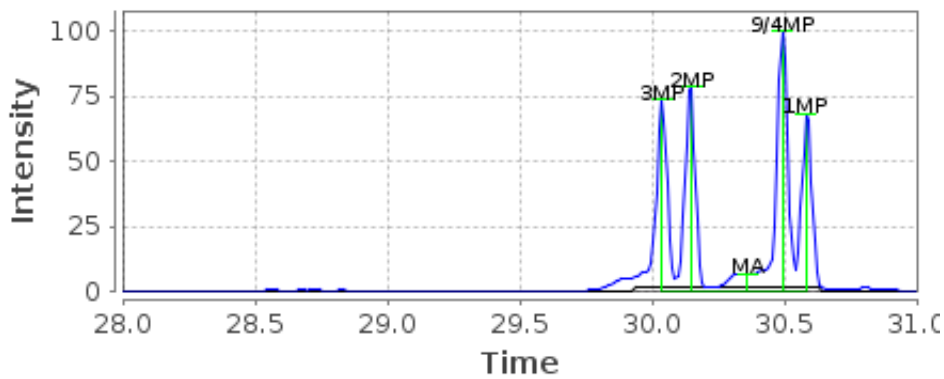
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M/Z 234, No-1-18.133

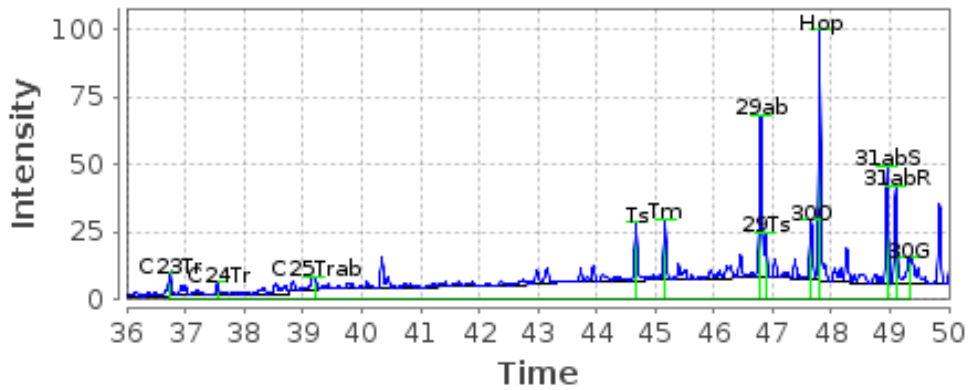


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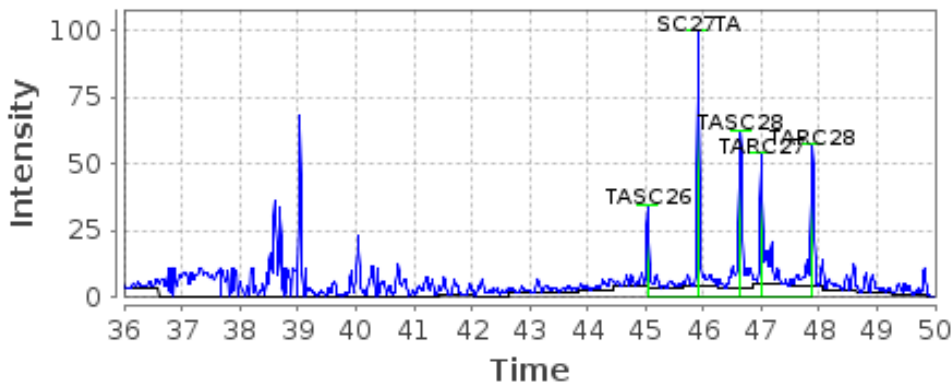


MC-2016-0231 HDME

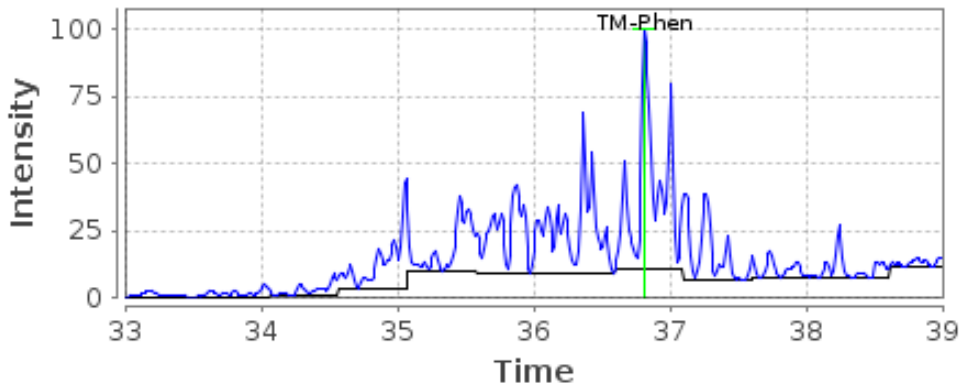
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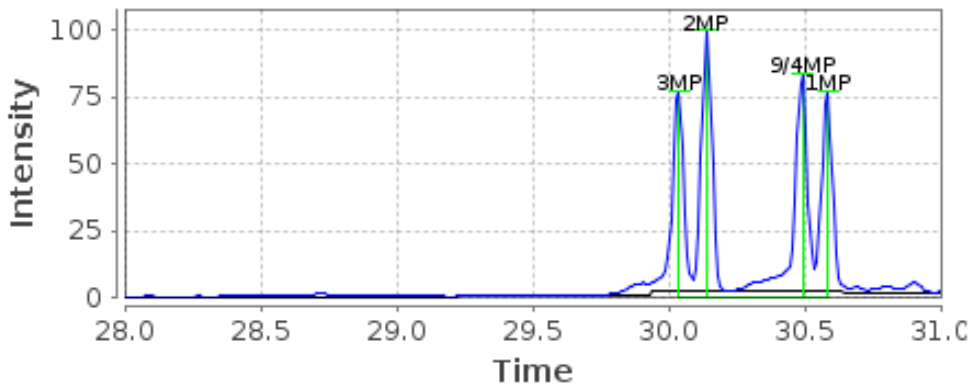
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M/Z 234, No-1-18.134

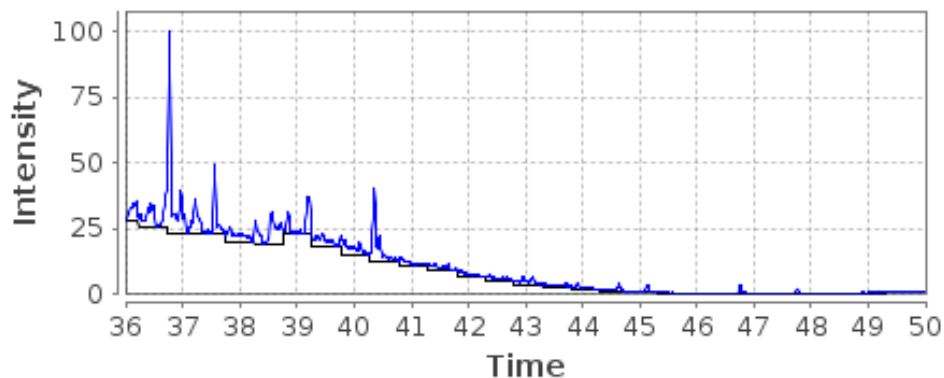


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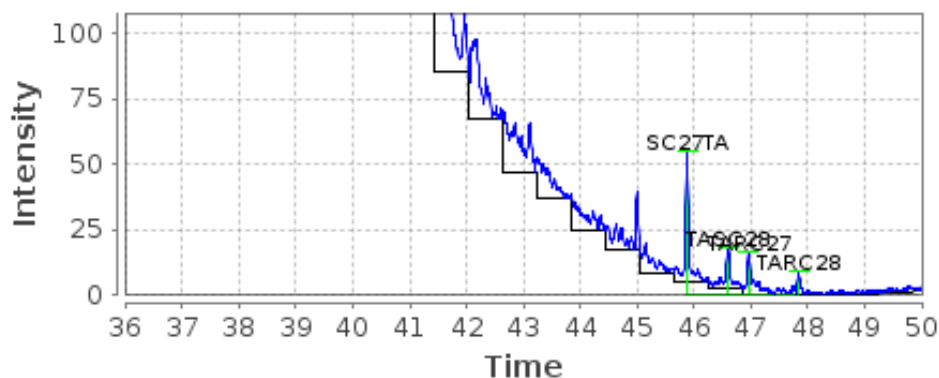


MC-2016-0232 DMA

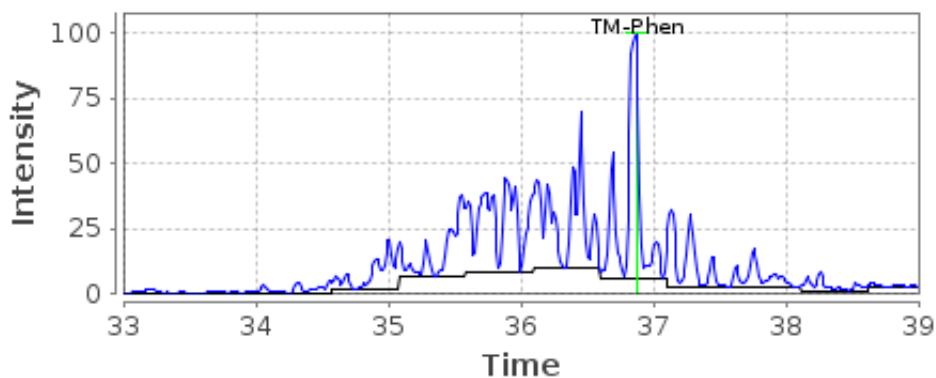
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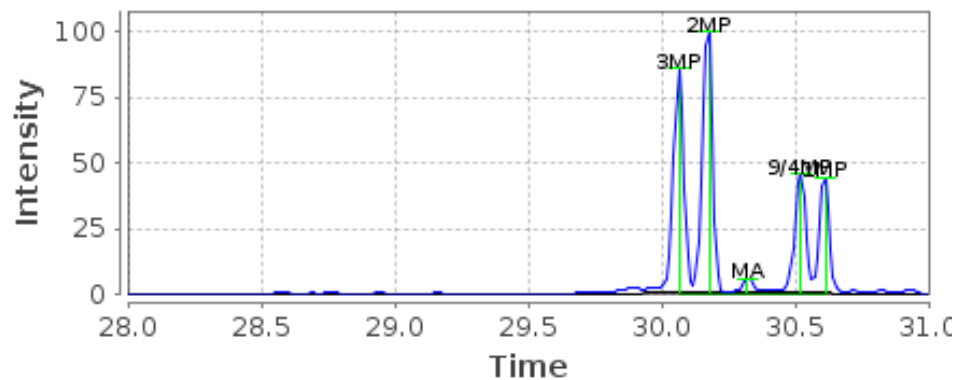
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M/Z 234, No-1-18.135

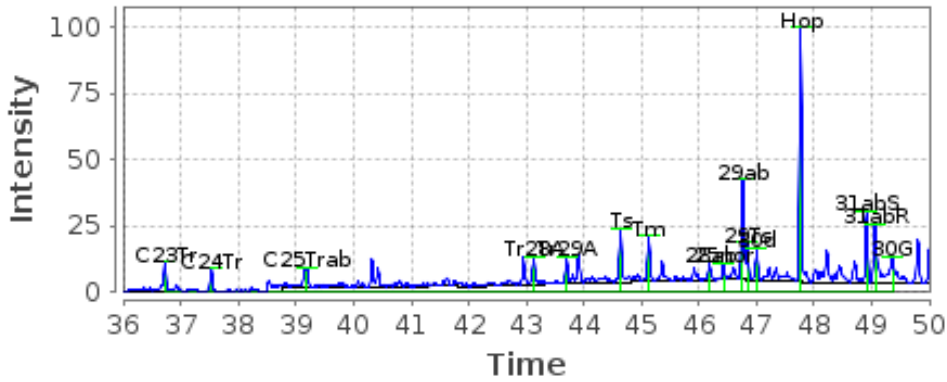


M/Z 192, No-1-18.135

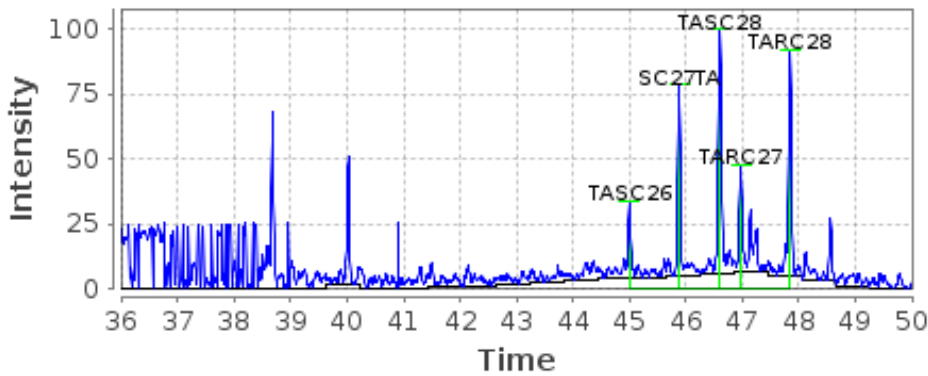


MC-2016-320-S1-S2 Wisting

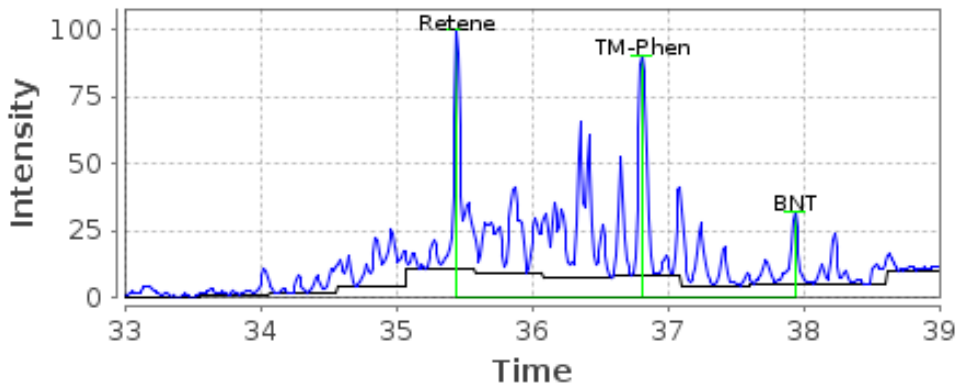
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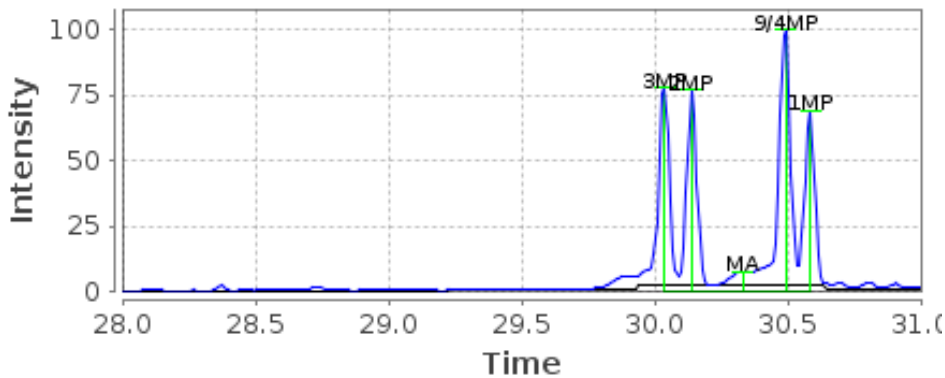
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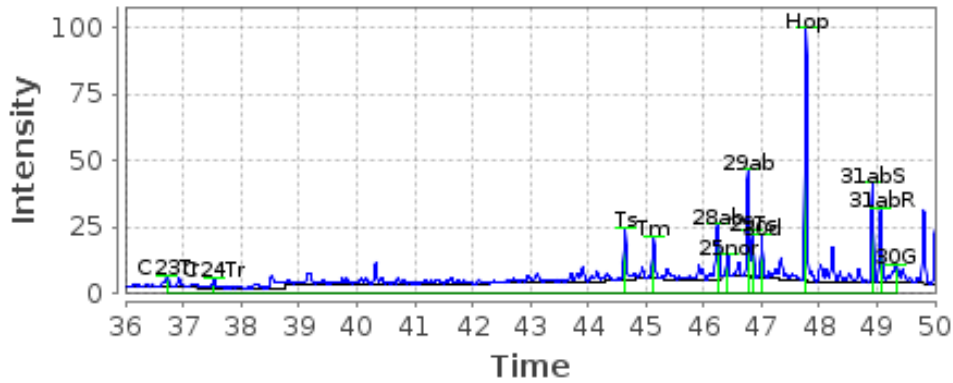


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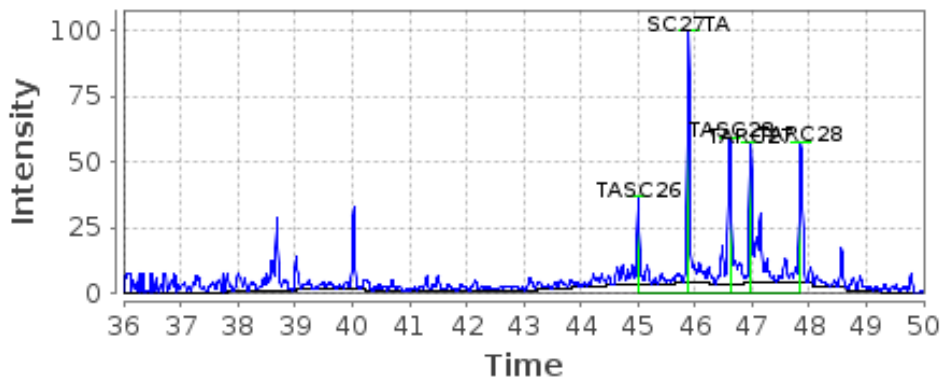


MC-2016-360 Troll

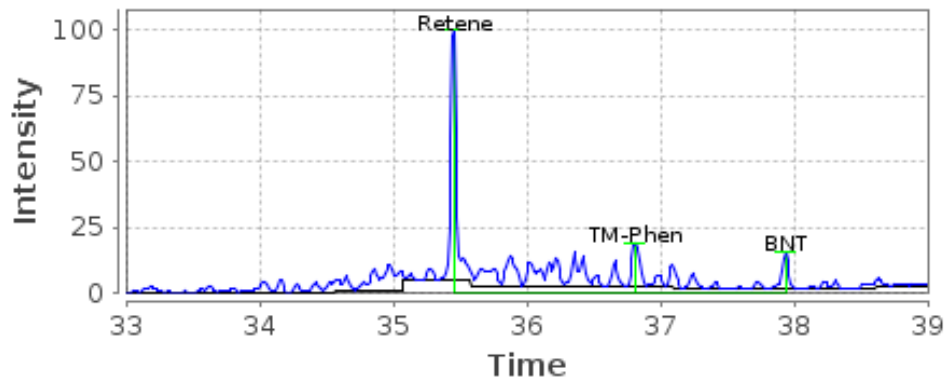
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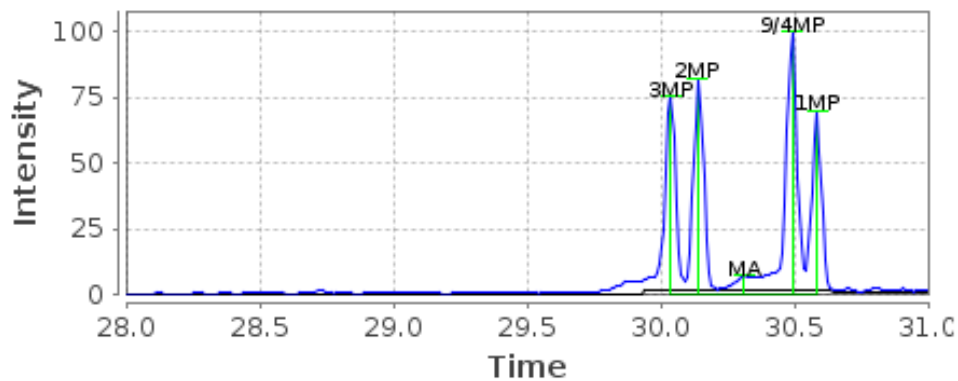
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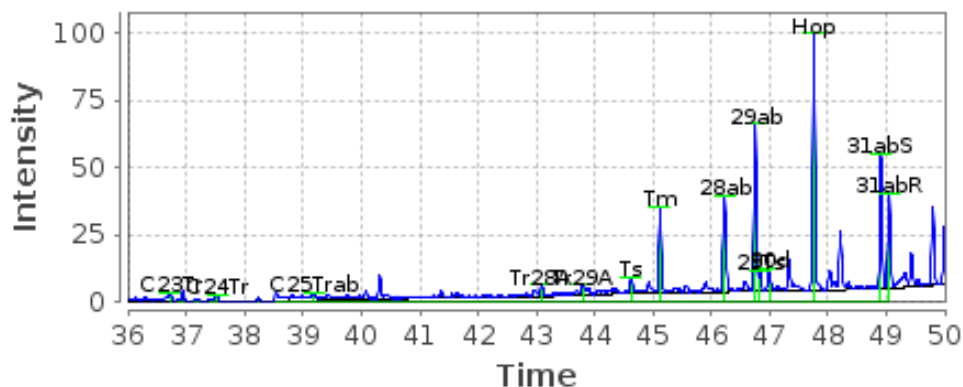


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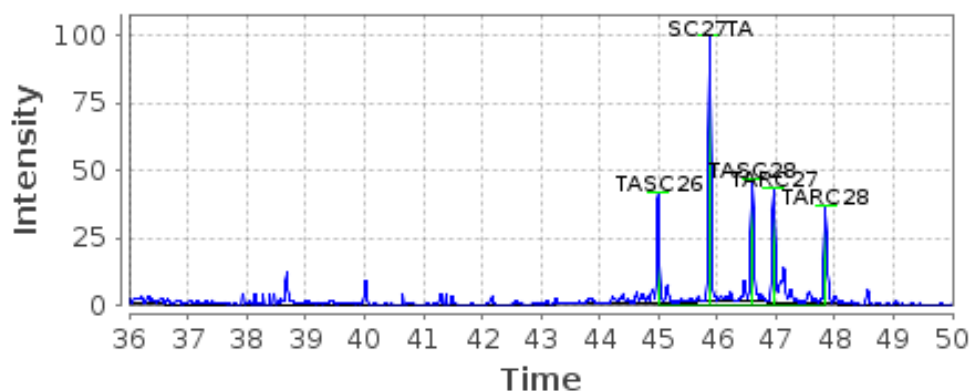


2017-113-C1 Sigyn

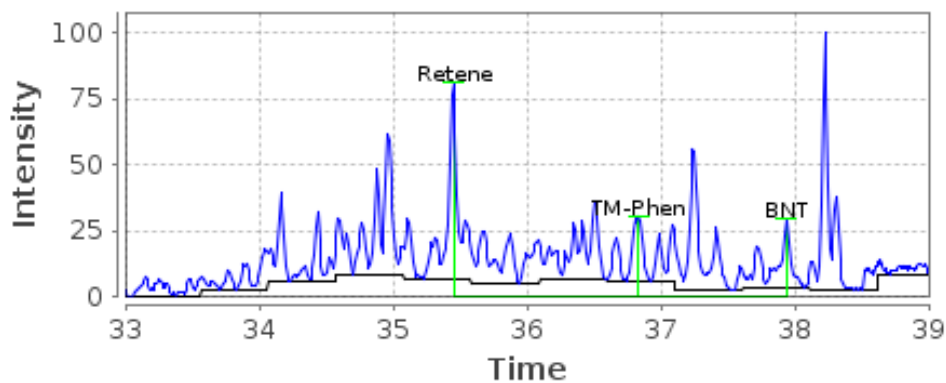
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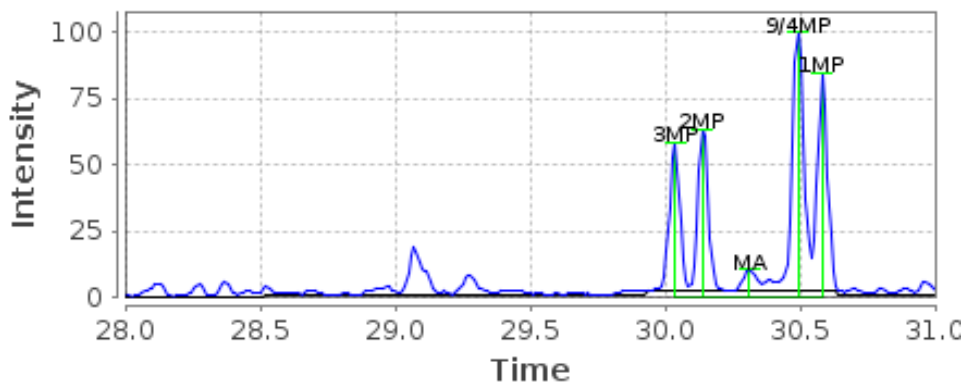
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M/Z 234, No-1-18.139

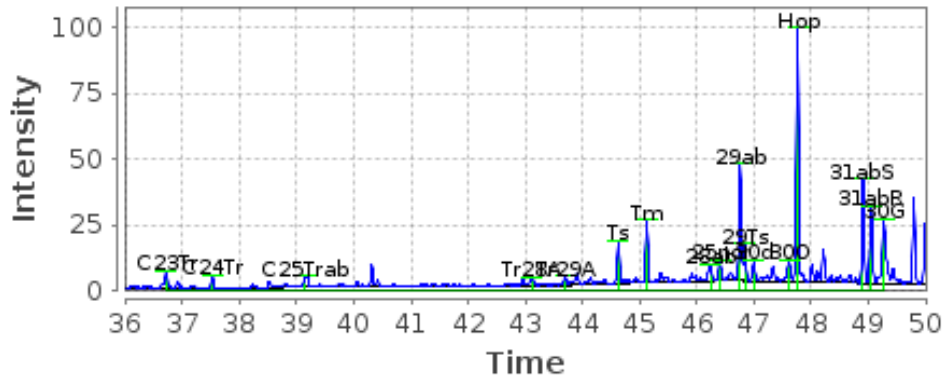


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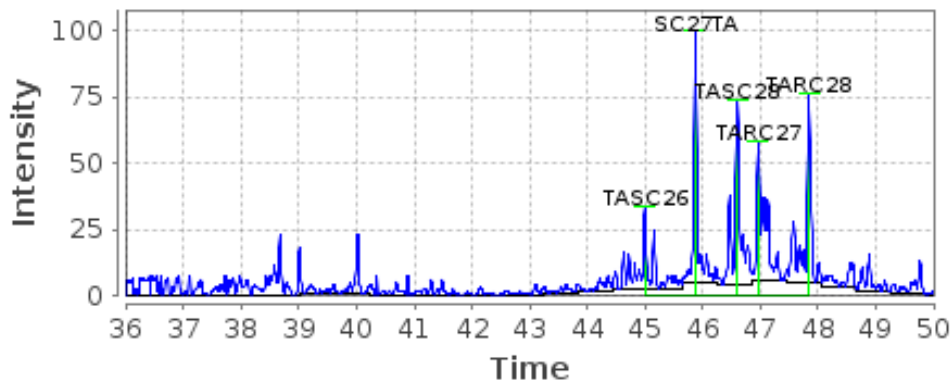


2005-0439 SINTEF-MIX gml

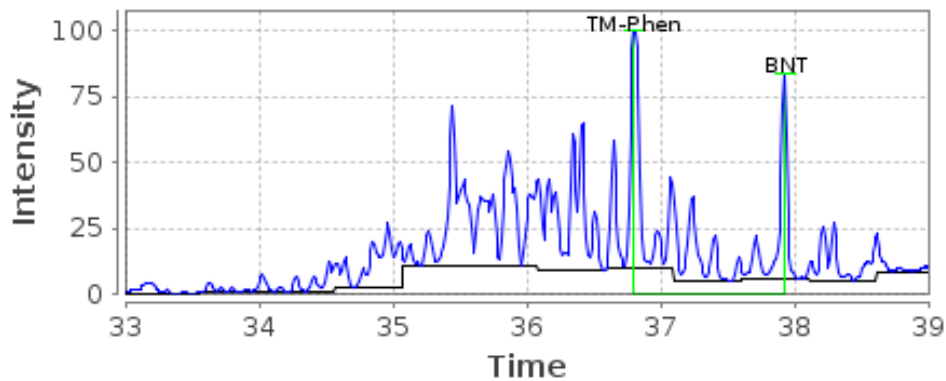
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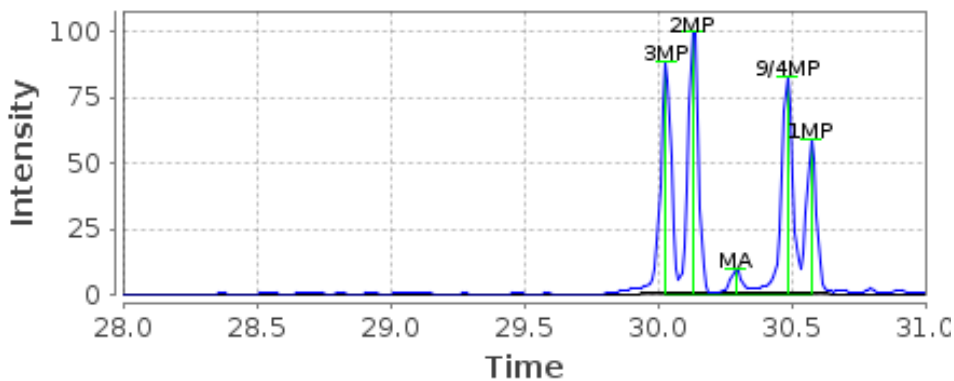
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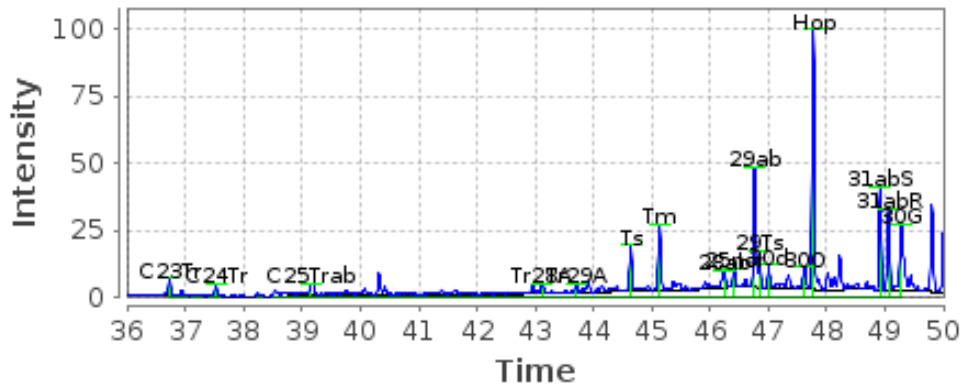
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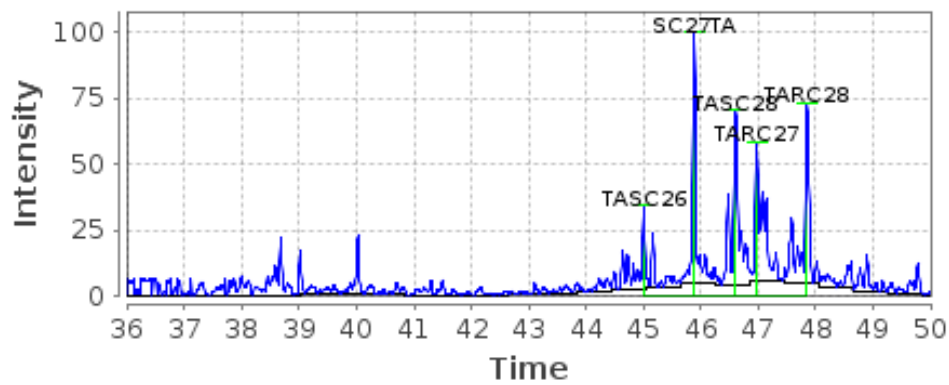
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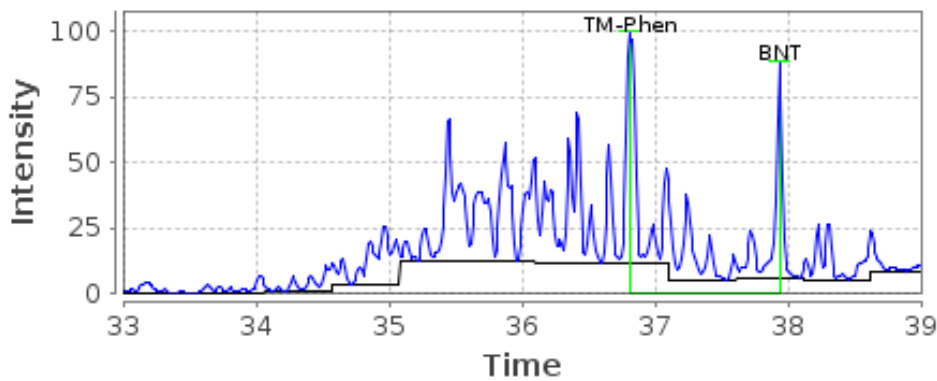
SINTEF-MIX 2017
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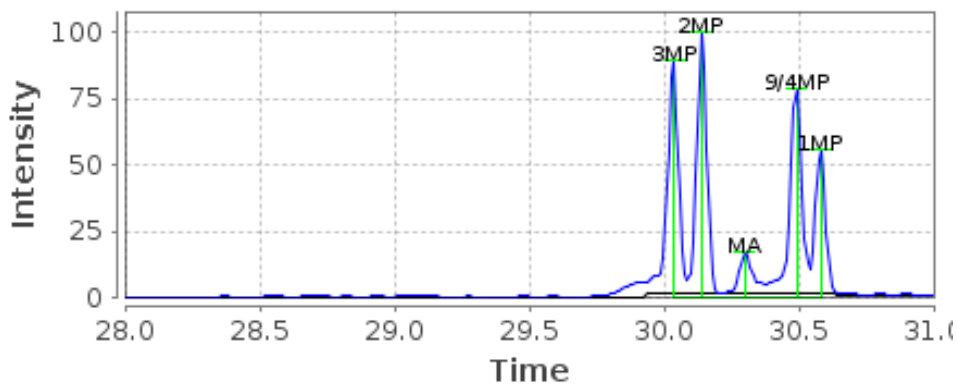
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M/Z 234, No-1-18.145



M/Z 192, No-1-18.145



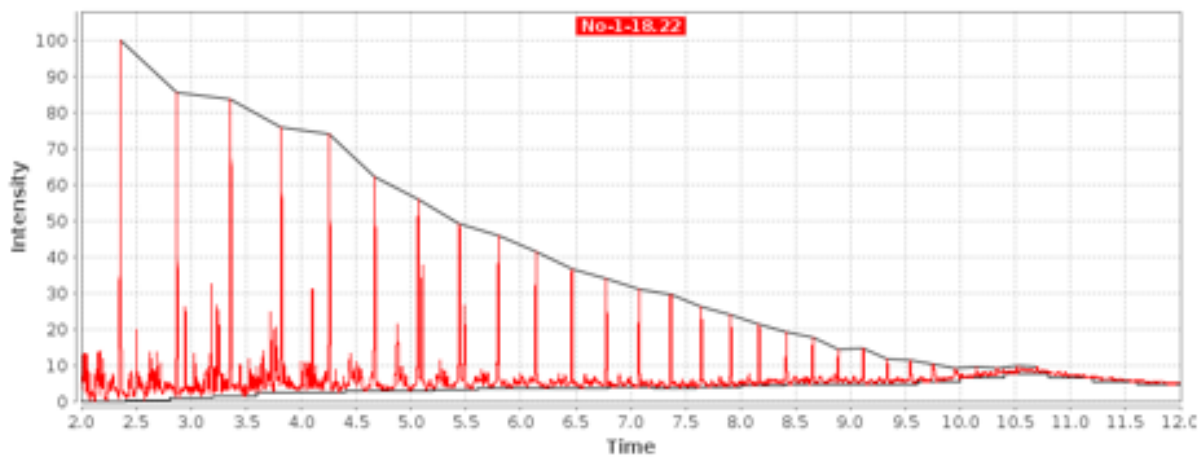
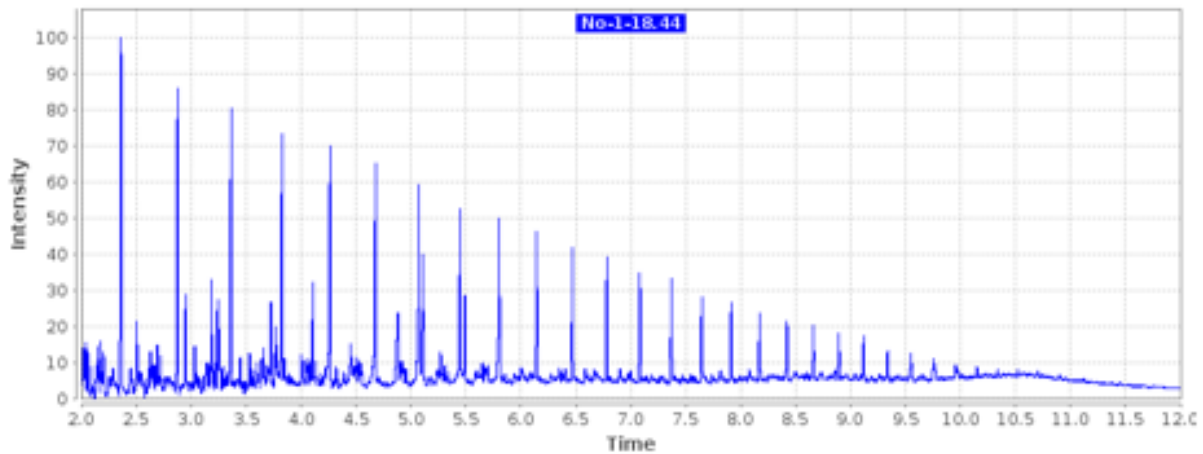
D Vedlegg D: COSIWEB rapport av Vigdis vs Statfjord*COSI (Computerized Oil Spill Identification) Report*

Comparison of

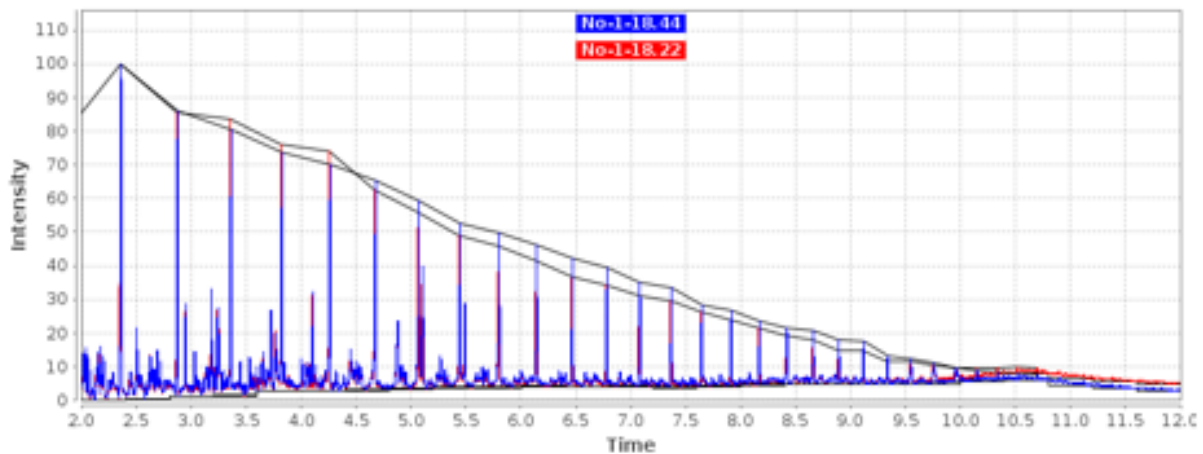
	No-1-18.44	Vigdis crude oil
with	No-1-18.22	Statfjord crude oil, Duplicate_1

GC analysis

GC-FID



GC-FID, overlays

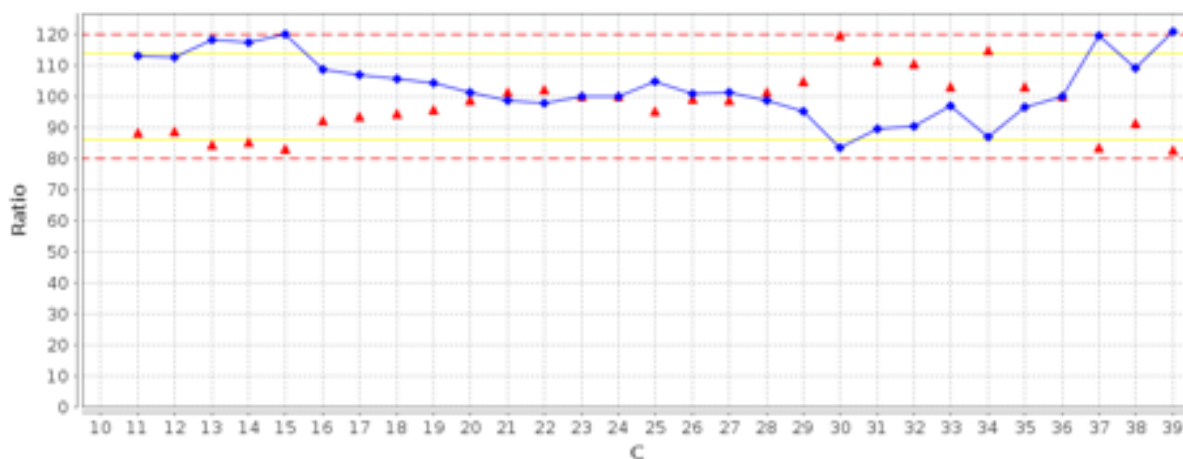


Isoprenoid ratios



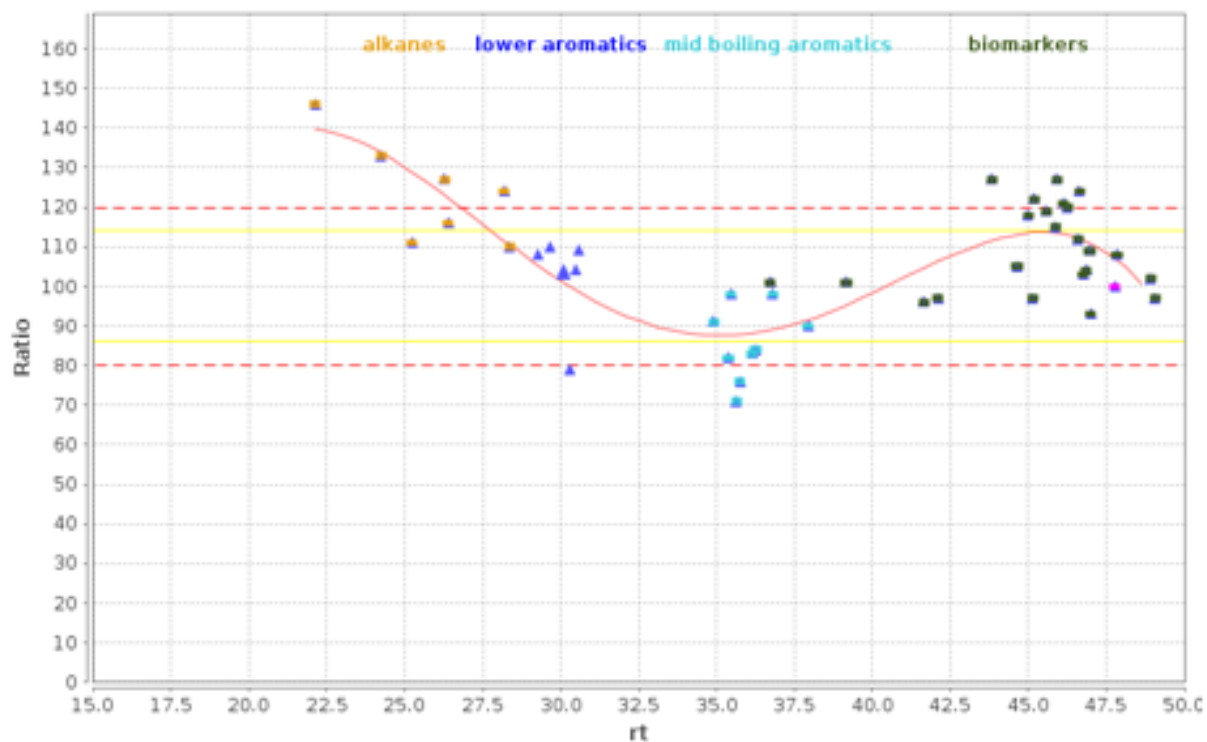
ratio	No-1-18.44	No-1-18.22	%diff	flag
C17/Pr	1.53	1.52	0.13	
C18/Ph	1.97	1.98	0.39	
Pr/Ph	1.47	1.50	1.12	

GC-PW-plot



GC/MS analysis

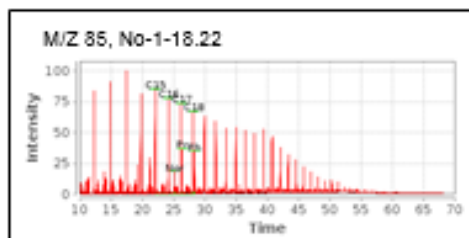
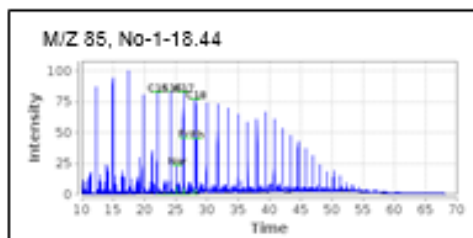
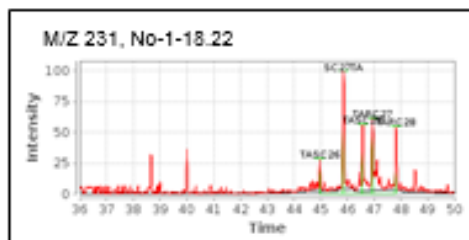
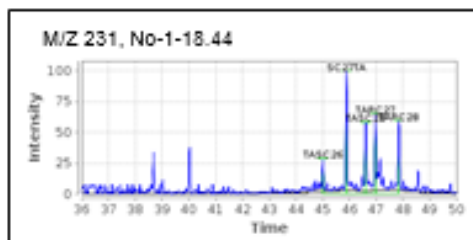
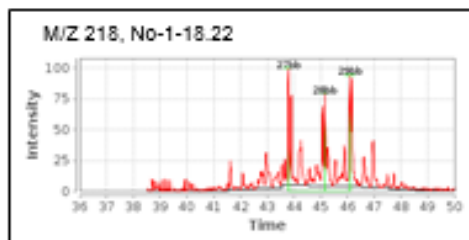
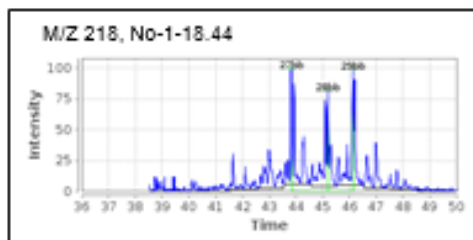
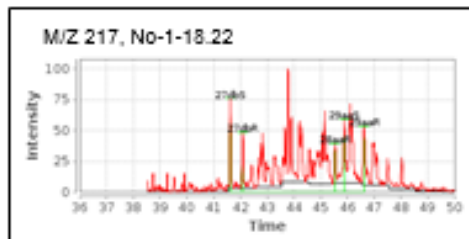
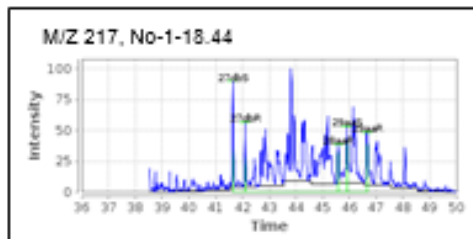
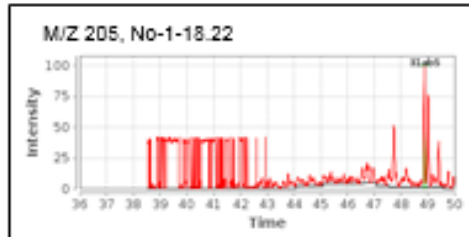
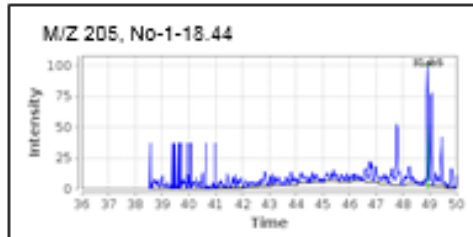
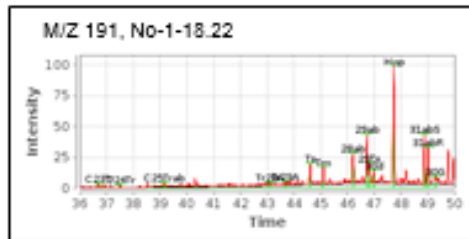
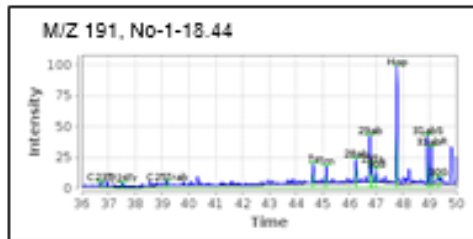
MS-PW-plot

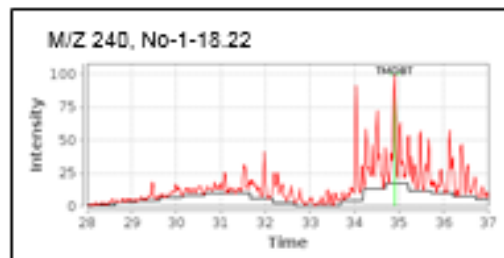
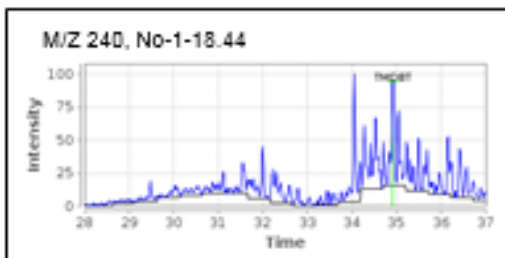
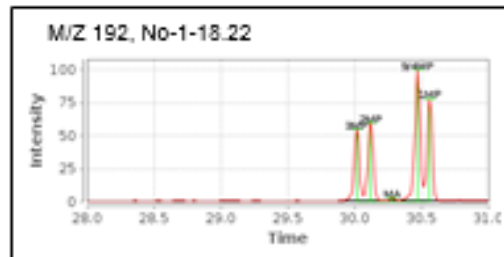
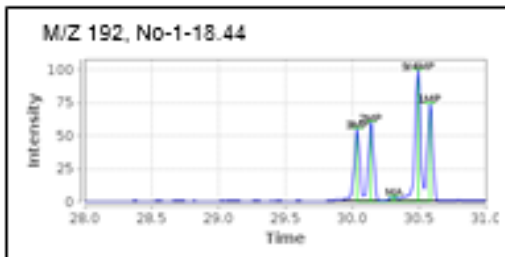
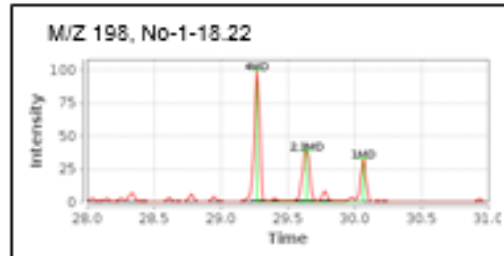
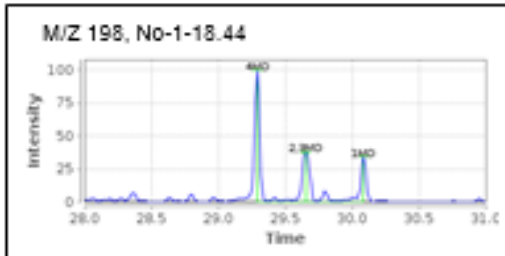
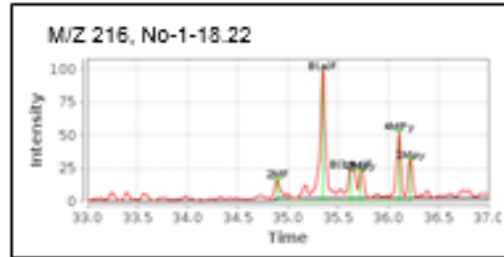
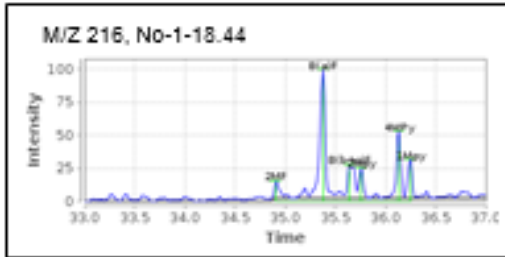
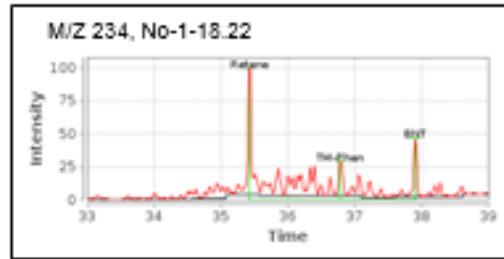
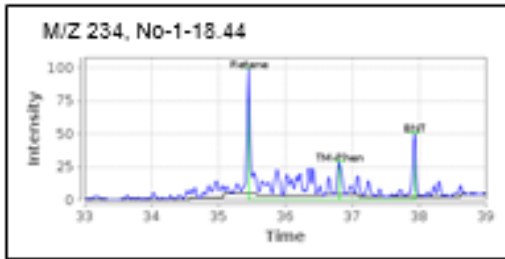


Diagnostic ratios

ratio	No-1-18.44	No-1-18.22	%diff	flag
<u>Is</u>	0.17	0.18	2.89	
Tm	0.15	0.15	1.47	
28ab	0.21	0.26	9.23	1
29ab	0.40	0.42	1.95	
30O	0.00	0.00	0.00	
31abS	0.42	0.42	1.04	
30G	0.07	0.06	0.88	
27dbR	0.61	0.62	0.50	
27bb	1.00	1.05	2.49	
TASC26	0.28	0.28	1.03	
TASC28	0.58	0.56	1.69	
TARC27	0.64	0.61	2.60	
TARC28	0.59	0.55	3.47	
C17/ <u>Pr</u>	1.82	2.01	4.81	
C18/ <u>Ph</u>	1.72	1.94	5.98	
<u>Pr/Ph</u>	1.01	1.07	2.61	
2MP	0.60	0.60	0.52	
MA	0.03	0.03	13.54	1
4MD	2.91	3.01	1.69	
2MF	0.27	0.30	4.73	
B(a)F	1.92	1.91	0.34	
B(<u>b+c</u>)F	0.51	0.44	7.52	1
2MPy	0.46	0.42	4.13	
1MPy	0.58	0.59	0.81	
<u>Retene</u>	3.72	3.74	0.29	
BNT	1.90	1.75	4.29	

Mass chromatogram





Comment

Part A: Comparison of different samples

For the comparison of a duplicate injection of one of the samples, see part B

GC

Visual inspection, overlays

Oil type (tentative)?

Obvious differences?

Isoprenoid ratios, GC-PW plots

Significant differences?

MS

Visual inspection of the ion chromatograms (MS-tab)

Oil type?

Obvious differences?

Peaks measurements

Reasons for selecting/deselecting DRs and data points in the PW-plots

MS-PW plot -significant differences.

Diagnostic Ratios -significant differences?

Overall Result

Uniqueness of the samples relative to the other samples in the database.

Match conclusion (Match, Possible match, Inconclusive or Non-match)

Part B: Comparison of a duplicate injection of one of the samples For the comparison of different samples see part A

GC-FID

Visual inspection, overlays

Obvious differences?

Isoprenoid ratios, GC-PW plots obvious differences.

GC-MS (sim)

Differences of DRs below repeatability?

Differences of PW-plot points below repeatability?

Conclusion

E Vedlegg E: Protokoll/beslutningskart for oljesøidentifikasjon

Figuren er hentet fra CEN (2012).

CEN/TR 15522-2:2012 (E)



Figure 1 — Protocol/decision chart for oil spill identification