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Journal of Molecular Biomarkers & Diagnosis

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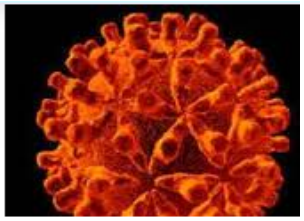

Major Research Interests

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Major Research Interests

1. Transcriptomics and Bioinfomatics;
2. Using multi-techiniques for noval biomarker development, and the application of traditional biomarker for tracing natural or anthropogenic organic matter source;
3. Using GC-ir-MS analysis to measure specific isotopes (mainly $^{13}C/^{12}C$ and $^{2}/^{1}H$) of biomarkers to trace source.

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1. Transcriptomics and Bioinfomatics

Putative TLR and TCR pathways of *L. japonicus* based on new 454 sequencing

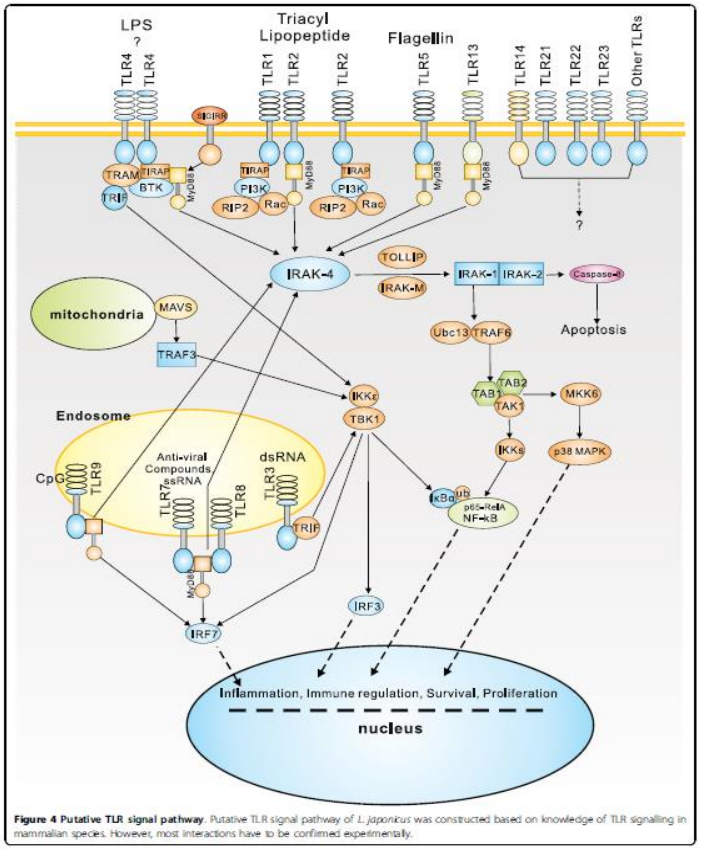

Figure 4 Putative TLR signal pathway. Putative TLR signal pathway of *L. japonicus* was constructed based on knowledge of TLR signalling in mammalian species. However, most interactions have to be confirmed experimentally.

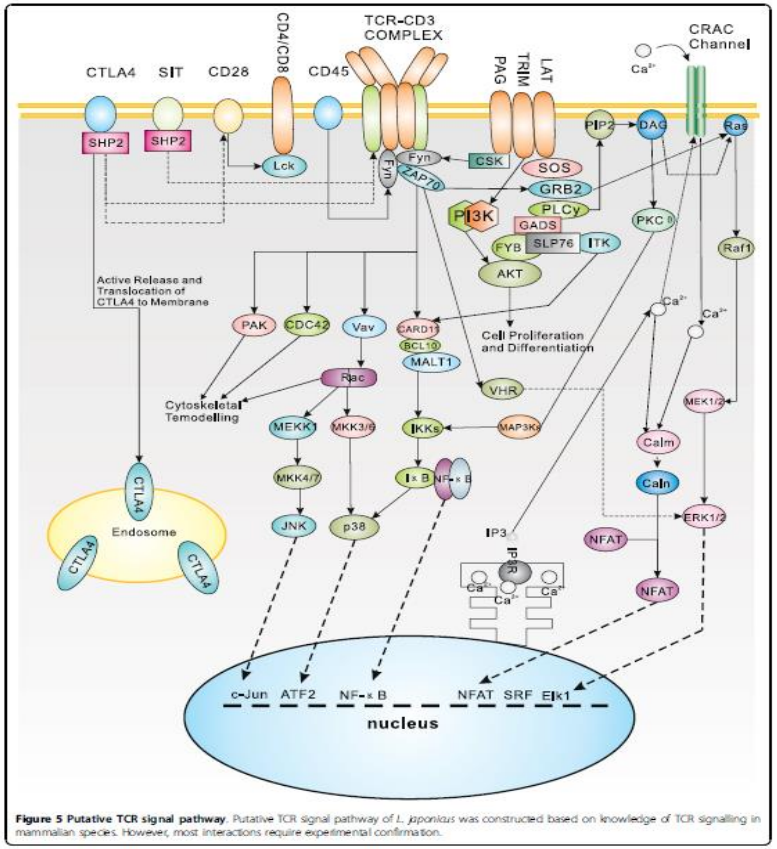

Figure 5 Putative TCR signal pathway. Putative TCR signal pathway of *L. japonicus* was constructed based on knowledge of TCR signalling in mammalian species. However, most interactions require experimental confirmation.

Xiang and He et al., 2010

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1. Transcriptomics and Bioinfomatics

Different expression analyses of stages and consensus sequences in *L. japonicus* under bacteria-challenge.

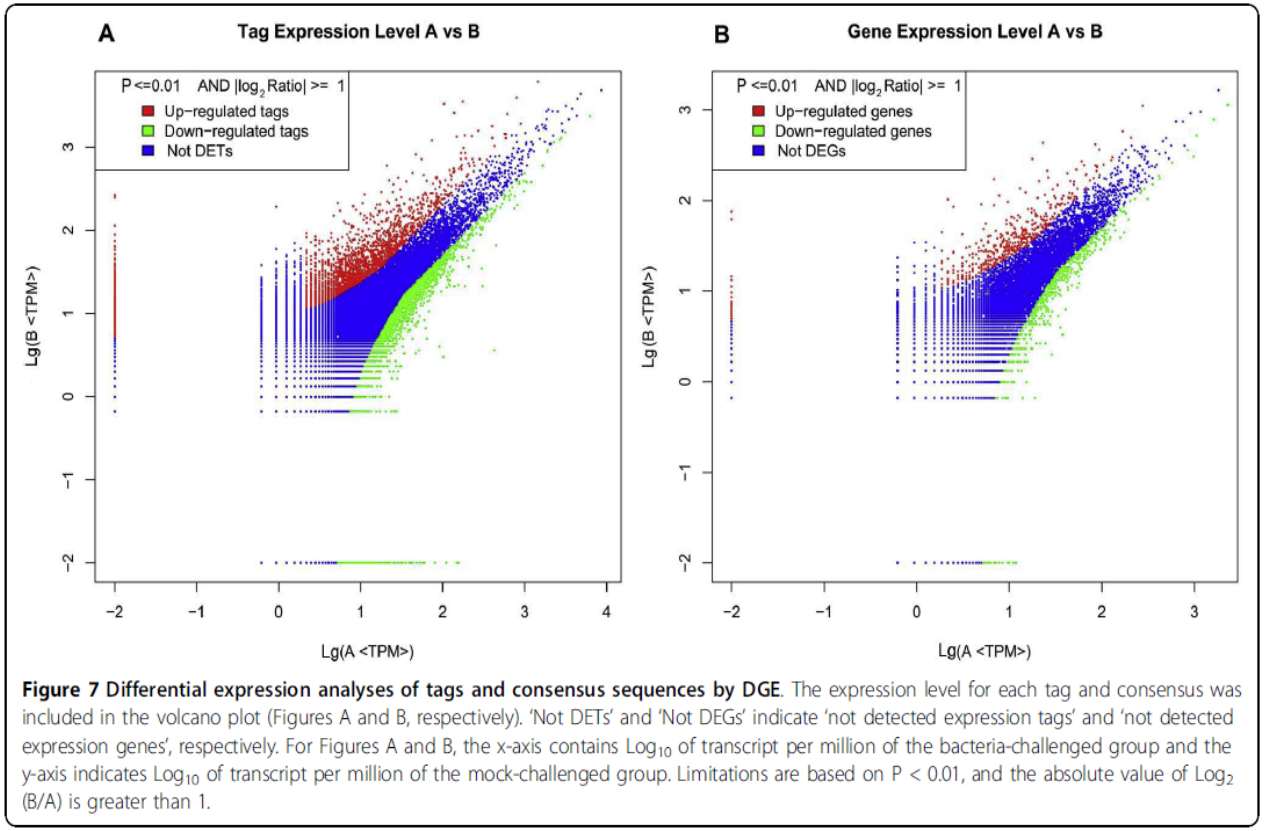

Figure 7 Differential expression analyses of tags and consensus sequences by DGE. The expression level for each tag and consensus was included in the volcano plot (Figures A and B, respectively). 'Not DETs' and 'Not DEGs' indicate 'not detected expression tags' and 'not detected expression genes', respectively. For Figures A and B, the x-axis contains Log_{10} of transcript per million of the bacteria-challenged group and the y-axis indicates Log_{10} of transcript per million of the mock-challenged group. Limitations are based on $P < 0.01$, and the absolute value of Log_2 (B/A) is greater than 1.

Xiang and He et al., 2010

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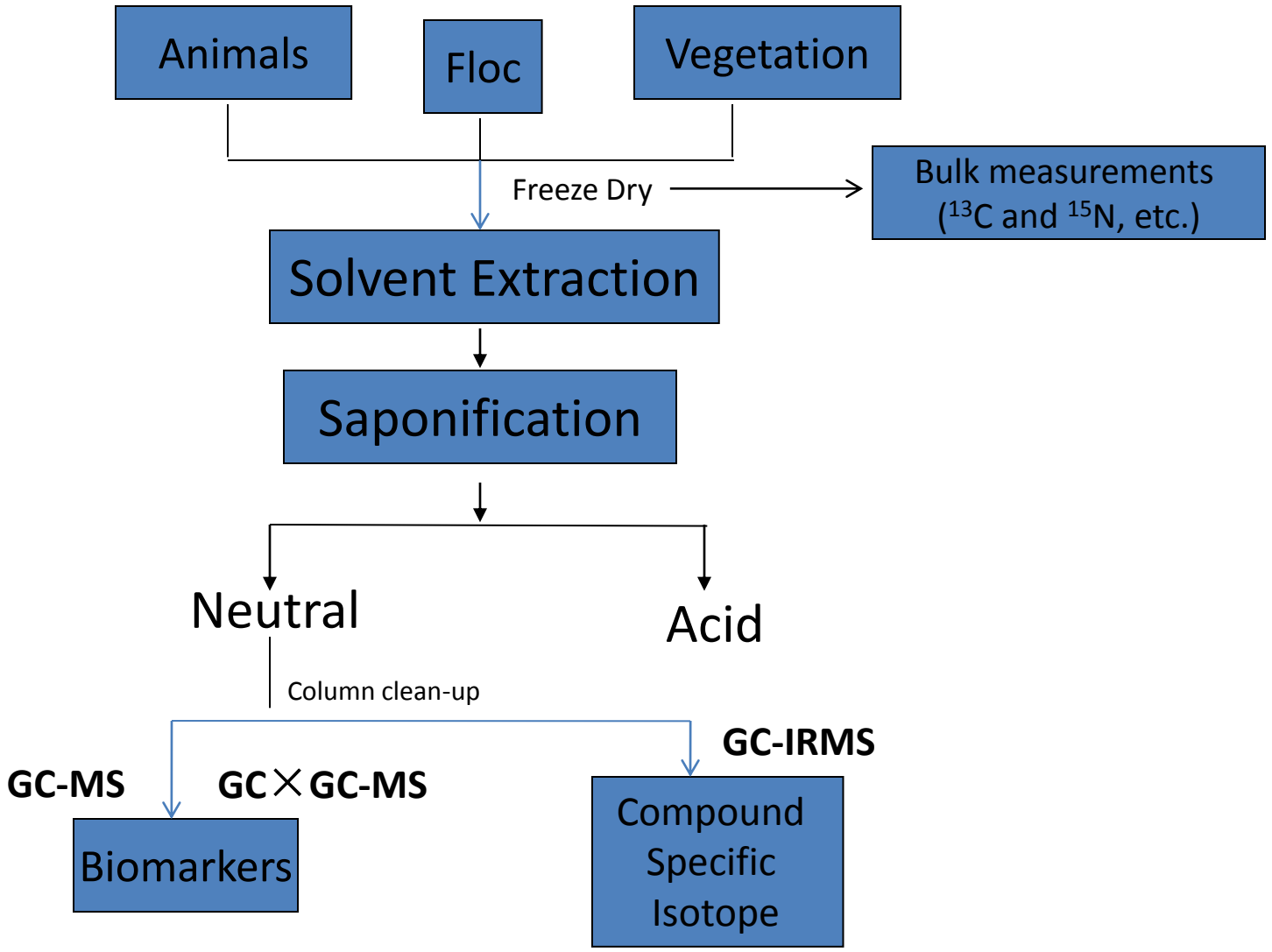
2. Biomarkers: Analytical Methods



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2. Common biomarkers to trace source

-*n*-alkanes
-fatty acid
-Highly brached isoprenoid
-hopanoid
-sterol
-PAHs
-diterpenoid
-triterpenoid
…

He et al., 2014

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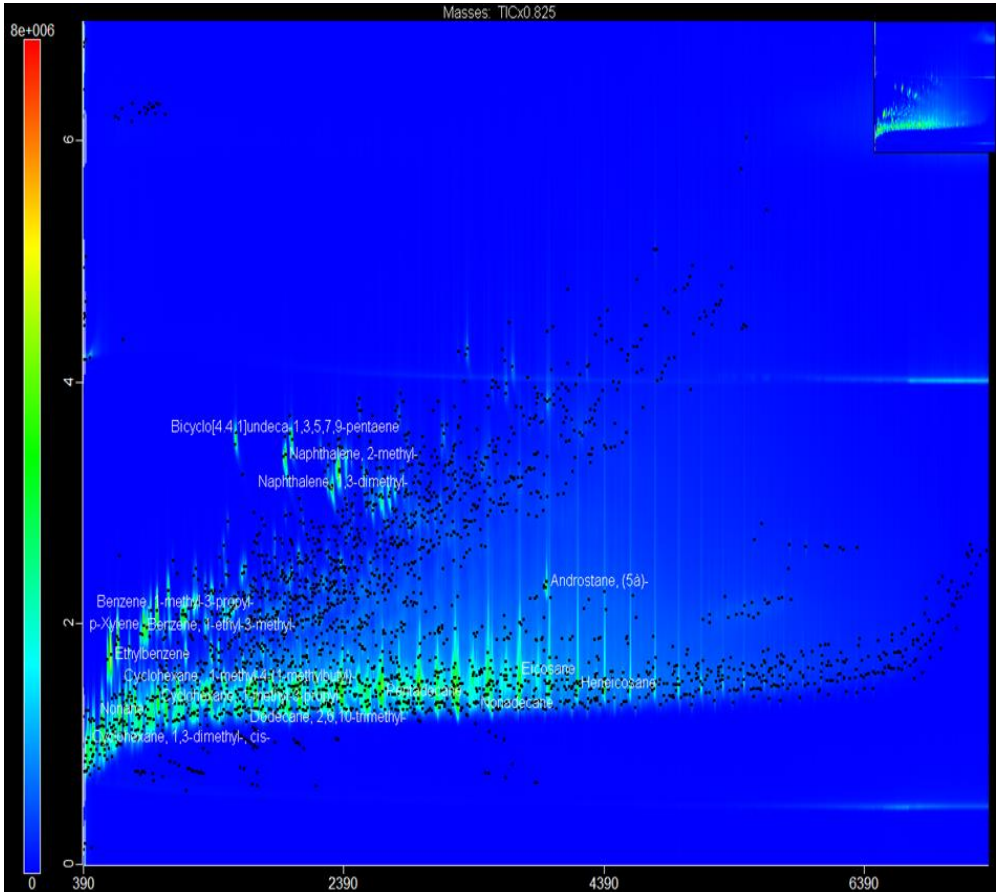
2. Common biomarkers to trace source (examples)

Raw data measured by GC×GC-TOFMS from a really complex mixture (crude oil for this case)



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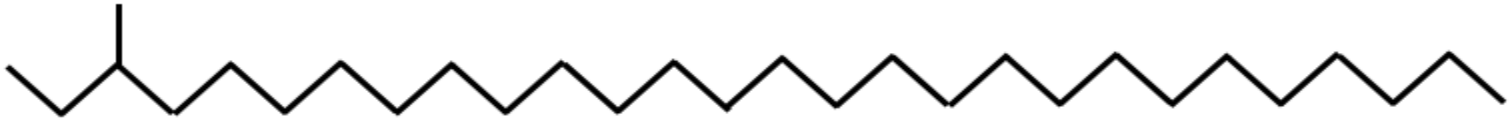
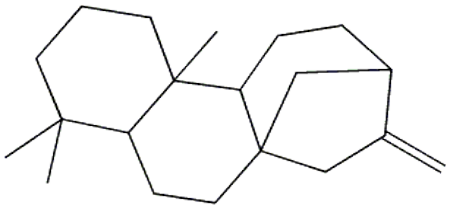
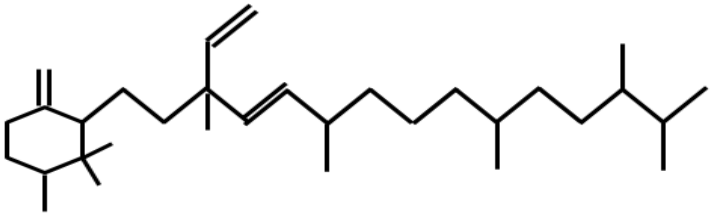
2. Common biomarkers to trace source



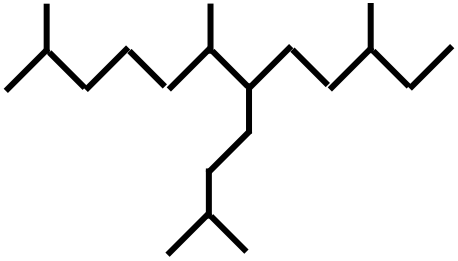
Example of an anteiso alkane: 3-methyloctacosane (C_{29} branched alkane)



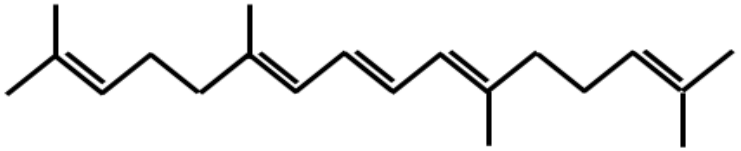
ent-kaur-16-ene



Example of a Botryococcene



Example of C_{20} Highly Branched Isoprenoid (HBI)



2,6,11,15-tetramethyl-hexadeca-2,6,8,10,14-pentaene

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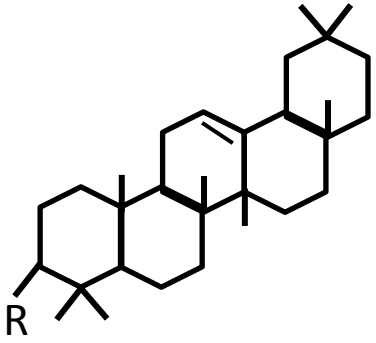
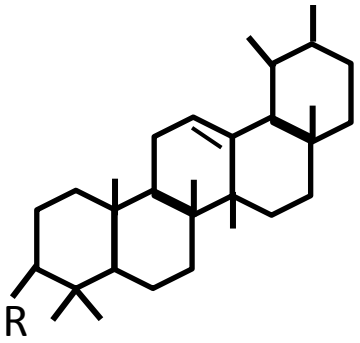
2. Common biomarkers to trace source



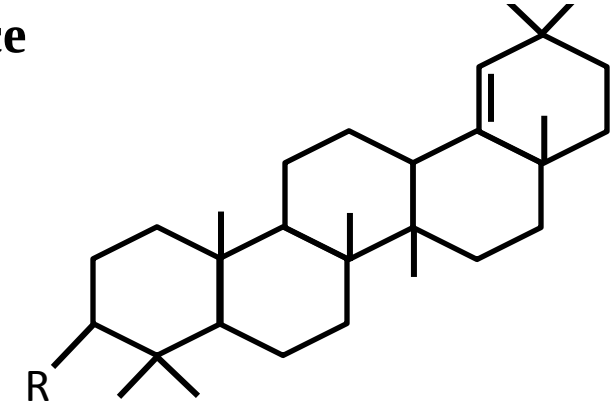
Olean-12

R = O : β-amyrinone
R = OH: β-amyrinol
R = $C_2H_3O_2$: β-amyrinyl acetate
R = $C_4H_7O_2$: β-amyrinyl butanoate



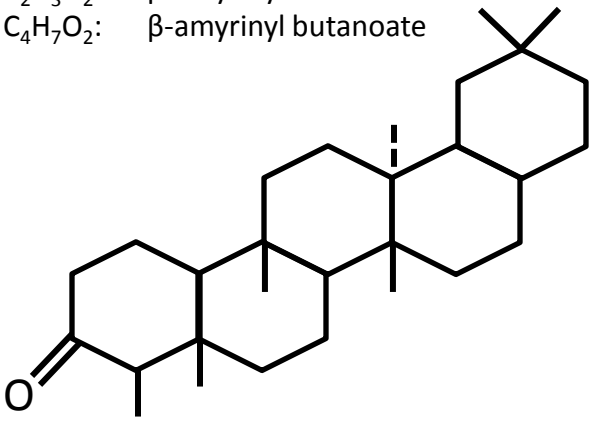
Urs-12

R = O : α-amyrinone
R = OH: α-amyrinol

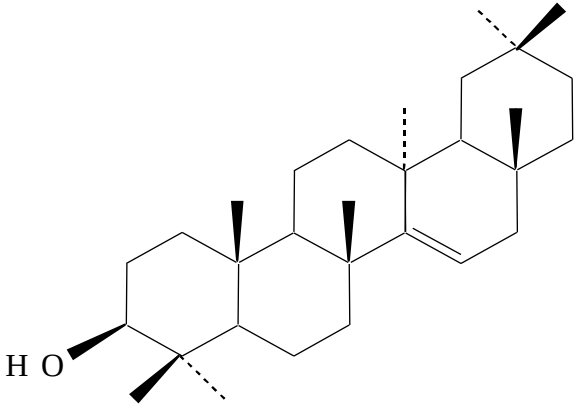


Olean-18 (germanic-)

R = O : germanicone
R = OH: germanicol
R = $C_2H_3O_2$: germanicyl acetate
R = $C_3H_5O_2$: germanicyl propionate
R = $C_4H_7O_2$: germanicyl butanoate
R = $C_5H_9O_2$: germanicyl pentanoate
R = $C_6H_{11}O_2$: germanicyl hexanoate



Friedelan-3-one



Taraxerol

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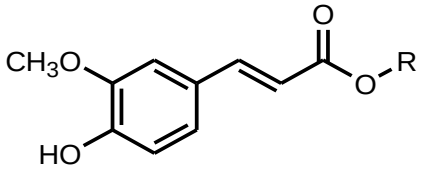
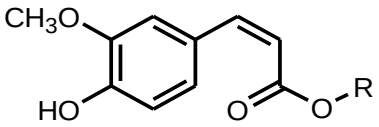
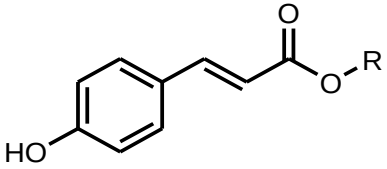
2. Biomarkers in Cattails (examples)



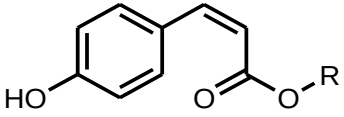
I. E-Ferulic acid, R=H
Alkyl E-ferulates, R=$(CH_2)_nCH_3$, n=16-28



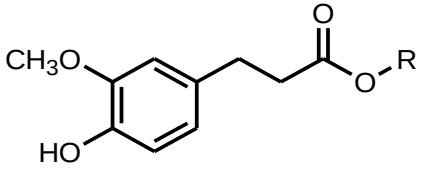
II. Z-Ferulic acid, R=H
Alkyl Z-ferulates, R as in I



III. E-*p*-coumaric acid, R=H
Alkyl E-*p*-coumarates, R as in I



IV. Z-*p*-coumaric acid, R=H
Alkyl Z-*p*-coumarates, R as in I



V. Alkyl dihydroferulates
R=$(CH_2)_nCH_3$, n=20-24

Chemical structures of the ferulic and *p*-coumaric acids and esters.

He et al., 2014, submitted

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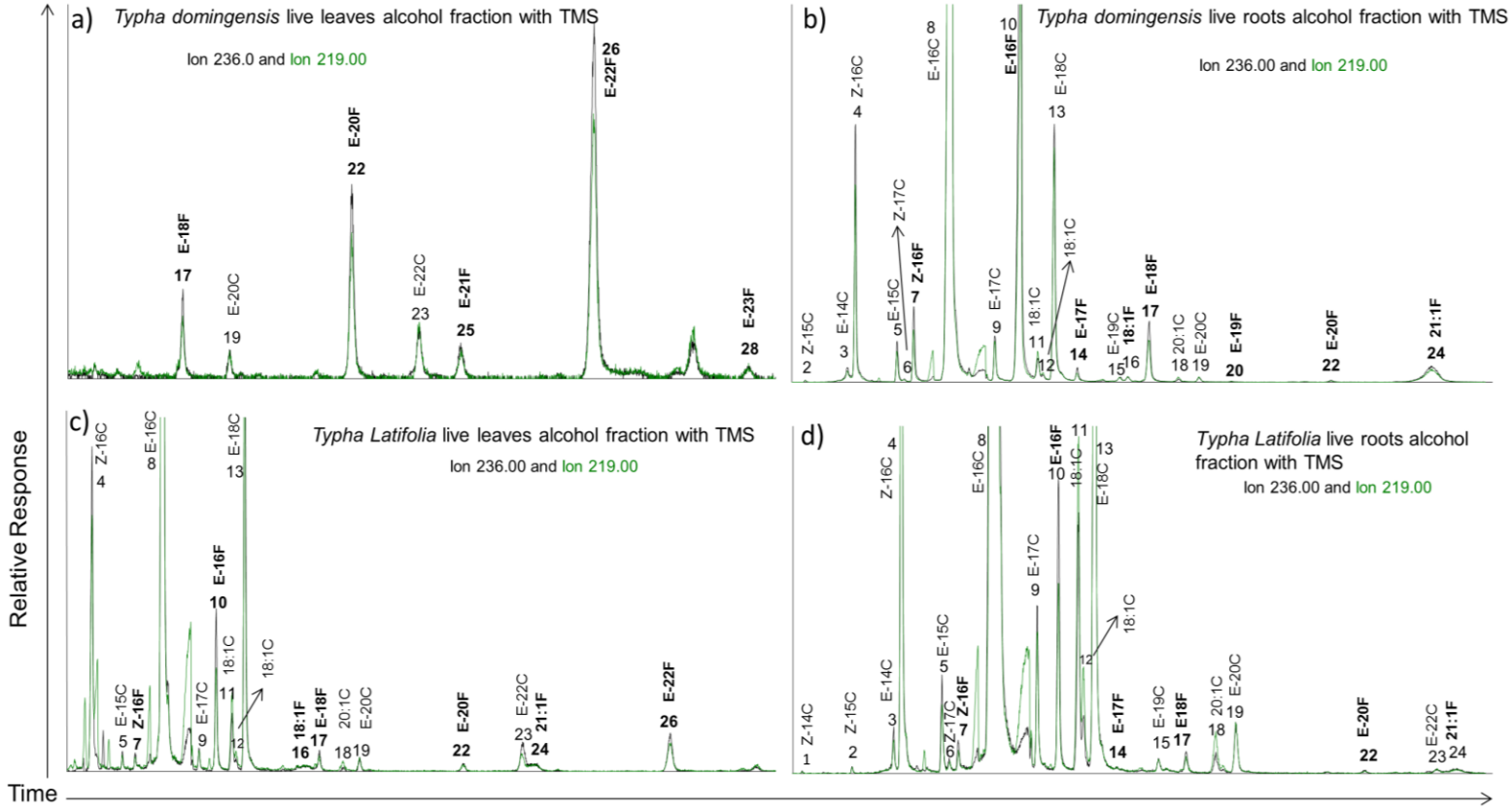
2. Biomarkers in Cattails (examples)



Note: Alkyl-p-coumarates and alkyl-ferulates were listed by elution order from no. 1 to 34. Alkyl-ferulates and alkyl-p-coumarates are marked by numbers, E-nF (n = number of alcohol moieties) means trans-n-alkyl-ferulate, E-nC (n = number of alcohol moieties) means trans-n-alkyl-coumarate.

He et al., 2014, submitted

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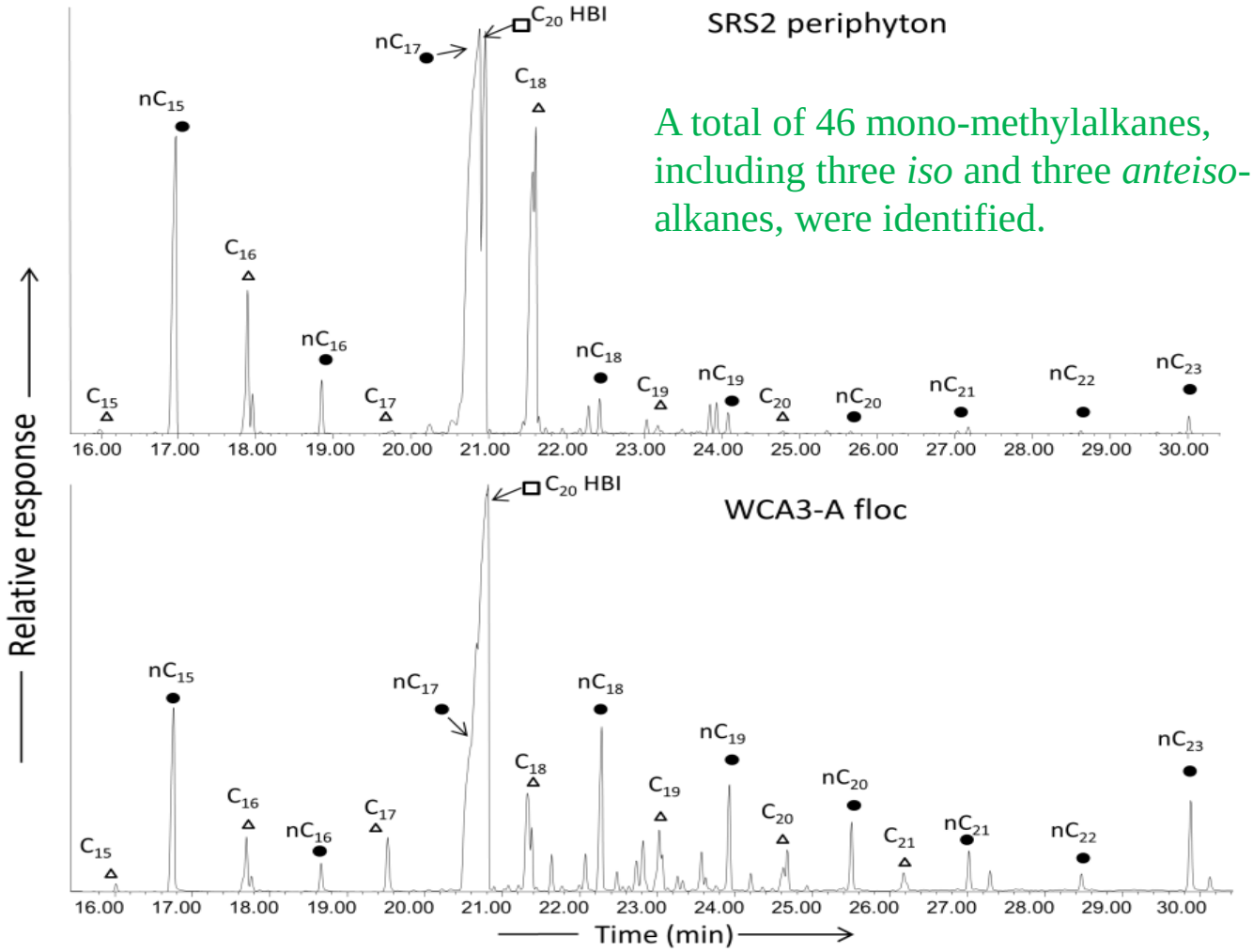
2. Biomarkers in periphyton and floc (examples)



A total of 46 mono-methylalkanes, including three *iso* and three *anteiso*-alkanes, were identified.

He et al., 2015

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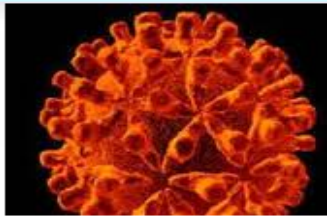

3. Compound specific isotopes for biomarkers

- Highly specialized instrumental technique used to ascertain the relative ratio of light stable isotopes of carbon ($^{13}C/^{12}C$), hydrogen ($^{2}H/^{1}H$), nitrogen ($^{15}N/^{14}N$) or oxygen ($^{18}O/^{16}0$) in individual compounds separated from often complex mixtures of components.

- They can provide organic matter source information and direct information such as the primary productivity and hydrology etc.

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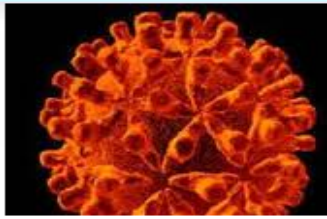
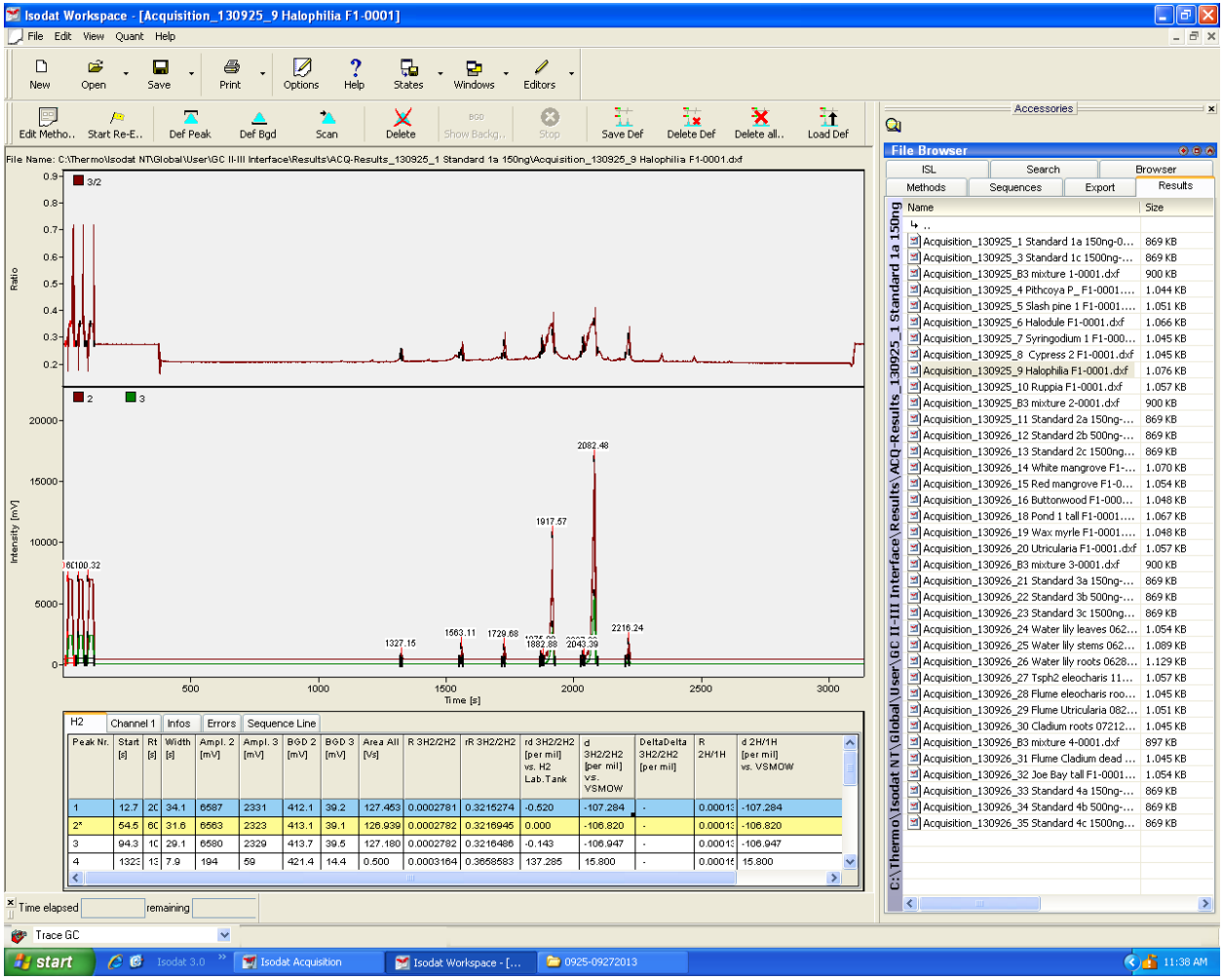


3. Examples of raw data generated from a GC-PirMS



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