



*Supplement of*

## **Extraction, purification, and clumped isotope analysis of methane ( $\Delta^{13}\text{CDH}_3$ and $\Delta^{12}\text{CD}_2\text{H}_2$ ) from sources and the atmosphere**

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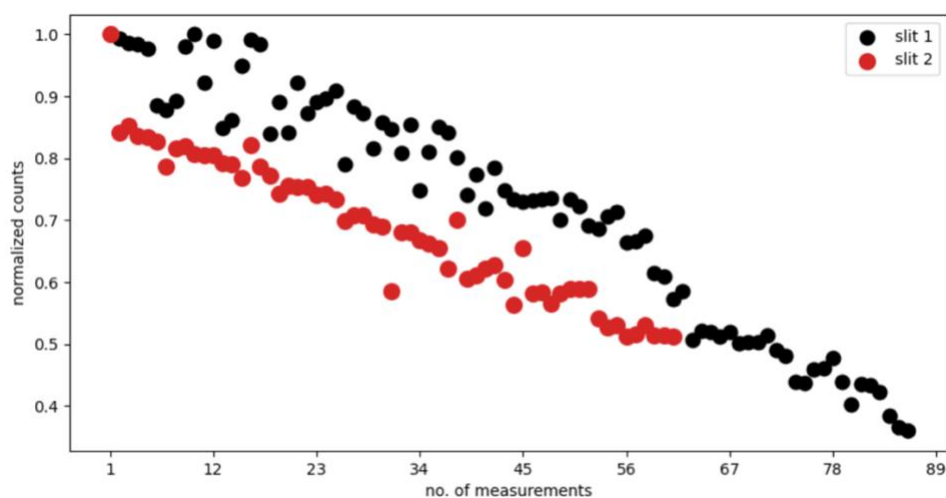


Fig S1: Normalized counts of detector L3 (mass 16) vs the number of measurements since a new slit was installed, each colour representing one slit as mentioned in the legend.

Table S1: Overview of the isotopic composition of the samples presented in Fig 11.

Samples	$\delta^{13}\text{C}$ (‰)	$\delta\text{D}$ (‰)	$\Delta^{13}\text{CDH}_3$ (‰)	se	$\Delta^{12}\text{CD}_2\text{H}_2$ (‰)	se
Thermogenic 1	-48.43	-166.78	3.37	0.33	9.44	2.09
Thermogenic 2	-34.86	-101.22	4.71	0.34	11.14	2.88
Thermogenic 3	-35.38	-100.84	4.78	0.31	11.33	2.06
Thermogenic 4	-22.05	-101.46	1.79	0.28	4.93	1.93
Thermogenic 5	-21.6	-100.99	1.56	0.25	6.37	2.06
High-temperature abiotic	-22.16	-87.05	0.32	0.45	3.29	3.72
Microbial 1	-76.82	-233.47	5.24	0.48	-16.27	3.1
Microbial 2	-43.93	-370.42	1.72	0.24	-18.75	1.42
Microbial 3	-29.37	-299.2	1.06	0.24	-34.45	1.5
Microbial 4	-51.19	-311.86	-1.28	0.33	-33.27	1.51
Microbial 5	-57.93	-176.34	3.47	0.34	-14.54	2.11
Microbial 6	-62.27	-231.66	2.86	0.28	-8.78	1.91
Microbial 7	-59.45	-238.41	2.16	0.47	-5.57	3.48
Microbial 8	-59.9	-228.85	3.33	0.39	-18.29	2.58
Microbial 9	-14.45	-322.49	2.94	0.36	-19.58	1.97
air A	-48.11	-80.3	0.1	0.4	41.7	2.6
air B	-47.99	-84.5	1.87	0.3	40	2.5
air C	-49.84	-115.7	1.91	0.38	42.3	3.8