

Air Sampling offshore Svalbard

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558

Methane as potent greenhouse gas is being released from the seafloor offshore Svalbard and it is uncertain if and to which extend this methane is reaching the sea surface and can be detected in the atmosphere. Since 2009 the University of Tromsø is conducting methane seep related scientific work in that area and took atmospheric samples in previous years. Jens Greinert is a visiting professor at the University of Tromsø and is associated to the MOCA project run by NILU in Norway. As part of a research cruise in July 2013 Jens took up the chance to increase the number of atmospheric samples from offshore during a 2 weeks cruise (Figure 1).

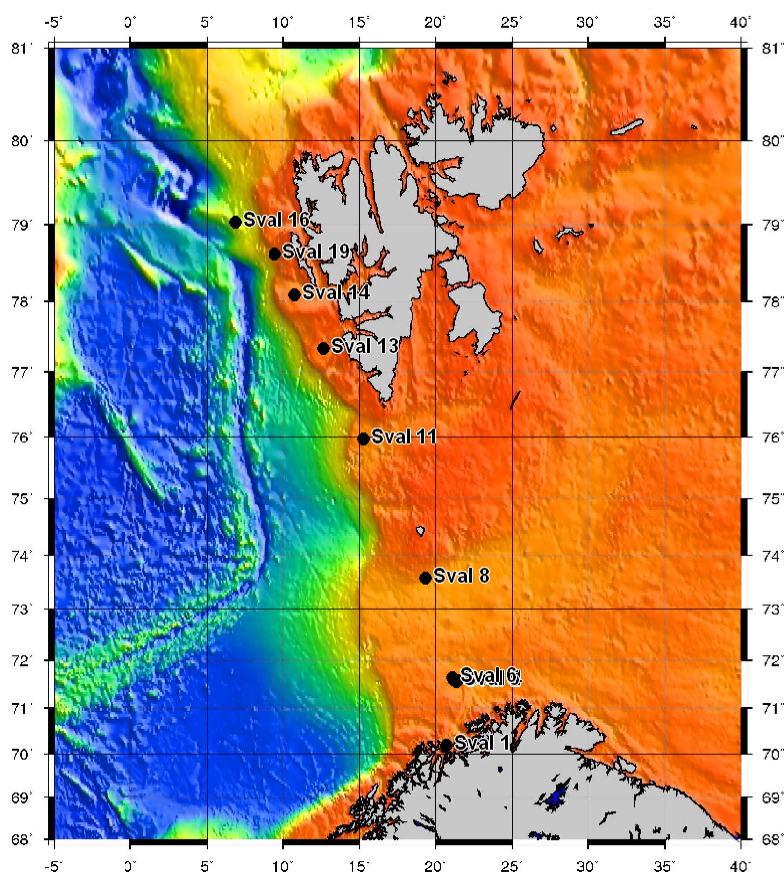


Figure 1: Sampling locations during the cruise which started in Tromsø and ended in Longyearbyen. Sample numbers 1 to 8 are referred to as 'south' in Figure 2, sample numbers 11 to 19 as 'north'.

The scientific objective was to see if shallow and deeper gas seeps release enough methane as free or dissolved gas phase to reach the atmosphere and increase local concentrations and/or change the isotopic signal measurable.

At certain locations during the cruise air samples were pumped into bags for later analyses. During pumping the intake tubing was held into the wind away from any exhaust and other possible

contaminations. After the cruise samples were sent to Royal Holloway University of London for compositional and isotopic analyses. Unfortunately 8 of the 20 samples in total leaked and could not be analyzed for their isotopic composition (Table 1)

Table 1

Arctic Cruise - July 2013

Svalbard RV Helmar Hanssen

Sample No	Date	Time (UT)	Latitude N	Longitude E	Temperature °C	Pressure hPa	Wind Speed m/s	Wind Direction	CH ₄ (ppm)	1/CH ₄ ppm	δ ¹³ C (‰)	StDev δ ¹³ C (‰)	Number of isotopic analyses	comment
Sval 1	7/11/2013	8:50:00 AM	70°10'68	20°39'82	9.9°C	1011	8.8	247	1.8722	5.3412	-47.35	0.04	4	
Sval 2	7/11/2013	9:04:00 PM	71°33'5	21°18'96	8.2°C	1012	8.9	320	1.8797	5.3200	-47.38	0.05	4	
Sval 3	7/12/2013	8:59:00 AM	71°35'88	21°08'67	8°C	1017	6.5	318	1.8829	5.3110	-47.45	0.10	3	
Sval 4	7/12/2013	9:38:00 PM	71°34'19	21°23'215	8.5°C	1017	2.2	60	1.8749	5.3337	-47.50	0.06	4	
Sval 5	7/13/2013	12:10:00 PM	71°33'95	21°15'02	9°C	1011	10.5	115	1.8784	5.3238	-47.55	0.04	3	
Sval 6	7/14/2013	12:30:00 PM	71°37'97	21°05'86	8.5°C	1004	6.7	300	1.8780	5.3249	-47.44	0.05	3	
Sval 7	7/14/2013	10:48:00 PM	72°48'7	19°59'68	6.4°C	1003	1.6	140						Leaked
Sval 8	7/15/2013	3:28:00 AM	73°35'18	19°18'52	5.4°C	1002	2.6	30	1.8764	5.3292	-47.35	0.05	4	
Sval 9	7/15/2013	8:20:00 AM	74°21'29	18°28'16	1.7°C	1003	3	270						Leaked
Sval 10	7/15/2013	1:33:00 PM	75°08'67	16°52'69	6.8°C	1002	8.8	290						Leaked
Sval 11	7/15/2013	6:55:00 PM	75°58'45	15°13'23	6.7°C	1000	11	305	1.8701	5.3474	-47.31	0.06	3	
Sval 12	7/15/2013	11:48:00 PM	76°38'83	13°48'65	3.1°C	999	11.4	334						Leaked
Sval 13	7/16/2013	4:49:00 AM	77°20'46	12°38'46	4.7°C	999	8	333	1.8780	5.3249	-47.32	0.02	3	
Sval 14	7/16/2013	10:03:00 AM	78°05'28	10°44'37	3.6°C	1001	13	335	1.8876	5.2976	-47.52	0.05	4	
Sval 15	7/16/2013	4:10:00 PM	78°40'08	08°40'5	2.9°C	1004	10.4	336						Leaked
Sval 16	7/17/2013	3:57:00 PM	79°01'38	06°49'47	5.4°C	1011	3.5	298	1.8803	5.3182	-47.34	0.02	3	
Sval 17	7/18/2013	5:32:00 AM	79°00'99	06°53'608	6.3°C	1016	2.6	353	1.9342	5.1702				Leaked
Sval 18	7/19/2013	8:08:00 AM	78°38'66	09°26'52	4.5°C	1017	2.4	40	1.8803	5.3183				Leaked
Sval 19	7/20/2013	9:55:00 AM	78°37'65	09°24'55	5.6°C	1007	4.2	350	1.8798	5.3198	-47.41	0.04	4	
Sval 20	7/20/2013	2:58:00 PM	78°27'99	10°3'89	6.2°C	1004	7	334						Leaked

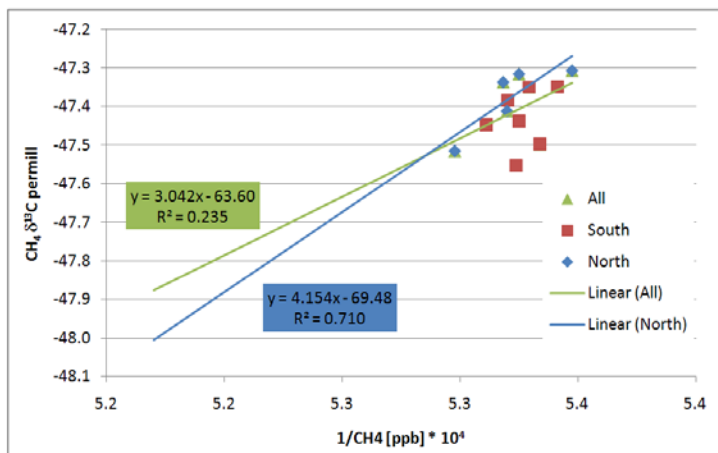


Figure 2: Keeling plot of the CH₄ δ¹³C and methane concentration of the samples.

As a preliminary result we see that the methane concentrations as well as its isotopic carbon signal do not show large variability. We conclude that seeps offshore Svalbard at least at the time of sampling, did not release measurable amounts of methane with a lower d13C signature (-55‰; Fisher et al., 2011) into the atmosphere. Future sampling will be conducted to monitor possible changes.

Reference

Fisher, R., Sriskantharajah, S., Lowry, D., Lanoisellé, M., Fowler, C.M.R., James, R.H., Hermansen, C., Lund-Myrhe, C., Stohl, A., Greinert, J., Nisbet, P.B.R., Mienert, J., and Nisbet, E.G. (2011): Arctic methane sources: isotopic evidence for atmospheric inputs. Geophysical Research Letters, Vol. 38, L21803, doi:10.1029/2011GL049319.