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## Atmospheric $\delta^{13}\text{C}$ - $\text{CH}_4$ measurements during SWERUS-C3

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Any use of this data, please reference the following two papers:

Berchet, A., Pison, I., Crill, P. M., Thornton, B., Bousquet, P., Thonat, T., Hocking, T., Thanwerdas, J., Paris, J.-D., and Saunois, M. (2020): Using ship-borne observations of methane isotopic ratio in the Arctic Ocean to understand methane sources in the Arctic, *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-2019-595>

Thornton, B. F., M. C. Geibel, P. M. Crill, C. Humborg, and C.-M. Mörth (2016), Methane fluxes from the sea to the atmosphere across the Siberian shelf seas, *Geophys. Res. Lett.*, 43, <https://doi.org/10.1002/2016GL068977>

This datapackage contains atmospheric observations of  $\text{CH}_4$ ,  $\text{CO}_2$ , and  $\delta^{13}\text{C}$ - $\text{CH}_4$  during the SWERUS-C3 project in the Arctic Ocean during July, August, and September 2014. Datasets were collected onboard the Swedish icebreaker *Oden*. **This datapackage consists of one .csv file:**

### 1. SWERUS\_d13C\_CH4\_atm\_1hour

Calibrated  $\delta^{13}\text{C}$ - $\text{CH}_4$  observations, in ‰, during SWERUS-C3. Data is averaged for one hour, and filtered for windspeed, wind direction, and  $\text{CO}_2 > 450$  ppm. Other variables: GPS (day of year, latitude, longitude).

Measurements are from an Aerodyne Research direct absorption interband cascade laser spectrometer. Data period is DOY 195-238 of 2014. For more details see Berchet et al., ACP, 2020.

DETAILS:

- DOY and time refer to UTC time, not local time.

- windspeed was determined by *Oden*'s sonic anemometers at 35m above sea level and corrected to a height of 10m above sea level (following Andersson et al.:  $ws(10m)=ws(35m)*(1+((1.3e-3)^{(0.5)/0.41})*\log(10/35))$ ) Windspeeds were cross-verified with speeds derived from 3D sonic anemometers at 20 m height on *Oden*'s bow meteorological mast.
- Aerodyne Research direct absorption interband cascade laser spectrometer provided measurements of  $^{12}\text{CH}_4$  and  $^{13}\text{CH}_4$  concentrations, which were used to calculate  $\delta^{13}\text{C-CH}_4$ . Standard ratio used was 0.0112372, Pee-Dee Belemnite, from Craig, 1957.  $\delta^{13}\text{C-CH}_4$  values presented here combine data from 4 measurement heights (9, 15, 20, 35 m above sea level).