$^{13}CDH_3$ and $^{12}CD_2H_2$ Geothermometers Record Thermogenic CH_4 rising along Active Faults from Depths of 5, 6.5, and 8 km

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Methane is rising to Earth's surface through mud volcanoes located along active fault outcrop traces in Southwestern Taiwan [1]. Bubbles of CH_4 burst vigorously in muddy pools with temperatures of ground water changing from 24° to 40° C following local earthquakes. Mud pools are stained by floating oily residues smelling of hydrocarbons. Measured abundances of $^{13}CDH_3$ and $^{12}CD_2H_2$ emitted from mud volcanoes of the Chukou and Chisan faults and from Wandan are equilibrated at temperatures of 150°, 200°, and 260° C. The $^{13}CDH_3$ and $^{12}CD_2H_2$ equilibrated geothermometers changed from 150° to 240 °C at a single emission site, the SYNH mud volcano. The range of temperatures is consistent with thermogenic formation of CH_4 from buried organic debris within the thermal regime of the "gas formation window". Our working hypothesis is that active faults drain reservoirs of thermogenic methane from organic-rich sediments lying at depths of 5, 6.5, and 8 km. We are testing the hypothesis by conducting time-series sampling of the mud volcanoes of SW Taiwan.

This work is offered to honor the outstanding research achievements of Bjorn O. Mysen in understanding silicate melts.

[1] Rumble et al. (2018) *Jour. Asian Earth Sci.* **167** 218-221.