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Methane in the water column above an active mud volcano in the Calabrian margin, SE Italy

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Methane release from submarine mud volcanoes (MV) is well known, but most of the input estimates are based on sediment fluxes or visual observations in the water column. We combined hydroacoustic mapping, bottom water sampling and collection of gases at the seafloor in two contrasting settings (mud flows and gas seeps) of the Venere MV, an active mud volcano in the Calabrian Margin, Ionian Sea, to derive methane input. Active seafloor gas discharge at five locations showed strong variability in intensity over repeated surveys over 31 days in November/December 2014. Four of these flare sites were arranged nearly concentrically around the mud volcano, with one weak bubble emission site located in the vicinity of the summit. Gas bubbles collected at these sites a few centimeters above seafloor consisted mainly of methane (> 99.9 %) with smaller portions of non-methane hydrocarbons. Bottom waters above gas flare emission sites and mud flow sites had very high methane concentrations up to 566 μM but only in close proximity to the seafloor, while methane was strongly depleted (< 20 nM) $\sim$100 meters above seafloor. The methane plumes (defined by methane concentrations > 100 nM) were relatively small and stationary with a vertical extend of 5 m above the seafloor and a maximum horizontal distribution of 50 m. No methane appeared to reach surface waters, therefore, methane is most likely microbially oxidized in the water column.