# Unusual lipid biomarkers at terrestrial methane seeps in southern Sicily, Italy

NADINE T. SMIT[1*], FAUSTO GRASSA[2], DARCI RUSH[1], LAURA VILLANUEVA[1], ELLEN C. HOPMANS[1], JAAP S. SINNINGHE DAMSTÉ[1,3], STEFAN SCHOUTEN[1,3]

[1] NIOZ Royal Netherlands Institute for Sea Research, and Utrecht University, Texel, the Netherlands
[2] Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Palermo, Palermo, Italy
[3] Faculty of Geosciences, Utrecht University, Utrecht, the Netherlands
[*] corresponding author: nadine.smit@nioz.nl

The greenhouse gas methane ($CH_4$) is an important contributor to natural and anthropogenic global climate changes in present and past environments. Worldwide, microbial methane oxidation in soils is one of the largest sinks for atmospheric methane and accounts for up to 10% of total oxidized methane. However, applicable tools for determining past methane concentrations in the atmosphere and the intensity of methane fluxes in the terrestrial realm are currently lacking.

Here, we have investigated soils from terrestrial methane seeps in southern Sicily, Italy where gases with methane concentrations of up to 95% are naturally released, likely stimulating microbial aerobic methane oxidation (AMO) in surrounding soils. Soils from Fuoco di Censo ('Everlasting Fire') were sampled with increasing distance from the methane seep.

We found an increasing abundance of isotopically depleted unsaturated $C_{16}$ fatty acids and hopanoic acids ( -42 to -55 permill) with decreasing distance to the methane seep. The high abundance of unusual fatty acids and glycolipids characteristic for mycobacteria in combination with their isotopic depletion suggest that these bacteria are involved in the oxidation of methane, ethane and propane at this $CH_4$ seep. Further investigations on the lipid inventory, 16S pyrosequencing and pmOA data of the sample set is currently underway and will be used to link the methanotrophic biomarkers with the microbes present in these soils.