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Static chamber methane flux measurements in volcanic/geothermal areas: preliminary data from Sousaki and Nisyros (Greece)

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Methane plays an important role in the Earth's atmospheric chemistry and radiative balance being the second most important greenhouse gas after carbon dioxide. Methane is released to the atmosphere by a wide number of sources, both natural and anthropogenic, with the latter being twice as large as the former (IPCC, 2007). It has recently been established that significant amounts of geological methane, produced within the Earth's crust, are currently released naturally into the atmosphere (Etiope, 2004). Active or recent volcanic/geothermal areas represent one of these sources of geological methane. But due to the fact that methane flux measurements are laboratory intensive, very few data have been collected until now and the contribution of this source has been generally indirectly estimated (Etiope et al., 2007). The Greek territory is geodynamically very active and has many volcanic and geothermal areas. Here we report on methane flux measurements made at two volcanic/geothermal systems along the South Aegean volcanic arc: Sousaki and Nisyros.
The former is an extinct volcanic area of Plio-Pleistocene age hosting nowadays a low enthalpy geothermal field. The latter is a currently quiescent active volcanic system with strong fumarolic activity due to the presence of a high enthalpy geothermal system.
Both systems have gas manifestations that emit significant amounts of hydrothermal methane and display important diffuse carbon dioxide emissions from the soils. New data on methane isotopic composition and higher hydrocarbon contents point to an abiogenic origin of the hydrothermal methane in the studied systems.
Measured methane flux values range from –48 to 29,000 (38 sites) and from –20 to 1100 mg/mˆ2/d (35 sites) at Sousaki and Nisyros respectively.
At Sousaki measurement sites covered almost all the degassing area and the diffuse methane output can be estimated in about 20 t/a from a surface of about 10,000 mˆ2.
At Nisyros measurements covered the Stephanos and Kaminakia areas, which represent only a part of the entire degassing area. The two areas show very different methane degassing pattern with latter showing much higher flux values. Methane output can be estimated in about 0.25 t/a from an area of about 30,000 mˆ2 at Stephanos and about 1 t/a from an area of about 20,000 mˆ2 at Kaminakia. The total output from the entire geothermal system of Nisyros probably should not exceed 2 t/a.

References

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