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Soil gas investigations at Monte Nuovo and Solforata (Campi Flegrei caldera, Italy)

Massimo Ranaldi, Carapezza Maria Luisa, Stefania Sicola, Francesco Sortino, Luca Tarchini

¹Dipartimento di Scienze, Università Roma Tre, Largo S.L. Murialdo 1, 00146 Rome, Italy

²Istituto Nazionale di Geofisica e Vulcanologia, Roma, Via di Vigna Murata 605, 00143 Roma, Italy

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Campi Flegrei is a caldera near Naples formed by two main collapses, following the huge eruptions that emitted the so called Campanian Ignimbrite (~39,000 years B.P.) and the Yellow Tuff Ignimbrite (~15,000 years B.P.). Only one eruption occurred in historical time (1538 A.D.) forming the Monte Nuovo cone, where a future eruptive vent might open nearby in case of volcanic reactivation. This caldera is famous worldwide for its recurrent uplift episodes, called bradyseismic events, accompanied by a marked shallow seismicity and increase of fumarolic activity. Since 2000 a new uplift began accompanied by chemical-physical changes in fumarolic activity indicating a fluid pressure increase in the hydrothermal system. In 2009 the uplift temporarily stopped (no reversal signals were recorded) to sharply re-increase in 2012-2013 and again from 2014 to 2016. Shallow seismic crises were also periodically recorded. In 2014 a soil CO₂ flux survey by accumulation chamber (a.c.) has been carried out for the first time at Monte Nuovo with 160 measurements over 0.4 km², finding values ranging from 10 to 120 g/m²day. The distribution of soil CO₂ flux anomalies highlights that main degassing occurs along N-S and NE-SW structural discontinuities. The total soil CO₂ flux evaluated for Monte Nuovo is 11 tons/day from 18,500 m². Considering that Solfatara is most active degassing area of Campi Flegrei a soil gas survey was performed also there by 50 sampling points over 0.4 km² investigating both the soil CO₂ and H₂S fluxes by a.c. The total soil CO₂ flux was estimated to 101 tons/day, whereas that of H₂S was appreciable over only 0.2 km² totalling 0.4 tons/day. Data confirm the ongoing anomalous degassing of Campi Flegrei and indicate that also Monte Nuovo is characterized by a present release of endogenous gas.