



Diffuse degassing at La Fossa crater (Vulcano Island, southern Italy): evidence of a new unrest?

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During the last century, some episodes of unrest occurred at La Fossa crater (Vulcano Island, Italy) that were not followed by eruptions. The first one occurred in 1916-1924 when the maximum temperature of the crater fumaroles progressively increased from about 100°C to 613°C. The second episode began in 1977 and consisted of an increase of crater fumarole temperatures and gas output. The maximum temperature of the crater fumaroles reached 692°C in January 1993, then decreased to 430°C in February 1996 and increased again to over 500°C in the same year. Since then, both gas output and maximum temperature have decreased slightly to the present values of 340°C-360°C. During this unrest no significant geophysical anomalies were recorded, apart from some short seismic swarms and minor inflation and deflation episodes. Chemical evidence of the unrest was an increase, with fluctuations, of the gas (essentially CO₂)/steam ratio. During the periods of maximum gas output the CO₂ reached the value of 19% (vol.) in the high-temperature fumarolic fluids. The synchronous variations between CO₂ and He and the isotopic composition of $\delta^{13}C_{CO_2}$ indicated that this CO₂ mostly derived from an input of hot magmatic fluids.

At the end of 2004 (December 2004) the maximum temperature of the La Fossa crater fumaroles increased about 50°C in few days and, in concomitance, a weak seismic crisis was recorded. Therefore, in the middle of December 2004, a campaign of diffuse CO₂ flux from the soil was carried out. These data have evidenced that, at present, the whole crater area is affected by an intense diffuse degassing and we estimate a value of ~700 tons/day in an area of ~480.000 m². This value is very high in comparison with those estimated using the data of similar extended campaigns: ~159 tons/day (area: ~470.000 m²) in July 1995 and ~164 tons/day (area: ~570.000 m²) in July 1998. At the present time the CO₂ content in the high-temperature fumarolic fluids (F11 fumarole, T= 374.6°C) is 18.7% (vol.).