



## **Preliminary results on the comparison between satellite derived ground temperature and in-situ measurement of soil CO<sub>2</sub> flux and soil temperature at Solfatara of Pozzuoli (Naples, Italy)**

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In this work we want to analyze the comparison between the ground temperature acquired with in-situ campaigns and the ground temperature obtained by processing remote sensing data with particular attention to ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) data. Moreover we have studied the possible correlation between the CO<sub>2</sub> measurements and the ground temperature. Test site area has been the Solfatara volcano, situated to the west of Naples, Italy. The Solfatara crater has a persistent volcanic-hydrothermal activity as demonstrate by ground deformation, seismicity and variations of the chemical-physical characteristics of the fluids emitted from fumaroles. Solfatara crater is characterized by a large soil diffuse degassing structure (Solfatara DDS, about 0.8 km<sup>2</sup>), from where a CO<sub>2</sub> flux in the order of 1000-1500 t/d is released by the soil. Solfatara DDS is also characterized by anomalous soil temperature. The correspondence between high CO<sub>2</sub> fluxes and soil temperature has been interpreted as the results of the condensation of CO<sub>2</sub>-rich steam, rising from the hydrothermal system, in the uppermost part of the soil (Chiodini et al., 2001; 2005). The energy dissipated daily by the degassing at Solfatara DDS is the main source of energy release in the entire Campi Flegrei caldera in the current period (Chiodini et al., 2001; 2005).

Concerning the satellite data, to monitor the thermal state of volcanic areas it is necessary to use TIR sensors with high spatial resolution in order to obtain detailed information on the areas where there are significant changes. Thanks to ASTER thermal infrared (TIR, 5 bands, 90 m spatial resolution) regions of the electromagnetic spectrum we have obtained the temperature ground map on the volcano area. For this study we have considered the ASTER's night observations that show well defined episodes of increasing thermal emission of crater thanks to a more uniform background temperature.

CO<sub>2</sub> fluxes and soil temperature (at 10 cm depth) are measured periodically in about 400 point randomly distributed in the Solfatara crater area and in its surroundings. The data measured in 3 surveys performed from 2003 to 2010, in periods roughly correspondent to the available ASTER data, have been elaborated with the geostatistical method of Sequential Gaussian Simulation in order to obtain maps with a spatial resolution of 90X90 m to be compared to the ASTER data.

The first results show a quite good correlations between ASTER derived temperatures and both temperatures and CO<sub>2</sub> fluxes derived from ground measurement, especially in the most anomalous areas characterized by higher soil CO<sub>2</sub> fluxes and temperatures. These first results encourage the possibility to use the satellite derived temperature as proxy of the CO<sub>2</sub> fluxes and to implement methods to use long time series of satellite TIR data in a monitoring prospective.