



## **Volcanic CO<sub>2</sub> mapping and flux measurements at Campi Flegrei by Tunable Diode Laser absorption Spectroscopy**

Maria Pedone, Alessandro Aiuppa, Gaetano Giudice, Fausto Grassa, Giovanni Chiodini, and Mariano Valenza  
DiSTeM, Università degli Studi di Palermo, Palermo, Italy (maria.pedone@unipa.it)

Near-infrared room-temperature Tunable Diode Lasers (TDL) have recently found increased usage in atmospheric chemistry and air monitoring research, but applications in Volcanology are still limited to a few examples. Here, we explored the potentiality of a commercial infrared laser unit (GasFinder 2.0 from Boreal Laser Ltd) to measurement of volcanic CO<sub>2</sub> flux emissions. Our field tests were conducted at Campi Flegrei (near Pozzuoli, Southern Italy), where the GasFinder was used (during three campaigns in October 2012, January 2013 and May 2013) to repeatedly measure the path-integrated concentrations of CO<sub>2</sub> along cross-sections of the atmospheric plumes of the two main fumarolic fields in the area (Solfatara and Pisciarelli). By using ad-hoc designed field-set-up and a tomographic post-processing routine, we resolved, for each of the 2 manifestations, the contour maps of CO<sub>2</sub> concentrations in their atmospheric plumes, from the integration of which (and after multiplication by the plumes' transport speeds) the CO<sub>2</sub> fluxes were finally obtained [1]. The so-calculated fluxes average of 490 tons/day, which agrees well with independent evaluations of Aiuppa et al. (2013) [2] (460 tons/day on average), and support a significant contribution of fumaroles to the total CO<sub>2</sub> budget. The cumulative (fumarole [this study] +soil [2]) CO<sub>2</sub> output from Campi Flegrei is finally evaluated at 1600 tons/day. The application of lasers to volcanic gas studies is still an emerging (though intriguing) research field, and requires more testing and validation experiments. We conclude that TDL technique may valuably assist CO<sub>2</sub> flux quantification at a number of volcanic targets worldwide.

[1] Pedone M. et al. (2013) Gold2013:abs:5563, Goldschmidt Conference, session 11a.

[2] Aiuppa A. et al. (2013) Geochemistry Geophysics Geosystems. doi: 10.1002/ggge.20261.

[3] Chiodini G. et al. (2010) Journal of Geophysical Research, Volume 115, B03205. doi:10.1029/2008JB006258.