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Discussions

Interactive comment on "Increasing CO_2 flux at Pisciarelli, Campi Flegrei, Italy" *by* Manuel Queisser et al.

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The manuscript report on the use of a very interesting and valuable tool to monitor degassing at the active vents in volcanic area. A portable remote sensing spectrometer LARSS, which detects CO2 in a spatially integrated manner, was used to conduct CO2 flux surveys in Pisicairelli area, located within the Campi Flegrei caldera, Italy. Although measurements are associated with quite few uncertainties, the results indicate an increase in CO2 flux in the last 2 years – findings are well in agreement with other recent study in the area. Based on recent data indicating a deceleration of ground uplift at Campi Flegrei, the authors also suggest that the ongoing degassing it is related to a release of deep magmatic gases towards the hydrothermal system, possibly accompanied by an increased bulk permeability of the shallow crust. Finally, the authors

highlight the importance of the technique in giving spatially comprehensive values of CO2 flux acquired which may help to estimate the degassing process as a whole and then provide clues about the strength of the CO2 source. The paper is very interesting and worthy of publication in Solid Earth discussions, and their results are very important for the understanding of degassing at Pisciarelli, which together with the nearby Solfatara crater, are attracting more and more the scientific attention nowadays. However, the authors attempt a simplified explanation of the degassing behavior while they should consider the complex geology-fluids interaction in the shallow ground (tens of meter) and in the subsoil below the investigated area, which are controlling the surficial degassing. Though the proposed methodology is very valuable, it should also be considered (and discussed in the manuscript) that its integration with other punctual measurements techniques (e.g. accumulation chamber) is needed to better characterize the areal degassing and constrain the effect of local elements (e.g. fractures) on the degassing behavior.

Thus, I would suggest minor revisions on the following points in the manuscript:

- Page2, lines 3-6: here the recent work on the geology and the structure of the area should be mentioned (Isaia et al. 2015 and Vitale et al. 2014):

- Page2, lines 9-10: here I would also discuss the effect of i) the subsoil in controlling the surficial degassing (Montanaro et al. 2016), and ii) passing of a seismic wave that can induce a strong increase in the total amount of gas (Gresse et al. 2016);

- Page2, lines 20-21 (and in the discussion as well): the recent work of Mayer et al. (2016) and Piochi et al. (2015), concerning the effect solfataric alteration that increases porosity and permeability of altered rock, should be mentioned and discussed;

- In "Materials and methods": maybe here should be briefly discussed about other factors influencing the measurements, such as wind, change in humidity around the measured spots, etc., which are also mentioned in the results;

- Page4, line 10: "gas plume" rather than volcanic;

- Page5, line 14: “td-1” rather than “kgs-1”(?);

- Page6, line 8-9: here the works of Vanorio (2015) and Heap (2014) on the properties of the caldera-filling tuffs should also be cited and maybe briefly discuss about it.

- Figure 2: can you reverse the Heading angle values in a way that is consistent with Figure 1B?

Here the suggested citations:

Vitale S, Isaia R. Fractures and faults in volcanic rocks (Campi Flegrei, southern Italy): Insight into volcano-tectonic processes. International Journal of Earth Sciences. 2014 Apr 1;103(3):801-19.

Isaia R, Vitale S, Di Giuseppe MG, Iannuzzi E, Tramparulo FD, Troiano A. Stratigraphy, structure, and volcano-tectonic evolution of Solfatara maar-diatreme (Campi Flegrei, Italy). Geological Society of America Bulletin. 2015 Sep 1;127(9-10):1485-504.

Gresse M, Vandemeulebrouck J, Byrdina S, et al (2016) Changes in CO2 diffuse degassing induced by the passing of seismic waves. J Volcanol Geotherm Res 320:12–18. doi:10.1016/j.jvolgeores.2016.04.019

Mayer K, Scheu B, Montanaro C, et al (2016) Hydrothermal alteration of surficial rocks at Solfatara (Campi Flegrei): Petrophysical properties and implications for phreatic eruption processes. J Volcanol Geotherm Res 320:128–143. doi: 10.1016/j.jvolgeores.2016.04.020

Piochi M, Mormone A, Balassone G, Strauss H, Troise C, De Natale G (2015) Native sulfur, sulfates and sulfides from the active Campi Flegrei volcano (southern Italy): Genetic environments and degassing dynamics revealed by mineralogy and isotope geochemistry, Journal of Volcanology and Geothermal Research, Volume 304, 2015, Pages 180-193, ISSN 0377-0273, http://dx.doi.org/10.1016/j.jvolgeores.2015.08.017.

Heap MJ, Baud P, Meredith PG, et al (2014) The permeability and elastic moduli of tuff from Campi Flegrei, Italy: Implications for ground deformation modelling. Solid Earth 5:25–44. doi: 10.5194/se-5-25-2014

Vanorio T, Kanitpanyacharoen W, (2015) Rock physics of fibrous rocks akin to Roman concrete explains uplifts at Campi Flegrei Caldera, Science, DOI: 10.1126/science.aab1292

Montanaro C, Mayer K, Scheu B, Isaia R, Mangiacapra A, Gresse M, Vandemeulebrouck J, Moretti R, Dingwell DB. Hydrothermal activity and subsurface soil complexity: implication for outgassing processes at Solfatara crater, Campi Flegrei caldera. InEGU General Assembly Conference Abstracts 2016 Apr (Vol. 18, p. 12509).

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