On the use of hyperpectral infrared imagers for studying volcano plumes: IMAGETNA campaign and first results

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Knowledge of the composition and the spatial evolution of volcanic plumes provides insights to processes occurring in the Earth's interior. On the other hand, quantification of gaseous emission fluxes is also a fundamental task in the framework of climate change in order to refine the contribution of natural emissions. UV cameras allow us to image volcanic plumes and evaluate SO2 fluxes, although can be subject to uncertainties in the retrieval. Another technique of imaging is now available in the infra-red. Such infrared hyperspectral imager (pixel-by-pixel spectra) might represent a major step forward in volcanology due to its potential to allow SO2 flux measurements during the night and gives access to additional relevant species but has to be tested and validated as a first step.

In June 2015 a campaign of measurements - IMAGETNA - was performed at Mt Etna (Pizzi Deneri Volcano Observatory) with the intent to explore the application of these techniques for volcanic gas measurements all together. Over five days the volcanic plume was remotely observed simultaneously by employing three different hyperspectral imagers (commercial and under development), FTIR instrument, UV LWIR cameras, and radiometer. Results gathered from the different instruments will be compared and by performing sensitivity tests on the retrieval codes the reliability of applying these techniques to volcanic gas observations will be evaluated.

The campaign, the characteristics of the different instruments involved as well as the instrumental deployment strategy will be presented. Direct comparisons of spectral radiance in the infrared obtained by the different infrared instruments will be shown for several selected fields of view. First results for SO2 from UV and in the infrared imagers will be shown, as well as first investigations on other species detected in the infrared.