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Innovative methodologies and technologies for thermal energy release measurement.

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Volcanoes exchange heat, gases and other fluids between the interrior of the Earth and its atmosphere influencing processes both at the surface and above it. This work is devoted to improve the knowledge on the parameters that control the anomalies in heat flux and chemical species emissions associated with the diffuse degassing processes of volcanic and hydrothermal zones.

We are studying and developing innovative medium range remote sensing technologies to measure the variations through time of heat flux and chemical emissions in order to boost the definition of the activity state of a volcano and allowing a better assessment of the related hazard and risk mitigation.

The current methodologies used to measure heat flux (i.e. CO_2 flux or temperature gradient) are either poorly efficient or effective, and are unable to detect short to medium time (days to months) variation trends in the heat flux. Remote sensing of these parameters will allow for measurements faster than already accredited methods therefore it will be both more effective and efficient in case of emergency and it will be used to make quick routine monitoring. We are currently developing a method based on drone-born IR cameras to measure the ground surface temperature that, in a purely conductive regime, is directly correlated to the shallow temperature gradient. The use of flying drones will allow to quickly obtain a mapping of areas with thermal anomalies and a measure of their temperature at distance in the order of hundreds of meters. Further development of remote sensing will be done through the use, on flying drones, of multispectral and/or iperspectral sensors, UV scanners in order to be able to detect the amount of chemical species released in the athmosphere.