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Development of sensors based on the fiber Bragg grating technology to measure strain changes at volcanoes (MED-SUV project; WP 2; Sub-Task 2.2.2)

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Stress and strain changes at volcanic areas are recognized among the best indicators of changes in the activity of the system, and its possible evolution towards critical stages. Depending on their time evolution, stress and strain changes have been the focus of either geodetic (static changes) or seismological (dynamical changes) studies.
In volcano geodesy, encouraging results have been obtained though borehole strain-meters. However, they are not easy to install and involve high costs. Therefore, the near future of strain observations at volcanoes depends on the development of broad-band sensors which are low-cost and easy to install, even in the form of dense arrays.
Advancements in opto-electronics have allowed the development of low-cost sensors, reliable, rugged and compact, which are particularly suitable for on-field application.
In the framework of WP 2 (New monitoring and Observing systems) of the MED-SUV project, the sub-task 2.2 involves the development of strain sensors based on the fiber Bragg grating (FBG) technology. In comparison with previous implementation of the FBG technology to study rock deformations, the system that is being developed within MED-SUV is expected to offer a significantly higher resolution and accuracy in static measurements. Moreover, a careful study will be carried out in order to obtain a smooth dynamic response up to 100 Hz, thus allowing the observation of seismic waves. Finally, strategies to implement a tri-axial configuration will be studied. The performances of the proposed systems will be tailored to suit the requirements of volcano monitoring, with special attention to the trade-off between resolution and cost.
Here we present an overview of FBG technology applied to strain measurement, the main objectives of our sub-task in the framework of MED-SUV and some preliminary data from a test installation on Etna.