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## Long-Term Monitoring with Fiber Optics Distributed Temperature Sensing at Campi Flegrei: The Campi Flegrei Deep Drilling Project

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Monitoring volcanic phenomena is a key question, for both volcanological research and for civil protection purposes. This is particularly true in densely populated volcanic areas, like the Campi Flegrei caldera, including part of the large city of Naples (Italy). Borehole monitoring of volcanoes is the most promising way to improve classical methods of surface monitoring, although not commonly applied yet. Fiber Optics technology is the most practical and suitable way to operate in such high temperature and aggressive environmental conditions. In this paper, we describe a fiber optics DTS (Distributed Temperature Sensing) sensor, which has been designed to continuously measure temperature all along a 500 m. deep well drilled in the West side of Naples (Bagnoli area), lying in the Campi Flegrei volcanic area. It has been then installed as part of the international 'Campi Flegrei Deep Drilling Project', and is continuously operating, giving insight on the time variation of temperature along the whole borehole depth. Such continuous monitoring of temperature can in turn indicate volcanic processes linked to magma dynamics and/or to changes in the hydrothermal system. The developed monitoring system, working at bottom temperatures higher than 100 °C, demonstrates the feasibility and effectiveness of using DTS for borehole volcanic monitoring.