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Comparison between temperatures pattern from thermal IR time series analisys and deformational pattern from InSAR and GPS data at Campi Flegrei caldera (Naples, Italy)

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Long-term thermal infrared volcanological monitoring is carried out at Campi Flegrei caldera (Naples, Italy) by INGV - Osservatorio Vesuviano by acquiring daily infrared images (LWIR) of fumaroles fields since year 2004.
The IR monitoring system (TIIMNet –Thermal Infrared Monitoring Network) includes two permanent automatic infrared (IR) stations installed at Solfatara crater and at Pisciarelli area equipped both with a NEC Thermo Tracer TS7302 IR camera with focal plane array (FPA) uncooled microbolometer measuring systems (320x240 pixel). At Solfatara the station is operative since July 2004 and acquires scenes of the SE inner slope of Solfatara where are located the major fumaroles at an average distance of about 300 m from the IR camera. The camera at Pisciarelli is operative since October 2006 and acquires scenes of the outer eastern flank of the Solfatara tuff-cone (average distance of fumaroles is about 130 m), corresponding to an area characterized by heavy water vapor and CO_2 emissions.
To obtain as much as possible accurate temperature values which can be representative of surface temperatures of fumaroles fields, time series of raw IR scenes has been processed with integrated methodologies. Briefly these methodologies are based on Standard Deviation filtering (as SD represents a quality parameter), background correction of the temperature values and periodicities removal using Matlab tools.
The data representation, using an average moving window, show a pattern without evidence of the major seasonal cyclicity, although it still contains minor cyclicity probably due to endogenous factors and, particularly at Pisciarelli, it evidences significant temperature peak values on August 2009 and a gradual increase of temperatures from November 2010 till now.
In order to strengthen the significance of data from IR thermal analysis, a comparison with deformational pattern has been carried out using both High-Resolution Spotlight TerraSAR-X data, processed using the Small Baseline Subset algorithm (SBAS) implemented on the DLR's operational InSAR software GENESIS, and data from continuous GPS stations operated by the INGV – Osservatorio Vesuviano.
The comparison has shown similar patterns from InSAR and GPS time series and IR temperature time series, suggesting as ground deformations and surface temperatures of fumaroles fields likely represent comparable responses to volcanic processes of the Campi Flegrei area.