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1.3-P-08

Filtering the Noise from Satellite Measurements of Radiant Flux over Active Volcanoes

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Thermal remote sensing is a valuable tool for monitoring active volcanoes. One can detect thermal anomalies originating from a volcano by comparing signals in mid and thermal infrared spectra. Once a thermal anomaly is detected, it has to be characterized in order to evaluate the activity status of volcano. The radiant flux is a suitable parameter for volcano characterization. Atmosphere, satellite viewing angle and sensor characteristics have a significant influence on the thermal anomaly characterization. Some of the influences are easy to correct using standard remote sensing preprocessing techniques, however, some noise still remains in data. In addition, satellites in polar orbits have long revisit times and thus they might fail to detect short volcanic events. It would therefore desirable to use data from different satellites in order to reduce uncertainties and improve temporal resolution. If one tries to simultaneously use data from different instruments, the measurements are often not comparable. Kalman filter allows the combination of measurements from different sources that have different levels of accuracy. Here we applied the Kalman filter to reduce noise and increase the temporal resolution of volcano radiant flux measurements from simultaneous MODIS and AVHRR measurements. As the evolution of the volcanic activity is difficult to predict we did not apply a physical model for the system state transition; we used a stochastic based model. A main challenge was to define the process noise covariance matrix and the relation between process and noise measurement. We finally decided to weight the process noise with the pixel area and cloud coverage over the volcano. We applied this technique to an eruption of Etna in 2002 and found good agreement with data of better resolution (DLR micro satellite BIRD).

1.3-P-09

Long Time Series Of Fumarolic Compositions At Volcanoes: The Key To Understand The Activity Of Quiescent Volcanoes

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Long time series of fumarolic chemical and isotopic compositions at Campi Flegrei, Vulcano, Panarea, Nisyros and Mammoth volcanoes highlight the occurrence of mixing processes among magmatic and hydrothermal fluids. At Campi Flegrei temperatures of about 360°C of the hydrothermal system are inferred by chemical and isotopic geoindicators. These high temperatures are representative of a deep zone where magmatic gases mix with hydrothermal liquids forming the gas plume feeding the fumaroles. Similar mixing processes between magmatic fluids and a hydrothermal component of marine origin have been recognized at Vulcano high temperature fumaroles. In both the system a typical 'andesitic' water type composition and high CO_2 contents characterizes the magmatic component. Our hypothesis is that pulsing injections of these CO2-rich magmatic fluids at the bottom of the hydrothermal systems trigger the bradyseismic crises, periodically affecting Campi Flegrei, and the periodical volcanic unrest periods of Vulcano. At Campi Flegrei a strong increase of the fraction of the magmatic component marked the bradyseismic crisis (seismicity and ground uplift) of 1982-84 and four minor episodes occurred in 1989, 1994 and 2000 and 2006. Increases of the magmatic component in the fumaroles of Vulcano were recorded in 1979-1981, 1985, 1988, 1996, 2004 and 2005 concurrently with anomalous seismic activity. Physical-numerical simulations of the injection of hot, CO2 rich fluids at the base of a hydrothermal system, asses the physical feasibility the process. Ground deformations, gravitational anomalies and seismic crisis can be well explained by the complex fluid dynamic processes caused by magma degassing episodes. Sporadic data on the fumaroles of other volcanoes, for example Panarea, Nisyros (Greece), Mammoth (California), suggest that magma degassing episodes frequently occur in dormant volcanoes causing volcanic unrest processes not necessarily linked to magma movement but rather to pulsating degassing processes from deep pressurized, possibly stationary, magma bodies.

1.3-P-10

Deformation Monitoring at Volcan de Colima, Mexico and Its Implications to the Risk of Communities Around the Volcanic Edifice During the Recent Activity Phase (1998-2010)

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The Vocan de Colima is one of the most active volcanoes in Mexico. It is an andesitic stratovolcano located within the N-S trending Colima Rift Zone in the western front of the Mexican Volcanic Belt. The eruptions of the last 500 years involved a wide spectrum of eruptions styls, considering major block lava emissions, phreatic explotions, and large and moderate explosive events were each time is related the destruction and construction of lava dome in the active crater. More than 500,000 persons are settled around the volcano edifice within a distance of 50 km that can be impacted by a moderate eruptions of this active volcano.

The recent activity of the Volcan de Colima Mexico is monitoring by different physical sensors to detect the increase of activity. The doformation parameter is surveyed by a tiltmeter network composed of 5 plate sensores installed since 1999. The signal is digitized every 1.5 minutes and transmitted by telemetry to the Colima Volcano Observatory, were these sampled signals are processed. The recent activity of Volcan de Colima began with the extrusion of lava flow on November 1998