ious volcanic applications for the TDL-measurements of CO_2 and H_2S are described. Examples are:

Investigations of the CO_2 and H_2S emissions of the Volcano Teide (Tenerife) and Fogo (Cape Verde Islands) concerning single fumaroles, crater, and cone slopes.

Measurements of diffuse degassing of CO_2 and H_2S and optical fence measurements in the Quaternary Volcanic Province of Central Italy at Cava dei Selci, Solfatara, Caldara di Manziana, Vejano and Mola di Oriolo.

Measurements of diffuse degassing of CO_2 and H_2S on Volcano (crater, open mud pool).

Measurement of the CO_2 / H_2S ratio at Fumarole Bay, Deception Island (Antarctica).

1.3-P-75

Tilt and GPS Data Patterns During Tungurahua's Eruptive Process, 2006-2010

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Tiltmeter data has been fundamental to help ascertain magma movements prior to important eruptions of Tungurahua. The VEI 3 and 2 pyroclastic flow-forming eruptions of 2006 were preceded by accelerated inflationary trends several weeks prior to these eruptions. Similarly another strong inflationary period in late 2007 led to a VEI 2 eruption in early February, 2008. Installation of 3 continuous telemetered GPS¡¯ has permitted cross checking with tilt data to corroborate results. Subtle inflationary trends registered by both systems suggested that the early 2010 reactivation of Tungurahua would involve relatively smaller volumes of magma compared to what had been expulsed during previous periods. Modeling of pressure changes and volumes of the source using both tilt and GPS data, results in magma volumes that are coherent with the approximate volume of ash fall during January and February, 2010 (2.8 million M3).

1.3-P-76

Development of a New Metodology for the Surveillance and Monitoring of Atmospheric Pollutants Sources.

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The new technology developed for monitoring natural and anthropogenic emission sources is based on the integration of the different areas of knowledge involved in the surveillance of atmospheric pollutants: Instrumental Technology, Software Engineering, Meteorology and Air Pollution Dynamics. The CEAM Foundation have integrate all these areas of knowledge in a coupled system capable of measuring and tracking the temporal evolution of three-dimensional dispersive conditions of pollutants on very complex terrain under a wide range of meteorological conditions.

The availability of measurements aloft obtained by means of a remote sensor (COSPEC, Millán et al. 1978) enabled us to make a direct comparison between the experimental dispersion parameters and the simulated ones (Palau et al. 2006). This represents a clear advantage over the information provided by the fixed ground-level monitoring stations for atmospheric pollutant control. Ground-level pollutant concentrations on complex terrain present high spatial and temporal variability that is difficult to simulate and compare directly with fixed ground-level measurements and new ways of interpretation and assessment of air quality on complex terrain must be looked for.

The new technology developed has been successfully applied to different air pollution scenarios (or case studies) as, for example, the Etna Volcano (DORSIVA experimental campaign) and the NO2-plume around Valencia city. The integration of the improved remote sensing experimental data with validated numerical systems can give a complementary view for the interpretation of meso-meteorological processes and for the monitoring and surveillance of air pollutants on complex-terrain regions.

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1.3-P-77

150 Years of Seismological Monitoring of Mount Vesuvius (Italy).

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Mt. Vesuvius (southern Italy) is one of the volcanoes with the greatest risk in the World because of its highly explosive eruptive style and its proximity to densely populated areas. The urbanization around Mt. Vesuvius began in ancient times and the impact of eruptions on human activities has been very hard. This is testified by the ruins of Pompeii, which are covered by the products of the plinian eruption that took place in 79 AD (Sigurdsson et al., 1985), and more recently by the chronicles of the eruptions that occurred from 1631 to 1944. For these reasons, Mt. Vesuvius was also one of the first volcanoes to be equipped with monitoring instruments. Pioneering instrumental observations began just before the second half of the 1800s, when the Vesuvius Observatory was founded, in 1841 (Imbò, 1949). At that time, Vesuvius was very active, and its effusive and explosive eruptions often caused damage to the surrounding areas. At the same time, it was a famous tourist attraction and drew travelers from all over the world (Gasparini and Musella, 1991). Since the middle of the nineteenth century, at least 12 eruptions have occurred that have been superimposed on persistent intra-crater activity characterized by Strombolian explosions and by the formation of small lava lakes. The last eruption occurred on 18 March, 1944, and marked a change in the status of Mt. Vesuvius, as it entered a closed conduit phase, which persists today. Following this last eruption, a change occurred in the 1960s, as documented by an increase in the occurrence rate of earthquakes. Since 1972, the monitoring of Mt. Vesuvius has become more systematic and has improved over time, so that there is a remarkable dataset relating to the current phase of quiescence.

1.3-P-78

Temporal Evolution of Diffuse CO_2 Emission from the Summit Crater of Fogo Volcano, Cape Verde

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Fogo is the most prominent and active stratovolcano of the Cape Verde archipelago and has a high probability of hosting a future eruption. In 1999, a volcanic monitoring program started, focusing mainly on the diffuse CO_2 emissions from Fogo's summit crater. Since then, soil gas surveys have been undertaken at the summit crater of Fogo to evaluate the temporal and spatial variations of CO_2 efflux and their relationships with the volcanic activity. Soil CO_2 efflux and soil temperature have been measured at 35-65 sites homogeneously distributed covering an area of about 0.12 km^2 inside the summit crater of Fogo. Soil CO_2 efflux measurements are performed following the accumulation chamber method. Based on the Sequential Gaussian Simulation (sGs) algorithms, CO_2 efflux distribution maps are construed to evaluate the spatial evolution of the diffuse soil CO_2 emission and to estimate the total CO_2 output from the summit crater. The 1999 survey was performed just 4 years after the las eruption at Fogo (April 1995), with an estimated total CO_2 emission rate of 918 ± 409 $t{\cdot}d^{-1}$. A drastic decrease in the CO_2 emission rate was observed in the following survey performed in 2007, eight years after the first one, with a total CO_2 emission of 56 ± 15 $t{\cdot}d^{-1}$. This value and the estimated for 2008 and 2009 (39 ± 9 and 258 ± 74 $t{\cdot}d^{-1}$, respectively) are much lower than the observed in 1999. This observed decreasing trend on diffuse CO_2 emission from the summit crater of Fogo seems to be related to its eruptive cycle. Following the evolutionary model of gas release from volcanoes described by Notsu et al., 2006, Fogo seems to be at present within a post-eruptive phase. Evolution in the magma degasification processes from deep sources can explain the observed temporal change in the diffuse CO_2 emission. Monitoring this geochemical parameter will be tremendously beneficial for Fogo volcanic surveillance program.

1.3-P-79

Strengthening the Seismic-Volcanic Surveillance Program of Teide-Pico Viejo Dormant Volcano through Geochemical Characterization of Las Cañadas Aquifer.

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Teide-Pico Viejo Volcanic Complex located at the central and most elevated area of Tenerife Island (2,037 km^2) is actually a relatively young volcano. At least a sub-plinian eruption (VEI ~ 4) have occurred in the last 2,000 years (Ablay et al, 1995) and since Chahorra eruption (VEI ~ 3) on 1798 DC, the last volcanic eruption at Teide-Pico Viejo, it has been dormant, displaying only weak and low temperature fumaroles at the summit cone. Nevertheless, any new unrest at Tenerife Island (~ 1 million inhabitants and ~ 3-4 million tourists visiting each year) may produce issues for the safety of this dense population. The geochemical survey of groundwaters is one approach that can provide useful information to strengthen the geochemical seismic-volcanic surveillance program of a dormant volcano such as Teide-Pico Viejo Volcanic Complex (Federico et al., 2004). In this work, we report the results of the geochemical characterization of dissolved gases (N_2, O_2, Ar, CO_2, CH_4, CO, H_2, He, ^{222}Rn) in 96 groundwaters sampled at Las Cañadas aquifer (around the Teide-Pico Viejo volcano) between May and October, 2006. There are several aims for this work: (1) to determine the background level of magmatic gas input in the aquifer during quiescent periods, (2) to better define the origin of dissolved gases in Las Cañadas aquifer, specially CO_2, and (3) to delineate high permeable pathway of upward migration of volcanic-hydrothermal gases. Dissolved gases in most groundwater analyzed are variable mixtures of CO_2-rich fluids from the volcanic-hydrothermal system (as represent the Teide fumaroles) with dissolved air. Spatial distribution maps show anomalous concentration of ^{222}Rn CH_4, H_2 and CO_2 dissolved in groundwater at the westernmost area of Las Cañadas aquifer, which is in good spatial correlation with geophysical and geochemical anomalies related to 2004-2005 seismic-volcanic unrest at Tenerife Island (e.g. Pérez et al., 2007). References: Ablay et al., 1995, BV; Federico et al., 2004, JVGR; Pérez et al., 2007, PAGEOPH.

1.3-P-80

TDL, UV-DOAS, COSPEC and miniDOAS measurements of the degassing from the summit crater of Teide volcano, Tenerife, Canary Islands

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