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Geo-spatial warning systems, Nisyros volcano (Greece)
An emergency case study
GEOWARN

2000 – 2003

During three years an 8 Greek, German, Italian, and Swiss universities and state organizations have conducted a state-of-the-art technologic and scientific European research project in the entire volcanic area between Kos – Yali – Perigusa – Nisyros.

All data are open to public and can be ordered from the European Commission in Brussels. Information about all tasks, data and technologies during the project are published on Internet since 2003 through Swiss Federal Institute of Technology (ETH Zürich, Switzerland): www.geowarn.ethz.ch

The major aim of the system was the development of a geo-spatial warning system which comprises a huge amount of **graphical and numerical geo-spatial data, visualizations, derived satellite images (e.g. infrared thermal imaging), monitoring of surface movements (interferometric analysis), seismic activity, heat and gas fluxes and chemical changes in fumarolic gases and hydrothermal waters.** Integration of these independent parameters led to the development of useful modeling techniques that are suitable to detect dynamic processes such as reactivation of a quiescent volcano and earthquakes. Deep crustal seismic soundings (with 42 000 recorded seismograms) provided a regional volcano-tectonic and structural model derived by tomographic processing.

Conclusion for Nisyros volcano:

Nisyros is **a quiescent but active volcano in a region of high geodynamic unrest, representing a high severe hazard and risk potential.** An active hydrothermal system with high permeable rock horizons exist underneath the volcano with temperatures of about 100°C at the caldera floor, 350°C at 1550 m depth (measured 1983 in the exploration wells Nis1 and Nis 2 inside the Caldera) and a large volume of hot rocks and magma batches at greater depth, between 3000 and 8000m.

Although the last magmatic volcanic activity on Nisyros dates back at least 25,000 years, the present geodynamic activity encompasses high seismic unrest and widespread fumarolic activity. Violent earthquakes and steam blasts accompanied the most recent hydrothermal eruptions in **1871–1873 and 1887** and left large crater holes behind. Mud and hydrothermal vapours rich in CO_2 and H_2S were emitted from fracture zones which cut the caldera and extend towards the NNW through the vicinity of the village of Mandraki. In **1996 and 1997** seismic activity started with earthquakes of magnitudes up to 5.5 and with hypocenters down to 10 km depth, damaging 30 houses in Mandraki. **GEOWARN data indicated, that the seismic crisis was due to fresh magma input.**