Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06211, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06211
EGU General Assembly 2008

Earthquake swarm generation in Mts. Peloritani region: possible role of overpressured fluids?

S. Giammanco (1), M. Palano (1), A. Scaltrito (1), L. Scarfì (1), F. Sortino (2)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Catania, Catania, Italy (2) Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Palermo, Palermo, Italy (giammanco@ct.ingv.it / Fax: +39 095 435801)

Abstract

Northern Sicily, located along a convergent margin, represents the southernmost part of the Alpine-Apenninic orogenic belt, locally called "Appennine-Maghrebian Chain". It consists essentially of a nappe-pile edifice that involves distinct tectonic slices of metamorphic basement rocks. Mts. Peloritani, part of the Appennine-Maghrebian Chain, between 1994 and 2006, were affected by more than 1000 earthquakes ($1.0 \leq M_L \leq 3.3$) recorded by a local seismic network held by the Istituto Nazionale di Geofisica e Vulcanologia, Catania. Most of these events occurred as highly clustered swarms located at shallow depth close the villages of Castroreale and Rodì Milici (western part of Mts. Peloritani). This area is also characterized by the presence of some geothermal springs located near the villages of Terme Vigliatore and Rodì Milici. Other geothermal springs and gas emissions are located along the Tyrrhenian coast, especially in the area of a main fault named "Aeolian-Tindari-Letojanni fault system" on the westernmost part of Mts. Peloritani.

Here, we present a multidisciplinary approach, with respect to the tectonic setting, seismicity pattern and geochemical characteristics of fluid emissions, in order to understand the process of earthquake swarm generation beneath the area.

Most of the gases emitted in the study area, in terms of focused and/or diffuse gas emissions often associated with thermal fluids, is of mantle origin, as shown by the He isotopes ratio. On approaching the surface, deep gases undergo a strong interaction

with local aquifers. Surface efflux of mantle-derived gases measured in focused emissions together with the estimate of the P-T conditions of fluids in the local crust point to a pressurised gas source that would be located at depth of 7-12 km, corresponding with the range of hypocentral depths of seismic swarms. The widespread occurrence of pressurised fluid emissions at the surface in the studied area would indicate that the complex network of tectonic structures in the area acts as high-permeability pathways for the migration of sub-crustal fluids towards the surface. This scenario could be compatible with a close interplay between pressurised mantle fluids at depth, nucleation of earthquakes due to higher-than-hydrostatic pore pressure and release of mantle-derived gases at the surface.