



Identification and location of seismic signals at the Nirano Mud Volcanic Field, Italy

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Mud volcanoes are geological phenomena characterized by elevated fluid pressures at depth. This phenomena are only recently being investigated with passive seismic methods. To identify and characterize seismic signals produced at the Nirano Mud Volcano, Italy, we deployed a temporary network composed of 11 stations.

During the three months survey period, the stations repeatedly recorded high frequency signals. We identified two types of drumbeat signals. The first has duration of about 50s and a frequency range of 10-45 Hz. The second signal has a duration of about 4s and a frequency range of 5-45 Hz. The drumbeat signals are not recorded on all the stations and their amplitude varies according to the detected signal type, suggesting a marked attenuation in the region.

We located the source region of the drumbeat signals at the north eastern-most region of the mud volcano system, using cross-correlation methods between station pairs. This observation is in agreement with geological observations: the most active part of the system is at the edge of the caldera where the fault controlled collapse occurs, hence facilitating the rise of deep fluids.

There are two possible mechanisms responsible for the generation of the drumbeat: sloshing of gas through the different shallow conduits feeding the mud vents; and/or the local collapse of gas pockets in the conduits. Overall, the data suggest a shallow source responsible for the drumbeat signals at the Nirano Mud Volcano.