

A microtremor survey to define the subsoil structure in a mud volcano areas

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Mud erupting systems have been observed and studied in different localities on the planet. They are characterized by emissions of fluids and fragmented sedimentary rocks creating large structures with different morphologies. This is mainly due to the presence of clay-bearing strata that can be buoyant in the surrounding regions and over-pressured fluids that facilitate the formation of diapirs through sedimentary rocks. In this study, we investigate the Lusi mud erupting system mainly by using ambient vibration methods. In particular, thickness of the sediments and the body wave velocities have been investigated. Results are integrated with gravimetry and electrical resistivity data in order to locate the main geological discontinuities in the area as well as to reconstruct a 3D model of the buried structure. The approach commonly used for this type of studies is based on the ratio of the horizontal to vertical components of ground motion (HVSR) and on passive array techniques. The HVSR generally enables to recognize peaks that point out to the fundamental frequency of the site, which usually fit quite well the theoretical resonance curves. The combination of HVSR and shear wave velocity, coming from passive array techniques, enables to collect valuable information about the subsurface structures. Here we present new data collected at the mud volcano and sedimentary hosted hydrothermal system sites in order to investigate the depths of the main discontinuities and of the hypothesized hydrocarbon reservoirs. We present the case study of Salse di Nirano (northern Italy), Salinelle (Mt. Etna, Sicily) and Lusi hydrothermal systems (Indonesia). Our results indicate that the ambient vibrations study approach represents a swift and simplified method that provides quick information on the shallow subsoil structure of the investigated areas.