

## **Historical reconstruction of oil and gas spills during moderate and strong earthquakes and related geochemical surveys in Southern Apennines**

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The aim of this study is to contribute to the assessment of natural hazards in a seismically active area of southern Italy through the joint analysis of historical sources and fluid geochemistry. In particular, our studies have been focalized in the Val d'Agri basin, in the Apennines extensional belt, since it hosts the largest oilfield in onshore Europe and normal-fault systems with high seismogenic potential (up to M7).

The work was organized into three main themes: 1) literature search aimed at identifying fluid emissions during previous moderate-strong earthquakes; 2) consultation of local and national archives to identify historic local place names correlated to natural fluids emissions; 3) geochemical sampling of groundwater and gas issuing at surface, identified on the basis of the bibliographic sources.

A reasoned reading of written documents and available historical data was performed. Moreover, we reworked information reported in historical catalogues, referred to liquid and gas hydrocarbon leakages occurred during seismic events of the past (in a range of magnitude from 5 to 7) in the Southern Apennines (with a particular focus on the Val d'Agri). Special attention was given to the phenomena of geochemical emissions related to major historical earthquakes that took place in the area, most notably that of 16 December 1857 (M = 7). A careful analysis of the Robert Mallet's report, a complete work aimed at describing the social impact and the effects on the environment produced by this earthquake through illustrated maps and diagrams, included several hundred monoscopic and stereoscopic photographs, was done.

From archival sources (at national and/or local administrations), "sensitive" sites to the onset of leakage of liquid and gaseous hydrocarbons in the past were identified.

A soil-gas survey (22 gas concentrations and flux measurements) and 35 groundwater samplings were carried out in specific sites recognized through the above studies. From a geochemical point of view, gathered results individuated Tramutola (Potenza) as a particularly interesting site, characterized by the presence of small oil springs at surface as well as deep-derived gas and hydrocarbons.

The importance to track, map and monitor spill of fluids and, in particular, hydrocarbons also in quiescent times could constitute an additional element to set the "natural background noise" of the territory (baseline) not influenced or triggered by human activity.