MUD VOLCANOES AS A NATURAL STRAINMETER

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Increasing evidence supports the idea that seismicity has to be considered as an expression of a complex multi-scale phenomenon. Most important aspects of such process is a remarkable space-time clustering and a degree of unpredictability which does not decrease when quality of measurements is improved. Many Authors suggest that, on the basis of statistical analyses of past seismic catalogues and new experimental data about fracturing process, "criticality" could represent an effective reference model for seismogeneis. In this view, the non-linear character of dynamical interactions between potential seismic sources makes the system dramatically influenced by relatively small variations in the strain field which can significantly modify seismic hazard level. Such fluctuations can be the result of a number of processes such as, as an example, large scale redistribution of tectonic loads after the occurrence of significant earthquakes. Thus, large agreement exists about the importance of reliable evaluations of strain field fluctuations as an important tool for new-generation seismic hazard estimates. More direct approaches (e.g. space geodesy techniques) are not able, in many cases, to reach a sufficient accuracy at least as concerns the time-space scale of practical interest (10^3-10^4 m, 10^6-10^7 sec). On this respect, several studies reveal that continuous monitoring of deep seated confined fluids could represent an effective and low-cost tool for the detection of volumetric strain field fluctuations in the crust. To this purpose, monitoring of mud volcanoes activity, due to their spread over large territories (as in the case of Azerbaijan) and to the confined character of their reservoirs and depth-to-surface conduits, could be considered as a new important tool for the detection of volumetric strain fluctuations at depth and for better constraining seismic hazard evaluations.

In the presentation, two topics will be focused. The first one will concern evidence of phenomena responsible for regional scale short-term (10^6-10^7 sec) redistribution of stresses and available models useful for their characterization. The second one will concern the characterization of solid-fluid mechanical interactions in presence of relatively fast variations in the local strain field and the evaluation of their effects on the mud-volcano system.