Geophysical Research Abstracts
Vol. 14, EGU2012-13537, 2012
EGU General Assembly 2012

Cluster analysis applied to multiparameter geophysical dataset

M. G. Di Giuseppe, A. Troiano, C. Troise, and G. De Natale
INGV-Osservatorio Vesuviano. Via Diocleziano, 328. 80124. Naples (Italy)

Multi-parameter acquisition is a common geophysical field practice nowadays. Regularly seismic velocity and attenuation, gravity and electromagnetic dataset are acquired in a certain area, to obtain a complete characterization of the some investigate feature of the subsoil. Such a richness of information is often underestimated, although an integration of the analysis could provide a notable improving in the imaging of the investigated structures, mostly because the handling of distinct parameters and their joint inversion still presents several and severe problems. Post-inversion statistical techniques represent a promising approach to these questions, providing a quick, simple and elegant way to obtain this advantageous but complex integration.
We present an approach based on the partition of the analyzed multi parameter dataset in a number of different classes, identified as localized regions of high correlation. These classes, or 'Cluster', are structured in such a way that the observations pertaining to a certain group are more similar to each other than the observations belonging to a different one, according to an optimal logical criterion. Regions of the subsoil sharing the same physical characteristic are so identified, without a-priori or empirical relationship linking the distinct measured parameters. The retrieved imaging results highly affordable in a statistical sense, specifically due to this lack of external hypothesis that are, instead, indispensable in a full joint inversion, were works, as matter of fact, just a real constrain for the inversion process, not seldom of relative consistence. We apply our procedure to a certain number of experimental dataset, related to several structures at very different scales presents in the Campanian district (southern Italy). These structures goes from the shallows evidence of the active fault zone originating the M 7.9 Irpinia earthquake to the main feature characterizing the Campi Flegrei Caldera and the Mt. Vesuvius area. In all these application, cluster analysis integrating distinct geophysical methods appears an effective method to characterize complex geologic settings. Our post inversion clustering approach could possibly be applied at different of investigation scales, geophysical datasets, in many fields of geophysical exploration, where quantitative analysis of multiparameter geophysical information data is the key to successful implementation.