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Integrated analysis of seismological, gravimetric and structural data for identification of active faults geometries in Abruzzo and Molise areas (Italy)

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This paper deals with an interdisciplinary research that has been carried out for more constraining the active faults and their geometry of Abruzzo - Molise areas (Central-Southern Apennines), two of the most active areas from a geodynamic point of view of the Italian Apennines, characterized by the occurrence of intense and widely spread seismic activity.
An integrated analysis of structural, seismic and gravimetric (Gaudiosi et al., 2012) data of the area has been carried out through the Geographic Information System (GIS) which has provided the capability for storing and managing large amount of spatial data from different sources.
In particular, the analysis has consisted of these main steps: (a) collection and acquisition of aerial photos, numeric cartography, Digital Terrain Model (DTM) data, geophysical data; (b) generation of the vector cartographic database and alpha-numerical data; c) image processing and features classification; d) cartographic restitution and multi-layers representation.
In detail three thematic data sets have been generated "fault", "earthquake" and "gravimetric" data sets.
The fault Dataset has been compiled by examining and merging the available structural maps, and many recent geological and geophysical papers of literature.
The earthquake Dataset has been implemented collecting seismic data by the available historical and instrumental Catalogues and new precise earthquake locations for better constraining existence and activity of some outcropping and buried tectonic structures. Seismic data have been standardized in the same format into the GIS and merged in a final catalogue.
For the gravimetric Dataset, the Multiscale Derivative Analysis (MDA) of the gravity field of the area has been performed, relying on the good resolution properties of the Enhanced Horizontal Derivative (EHD) (Fedi et al., 2005). MDA of gravity data has allowed localization of several trends identifying anomaly sources whose presence was not previously detected.
The main results of our integrated analysis show a strong correlation among faults, hypocentral location of earthquakes and MDA lineaments from gravity data.
Furthermore 2D seismic hypocentral locations together with high-resolution analysis of gravity anomalies have been correlated to estimate the fault systems parameters (strike, dip direction and dip angle) of some structures of the areas, through the application of the DEXP method (Fedi M. and M. Pilkington, 2012).

References

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