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Identification of active faults in Abruzzo area (central Italy) through the analysis of geological, seismological and gravimetric data

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The aim of this study is to identify and constrain the geometry of the seismogenic structures (active, outcropping and buried fault systems) of the Abruzzo area (central Italy), through an integrated analysis of geo-structural, seismic and gravimetric data. We generated three thematic: “faults”, “earthquakes” and “gravimetric" data: i) The fault dataset consists of data extracted from the available structural and geological maps (ITHACA catalogue; the "Neotectonic Map of Italy" 1:500.000; several geological sheets 1:50.000 from ISPRA CARG project; the Geological Map 1:100.000 Sheet 1), and many geological studies. ii) The earthquakes datasets was created by merging the data from historical and instrumental Catalogues (CPTI04 and CPTI11; ISIDE - INGV). iii) The gravimetric datasets consists in the Multiscale Derivative Analysis (MDA) of the Bouguer anomaly map of the area, whose maxima show the presence of density lineaments.
The merge of these datasets in GIS environment, highlighted four possible scenarios of correlation between faults, earthquakes and MDA maxima:
1) the existence of active faults, revealed by a strong correlation between epicentral location of seismic clusters, fault positions and MDA maxima;
2) the existence of buried active faults, highlighted by a good correlation between MDA maxima and epicentral positions, without correspondence with faults known from geological data;
3) the existence of inactive or silent faults, detected by the presence of faults reported in the geological datasets and literature which are associated with MDA maxima, without correlation of earthquakes;
4) the existence of faults not correlated with MDA maxima; this could be due to faults putting in contact two lithologies with a similar density.

A comparison between seismic hypocentral locations and the fault geometry retrieved by DEXP analysis on gravity data was performed over some significant active faults of the area, such as the Paganica fault. Our analysis yielded new insights into the fault characteristics (dip direction and angle) and its activity.