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Characterization of the San Giuliano di Puglia (southern Italy) active faults through the analysis of geological, seismological and gravimetric data

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The area of San Giuliano di Puglia (Southern Italy) was struck by a moderate earthquake of Mw=5.7 on October 31st, 2002. The aim of this study is to identify and constrain the geometry of the active structures in the area. We used an integrated analysis of geo-structural, seismological and gravimetric data in GIS environment.
More specifically, we built three thematic databases: the “fault dataset” consists of the collection of tectonic structures extracted from different catalogues and scientific papers; the “earthquake dataset” contains the instrumental and historical earthquakes extracted from the available catalogues; the “gravimetric dataset” consists of lineaments identified by the Multiscale Derivative Analysis (MDA) maxima of the Bouguer anomaly map. The maxima of the MDA map highlight lineaments contacting lithologies with different density. A table of attributes associated with each type of data was created ad-hoc.
Our analysis of the three thematic datasets at San Giuliano di Puglia showed a clear correlation between MDA lineaments and low-angle NW–SE thrust lineaments. Furthermore, there is a good correlation between the E–W re-localized San Giuliano di Puglia 2002 seismic sequence and a MDA maximum with E–W direction, without evidence of E–W surface mapped faults. Moreover, to define the geometry and depth extent of the active faults in the studied area, we have employed the Depth from Extreme Points method (DEXP) that produces an image of the source density distribution. Then we overlaid the DEXP image to the hypocenters section. The hypocenters section shows a sub-vertical plane, with the aftershocks tending to cluster between 12 and 16 km depth, well-correlated with sub-vertical DEXP maxima.
Our outcome of a E–W active fault with sub-vertical plain suggests a possible correlation of it with the pattern of the sub-vertical buried extension of Mattinata fault system, having E–W direction. These results are in good agreement with the geological and scientific works supporting the activation of Mattinata fault in 2002.