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SHALLOW NE-SW EXTENSION AND DEEP E-W RIGHT-LATERAL SLIP: COEXISTING SEISMOGENIC MECHANISMS AS AN EXPRESSION OF SOUTHERN ITALY GEODYNAMICS

The structural architecture of peninsular Italy is dominated by the Apennine mountain belt thrust over the Adriatic-Apulia foreland. In the southern Apennines most of the major seismicity gathers into a narrow ribbon stretched along the axis of the chain (Gruppo di Lavoro CPTI, 1999; Boschi et al., 2000). Large NW-SE trending seismogenic faults affect the uppermost 15 km of the crust with almost purely extensional kinematics (for a summary and review see: Valensise and Pantosti, 2001 and references therein).

Northeast of the chain axis and up to the Apulia foreland, seismicity is often deeper than 15 km and mainly occurs on right-lateral E-W trending fault planes (Del Gaudio, 2001; Di Bucci and Mazzoli, 2003; Valensise et al., 2004; Fig. 1). The Gargano Promontory and – further to the East – the central Adriatic Sea are also punctuated by reverse faulting earthquakes on E-W trending planes (Vannucci et al., 2004). On land, historical earthquakes roughly concentrate within three distinct E-W
running belts (Fig. 1), the northernmost of which includes the Mattinata Fault – a well documented strike-slip fault (Favali et al., 1993a, 1993b) that today exhibits right-lateral motion and active deformation (Piccardi, 1998; Chilovi et al., 2000). The damage patterns of these earthquakes are often stretched in an E-W fashion, which further suggests the activation of E-W seismogenic sources.

Our goal is to gain insight on the current dynamics of this region and contribute to identify the sources of the largest earthquakes (M > 5.5). To this end, we adopted a multidisciplinary approach that integrates the analysis of seismological data (historical and instrumental) with surface and subsurface geological data (geomorphology, structural geology, field geological survey, analyses of deep well logs and seismic reflection lines). We find that seismogenic structures in our study area originate at different depths and cut through the crust with two different mechanisms (Fig. 2): shallow, NW-SE oriented normal faulting within the Apennine chain and deeper E-W dextral strike-slip in the buried and outcropping Apulia foreland.

Fig. 2 - Cartoon showing the geometrical relationship between NE-SW extensional and deeper right-lateral E-W structures that represent the seismogenic sources of Irpinia 1980-like and Molise 2002-like earthquakes respectively (cross-section simplified and redrawn after: Butler et al., 2004).

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