



Active LANFs and related transfer mechanisms at the northern Termination of the Etrurian Fault System (Lunigiana-Garfagnana area, Italy).

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In the Lunigiana and Garfagnana Plio-Quaternary basins, field work (structural and morpho-structural surveys) has been integrated with seismic lines interpretation and seismological analysis, in order to define the geometry and the kinematics of the active faults. The two studied basins are asymmetric grabens originated in the hangingwall of a low-angle east-dipping extensional fault, which represents the northern termination of the well-known Etrurian Fault System. Several normal fault alignments, belonging to a inner east-dipping set and to an outer west-dipping set, splay upward from the detachment at depth increasing from 1 to 2.5 sec TWT, from W to E. A detailed description of the quaternary faults has been carried out, particularly as regards the dip-angle, the segmentation pattern and the amount of the associate displacement. The field expression of the two conjugate sets is similar, nevertheless east-dipping faults show, on average, lower dip-angles ($30^\circ < i < 60^\circ$, increasing in a W-E sense) and higher cumulative displacement values ($D > 4$ km) than the west-dipping ones ($50^\circ < i < 70^\circ$, $D > 2.5$ km). Kinematic analysis of striated major faults, confirm that the more recent movements are normal, or slightly oblique, and are coherent with an extensional triaxial stress field, characterised by a NE-SW trending minimum compression axis. In Lunigiana, the east-dipping Mulazzo and Olivola faults (which are the outermost of the east-dipping set) and on the Groppodaloisio and Compione faults (which are the outermost of the west-dipping set) show the strongest evidences of Late Quaternary activity. Historical and instrumental seismological data are in good agreement with these observations and suggest that the main earthquakes which struck the area could be associate to these faults. The possibility of nucleation of strong earthquakes on the basal detachment, sloping under the Apennines down to a depth of 5 sec TWT (~13 m) with and average dip-angle of 30° is an interesting but presently unsolved problem. Through

the Tendola - Equi Terme - Gramolazzo alignment, here named North Apuane Fault Zone=NAFZ, extension is transferred from the Lunigiana to the Garfagnana graben. The transfer zone, which corresponds to a complex regional arrangement of roughly E-W oriented right-lateral faults, experienced Quaternary deformation. Instrumental seismological data (1995 October 10 event and subsequent aftershock sequence) lead to hypothesise a present activity on NAFZ and provide a possible interpretative-key for the seismotectonic interpretation of the destructive 1920 September 7 earthquake. In the Garfagnana basin, where the seismological instrumental data are very poor, the NW-SE trending Casciana-Sillicano e Bolognana-Giovianno east-dipping faults show persuasive evidences of Late Quaternary faulting and can be interpreted as active and potentially seismogenic structures rooting at depth of 3-4 km on the regional detachment. Along the eastern side of the basin, the antithetical M. Prato-M. Mosca fault alignment could reasonably play a seismogenic role very similar to the Groppodoloso and Compione faults of the Lunigiana basin.