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Space-time evolution of the Vallo di Diano fault system, southern Apennines, Italy.

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Interaction and linkage of active faults control the seismic hazard potential of a region, as pre-linkage fault evolution strongly influence displacement-length relationships and slip rates. Earthquake recurrence intervals tend, in fact, to decrease as slip rates increase. Moreover, the mechanism to explain how displacement profile re-adjustment occurs during fault growth by segment linkage is based on the observations that changes in local stress regime during earthquakes increase the tangential stress level along strike. This can advance the timing of future earthquakes on neighbouring along-strike faults, or determine the activation, almost simultaneously, of more than one along-strike neighbouring active fault. The increasing stress level can also produce distortion of the displacement profile. This latter process is at the base of the phenomenon of pre-linkage displacement profile re-adjustment.

To determine the earthquake hazard associated to the seismogenic zones of the Apennines is therefore fundamental to understand the degree of interaction among neighbouring fault, as it well known that the strongest historical earthquakes along the Italian peninsula were generated by the activation of more than one along-strike seismogenic structure.The aim of this work is to investigate the timing of activity of the faults belonging to the Vallo di Diano Quaternary fault system (DIFS in Cello et al., 2003), and to evaluate the characteristics and degree of interaction. The DIFS is constituted by the Caggiano Fault (CF) and the Polla Fault (PF), probably re-activated together during both the 1561 and the 1857 earthquakes (Imax=X and XI respectively). We used seriated cross sections to investigate the entity of the geological throw along CF and PF. The long term tectonic activity of both faults (since the Quaternary) exhibits a substantial distortion of the displacement-length profiles in the overlapping area between the two structures. This result has been interpreted as an evidence of the mechanical interaction between CF and PF. The distribution of throw in the cumulative displacement profile, is instead characterized by the highest throw values concentrated in the central part of the fault system allowing us to argue that both interacting faults, probably linked at depth, act like two splays of the same seismogenic structure. This is also in agreement with available structural evidence; our investigations, in fact, demonstrate a coherent variation of the kinematic character along strike, from tip zones to the central part of the active fault system. Nevertheless, pitch variations are not concentrated along each single structure, but characterizes the entire array, hence confirming how the two faults may work together in a kinematically coherent way. We considered the distortion of the displacement-length profiles related to the quaternary tectonic activity for every fault of the DIFS as a result of the energetic barrier represented by shear stress in the overlapping zone between faults. The most recent evolution of the DIFS is characterized by an active deformation concentrated mainly along the CF, which represents the fault with the most clear geological evidence of post LGM tectonic activity. This has been discussed in order to discriminate slip rate variations in both space (i.e. along strike) and time for the DIFS.