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Seismotectonic implications in central Sicily (Southern Italy): new constraints from crustal seismicity

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The Sicilian fold and thrust belt system is a segment of the Alpine collisional belt that links the African Maghrebides with the Southern Apennines. The seismogenic compression hypothesis is partially supported by seismic data from western Sicily, where a few nearly E-W striking reverse earthquake occurred, and from eastern Sicily, where the background seismicity shows active compression at deep crust depths beneath the Etna region. Borehole breakout data at the outer thrust front and geodetic data support this compressional picture, pointing out slow seismic rate deformation. Although three destructive earthquakes occurred in central Sicily and in the surrounding areas (central Sicily, 361, Mw 6.6; Catania, 1818, Mw 6.0; Belice, 1968, Mw 6.1), seismotectonic zoning maps do not univocally define mainland Sicily domain and the last Italian official seismic zones model ZS9 identify it as completely aseismic domain. No specific information is available about the active state of strain of central Sicily region. To learn more about this poorly known seismogenic domain, we analyzed the instrumental seismicity which occurred from 1983 to 2010. We collected the arrival times of earthquakes occurring in the period December 1983 – April 2005, we analyzed and re-picked the waveforms of earthquakes occurring from April 2005 to April 2010. The total dataset is made up by 3566 P-phases and 2159 S-phases associated to 392 earthquakes, with local magnitude $1.0 \leq \mathrm{ML} \leq 4.7$
From the preliminary analyses performed on seismic data, we defined the mean P-wave velocity for different areas of the whole Sicily. Moreover, the depth of Moho and a detailed new crustal velocity model has been obtained for central Sicily. We relocated the dataset obtaining an improved hypocenter determination. We also computed 60 new focal mechanisms helpful into defining the cinematic behaviour in the study area.