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# Early seismogenic faults of the 2016 Accumoli-Amatrice seismic sequence (Central Apennines, Italy)

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The seismic sequence which caused numerous deaths and extensive damage in the area between Amatrice and Norcia (Central Apennine, Italy) started the 24th August, 2016 with a MW = 6.0 earthquake near Accumuli village and is ongoing. The earthquake area is strongly dissected by quaternary NW/NNW-SE/SSE (Apennine) and NE/NNE-SW/SSW (Antiapennine) fault systems. The Central Apennines main structure is the NNW-SSE Cittareale-Celano Fault System (CCFS); it extends from the Marsica Range to Cittareale-Norcia and further north; Pierantoni et al. (2015) identified it as an high-angle and NE-dipping, deeply rooted in the crust (> 15 km), shear zone. During the Pleistocene/Holocene it had extensional and left transtensive kinematic. The area of the 2016 seismic sequence is bounded on the W by a NE-dipping fault (CCFS Norcia branch) and on the E by the SW-dipping Mt Vettore (VF) and Mt. Gorzano (GF) fault system. Between these main fault systems other NW-SE striking, NE or SW-dipping, faults are present. The NW/NNW-SE/SSE fault systems are locally displaced by quaternary transversal (NE/ENE-SW/WSW) fault systems. The focal mechanism of the main shock and of the main aftershock (MW=5.4 near Norcia town, to N of Accumoli) are extensional with NNW-SSE/NW-SE axes and 45°/ 50° nodal plans. According to initial seismic assessment, macroseismic and INSAR/DPGS data many specialists felt from the first days after the main shock this seismic sequence was caused by activation of the NW-SE, SW-dipping VF and GF faults. Instead recent publications of Michele et al (2016) based on high precision seismological data showed clearly that the early sequence was caused at least by two opposing faults; one NE-dipping, deeply rooted (>15 km) is located at the western edge of Norcia depression; the other shallowest, SW-dipping, is placed on the Mt Vettore western slope. To try to detect which of the two faults was at the origin of this sequence were selected and taken into account the earthquakes occurred within about an hour after the main shock. These earthquakes are arranged in two distinct and staggered clusters, confined (N, S and center) by transversal fault systems; the first (A) develops in the northern Accumoli-Norcia area with an epicenter higher frequency arranged in an NNW-SSE belt and the second (B) in the southern Amatrice area with an epicenter higher frequency arranged in an NW-SE belt. Also A includes the main shock and the largest aftershock and B lower energy earthquakes, but overall deeper. Plotting in the depths of these earthquakes shows that most likely the first to be activated was the Norcia NE-dipping fault with extensional kinematic. Therefore according to all the above mentioned it appears that the 2016 seismic sequence was caused by a CCFS segment activation and GFS / VFS was activated shortly after by accommodation. Finally according to our and to Deschamps et al. (1981) data the periodic activation of Celano-Cittareale segments, confined each time by transversal structures, caused at least the 2016 Accumoli-Amatrice, the 2009 L'Aquila and the 1979 Norcia seismic sequences and other important historical (1915, 1703, etc) Central Apennines seismic sequences.