

Creep and locking of a low-angle normal fault: Insights from the Altotiberina fault in the Northern Apennines (Italy)

Letizia Anderlini (1), Enrico Serpelloni (1), and Maria Elina Belardinelli (2)

(1) Istituto Nazionale di Geofisica e Vulcanologia, CNT, Bologna, Italy, (2) Dipartimento di Fisica e Astronomia, Settore di Geofisica, Università di Bologna, Bologna, Italy

While low-angle normal faults have been recognized worldwide from geological studies, whether these structures are active or capable of generating big earthquakes is still debated. We provide new constraints on the role and modes of the Altotiberina fault (ATF) in accommodating extension in the Northern Apennines. We model GPS velocities to study block kinematics, faults slip rates and interseismic coupling of the ATF, which is active and accounts, with its antithetic fault, for a large part of the observed chain normal 3mm/yr tectonic extension. A wide portion of the ATF creeps at the long-term slip rate (1.7 ± 0.3 mm/yr), but the shallow locked portions are compatible with $M>6.5$ earthquakes. We suggest that positive stress accumulation due to ATF creep is most likely released by more favorable oriented splay faults, whose rupture may propagate downdip along low-angle normal fault surface and reduce the probability of occurrence of a seismic rupture of the shallower locked portion.