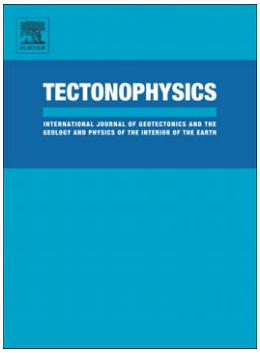

Global catalog of earthquake rupture velocities shows anticorrelation between stress drop and rupture velocity

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Global catalog of earthquake rupture velocities shows anticorrelation between stress drop and rupture velocity

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Abstract

Application of the SCARDEC method (Vallée et al., 2011; Vallée and Douet, 2016) provides the apparent source time functions together with seismic moment, depth, and focal mechanism, for most of the recent earthquakes with magnitude larger than 5.6-6. Using this large dataset, we have developed a method to systematically invert for the rupture direction and average rupture velocity V_r, when unilateral rupture propagation dominates. The approach is applied to all the shallow ($z < 120$ km) earthquakes of the catalog over the 1992-2015 time period. After a careful validation process, rupture properties for a catalog of 96 earthquakes are obtained. The subsequent analysis of this catalog provides several insights about the seismic rupture process. We first report that up–dip ruptures are more abundant than down–dip ruptures for shallow subduction interface earthquakes, which can be understood as a consequence of the material contrast between the slab and the overriding crust. Rupture velocities, which are searched without any a–priori up to the maximal P wave velocity (6000-8000 m/s), are found between 1200 m/s and 4500 m/s. This observation indicates that no earthquakes propagate over long distances with rupture velocity approaching the P wave velocity. Among the 23 ruptures

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