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On the relation between postseismic afterslip and aftershock seismicity of the 27 February 2010 Mw=8.8 Maule earthquake, central Chile

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We focus on the relation of aftershock seismicity and GPS-derived displacements following the Maule Mw 8.8 earthquake on 27 February 2010 in central Chile. The cumulative number of aftershocks and surface displacements follow a first order linear relationship indicating that both processes decay with a similar time dependent function. Based on this observational relationship, we suggest a simple method to map the spatial-temporal relative dependency between the seismicity and geodetic displacements. We compare the afterslip derived from GPS data with the distribution of aftershocks and propose a unit of measure (event/length) that quantifies the correlation. We apply this method for regionalized subsets along the Maule rupture allowing to map the relation between both processes. Using a local seismicity data catalog (Mc=3.5) we estimate an average absolute displacements of 9 mm/event on the plate interface. Furthermore, we investigate the slip for events based on scaling relations with postseismic afterslip inverted from GPS data on the plate interface. Results show that slip of individual events occasionally exceed locally the inverted afterslip from GPS. This might be explained by the tendency of the inversion to smooth small slip patches estimated by the scaling relation. However, we cannot rule out completely that the slip of some events exceeds the cumulative afterslip model which seems incompatible with aftershocks driven purely by afterslip. Most of the observed deformation is aseismic (80%) and the seismic slip concentrates on areas of high coseismic slip gradient. In times of increasing networks of geodetic and seismic stations this method can be applied to other earthquakes where a sufficient number of geodetic observations and earthquakes are observed.