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Reappraisal of the Mw8.8 2010 Maule (Chile) earthquake by Optimal time alignment (OTA) of tide-gauge tsunami waveforms in nonlinear joint inversion

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The Mw8.8 Maule (Chile) earthquake, occurred on 27 February 2010, has been one of the greatest earthquakes in the last 50 years. Its rupture process has been studied by using different methodologies and by inverting different kind of data, such as tsunami, seismic, InSAR, GPS, land-leveling.
Most of the published studies found a slip distribution composed by two main patches, one located northeast of the epicenter with maximum slip greater than 15 m and the other one located southwest of the epicenter with slip lower than 10 m.
The slip pattern retrieved by tide-gauge data inversions is generally placed landward with respect to the models obtained by inverting other kinds of data. Moreover, the tsunami waveforms predicted by the slip models are generally anticipated with respect to the observed ones, and the presence of these time-shifts can be translated into a misplaced pattern of slip.
We reappraise the coseismic slip distribution of the 2010 Maule earthquake by jointly inverting InSAR, GPS, land-leveling, and tsunami data; in particular, we apply, relatively to the tsunami data, a methodology named OTA (optimal time alignment, Romano et al.,2016) that allows for the automatic estimation of any eventual time-shift between observed and predicted tsunami waveforms resulting by the inversion.
In this way, we investigate how much slip effectively went to the trench and if is possible to reconcile the different slip models obtained with tsunami and other kinds of data without invoking second order effects in the tsunami propagation (e.g., dispersion, ocean floor elasticity, water density variation with depth).