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Build seismic cycle balance deformation with InSAR in Northen Chile

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Recent studies have pointed out to a discrepancy between the short- and long-term deformation of overriding plates in subduction zones. This led to debates about when and how permanent deformation is acquired. This contradiction has notably been observed along the Central Andes Subduction Zone, where the coast subsides during and shortly after major earthquakes while a coastal uplift with rates ranging between 0.1 and 0.3 mm/yr has been inferred the last 4000 ky. For instance, during the 15th September 2015 Mw 8.3 Illapel earthquake the geodetics (GPS and InSAR) data show a coastal subsidence along the line-of-sight of 20 cm in InSAR.

To reconcile the seemingly contradictory observations, we here propose to provide a seismic cycle uplift balance by constrainning inter-, co- and post-seismic vertical velocities from InSAR time series. The study focuses on La

Serena peninsula (71.3°W, 30°S, Chile) along which the Illapel earthquake occurred and for which long-term uplift rates have been provided by previous geomorphological studies.

To build this seismic cycle balance, we use InSAR data (Sentinel-1) acquired between the September 15, 2015 and January 19, 2019. The time series for the ascendant orbite is calculated and the accumulated vertical displacement extracted providing co- and post-seismic displacement. The co-seismic displacement are similar to those previously obtain. To constrain the displacement during the inter-seismic period, data on both sides of the peninsula are used. In that respect, we aim determining when, during the seismic cycle, and where, along the coast, the uplift occurs.

The deduced time series will then be confronted to numerical modelling to provide the short- and long-term mechanics reproducing the short- and long-term observations.