

Foreshocks and aftershocks of the 2014 M8.1 Iquique, northern Chile, megathrust earthquake

Hugo Soto (1), Christian Sippl (1), Bernd Schurr (1), Günter Asch (1), Frederik Tilmann (1), Diana Comte (2), Sergio Ruiz (2), and Onno Oncken (1)

(1) Deutsches GeoForschungsZentrum (GFZ), Potsdam, Germany (soto@gfz-potsdam.de), (2) Departamento de Geofísica (DGF), Universidad de Chile, Santiago, Chile

The M8.1 2014 Iquique earthquake broke a central piece of the long-standing, >500 km long northern Chile seismic gap. The Iquique earthquake sequence started off with a M6.7 thrust event presumably in the upper plate seaward of the Chilean coastline. Deformation was quickly transferred onto the megathrust with three more events of $M > 6$ until it culminated in the mainshock that broke a compact asperity with possibly up to 12 m of slip two weeks later. The mainshock was followed by vigorous aftershock sequence, including a M7.7 event just south of the main slip patch approx. two days later.

The whole sequence of events was well recorded by the Integrated Plate Boundary Observatory Chile (IPOC). The IPOC network was complemented quickly after the first large foreshock by ~60 additional temporary seismic stations deployed by the University of Chile and the German Research Centre for Geosciences – GFZ. Processing the continuous data with an automated multi-step process for event detection, association and phase picking, we located more than 25,000 events for one month preceding and nine months following the Iquique mainshock. Whereas the foreshocks skirt around the updip limit of the mainshock asperity, the aftershocks agglomerate in two belts, one updip and one downdip of the main asperity offshore the Chilean coast. The deepest events on the plate interface reach ~65 km depth in two separated clusters under the coastal cordillera, which show a significant difference in dip, indicating strong long-wavelength slab topography or a slab tear. We will also analyze upper- and deeper intra-plate seismicity and in particular its changes following the Iquique mainshock.