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Structure, seismogenic properties, and aftershock distribution in the rupture area of the 2010 Maule, Chile, earthquake

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The Maule Mw 8.8 earthquake that occurred along the Chilean subduction zone on 27 February 2010 is one of the largest megathrust earthquakes ever recorded. Several published rupture models have estimated co-seismic slip in excess of 15 m along the subduction thrust. However, mainly due to the lack of data and well constrained models, the relationship between co-seismic slip, seismic properties of the interface, and aftershock locations is still debated. Here we present first results of aftershock locations, moment tensor inversions and seismic tomography based on recordings from the International Maule Aftershock Data set (IMAD).

Based on automatic arrival time picks for P and S waves about 30,000 aftershocks in the magnitude range Ml 2-6.5 could be located. The seismicity is mainly concentrated along the subduction interface between 15-40km depth, except for the Pichilemu area in the North of the rupture zone were crustal seismicity in the overriding plate is prominent. Focal mechanisms are dominated by thrust faulting along the subdcution interface and normal faulting for the curstal events in the Pichilemu area. Preliminary velocity tomography results show a more or less planar plate interface. However, in the nucleation area of the 2010 Maule event a distinct P-wave velocity high extending into the overriding plate is observed. We are currently investigating the relationship between published co-seismic slip models and after slip distribution and the structural properties and aftershock locations.