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The 2010 Maule earthquake: How far south did it break?

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The Maule earthquake (Mw 8.8) occurred in a well identified seismic gap in South-central Chile. This earthquake broke a region ∼500km length between Rio Rapel and Arauco peninsula producing a big tsunami. An early post-seismic mission along the rupture zone was carried out by several teams from Chilean, European and American laboratories. A large number of seismometers and accelerometers started to work ten days after the earthquake and remained installed for about a year. We study a subset of the aftershocks focusing our study in the southern end of the rupture: the Arauco peninsula which has been the rupture limit of several past events such as the big mega earthquake of Valdivia (Mw9.5) in 1960 or the 1835 Maule earthquake (Mw 8.5) described by Darwin and Fitzroy. In Chile, in some cases, the Peninsulas have had the role of seismo-tectonic boundaries for the earthquake propagation. The segmentation of the subduction margins is currently debated. Geological studies show evidence of active shallow faults on the Arauco Peninsula that might have been reactivated during the Maule earthquake and that could be related to the segmentation. There is also an important controversy concerning the southern end of rupture: some authors claim that the region off-shore Arauco did slip substantially during the earthquake (up to 5 m West displacement and 1.75 m uplift at the tip of the Peninsula); while others stop the rupture closer to Concepcion, about 120 km N of Arauco.
In this study we study the aftershocks that occurred under and off the Arauco Peninsula area following the Maule earthquake to determine more precisely the southern limit of the rupture and to highlight the activated faults using the near field network. In a first step, we manually pick the wave-forms to locate the 200 larger events during the first month after the network installation. In a second step, we combine this locations to relocate an automatic catalog with a larger number events in the same area thanks to hypoDD software. For the aftershocks that have a sufficient azimuthal coverage, we also compute focal mechanisms using the first motion data. Preliminary results of the characterization of this seismicity will be discussed in this presentation.