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The rupture zone of the Feb. 2010 M8.8 Maule Chile earthquake : preliminary relocation of aftershocks from a temporary marine seismic network and numerical modeling of forearc thermal structure

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The 27 February 2010 M8.8 Maule earthquake ruptured a 500-600 km long segment of the Chile subduction zone. It also generated a tsunami with runup heights of 3-6 m observed along the coast of Chile and adjacent islands offshore. Most of the rupture filled a seismic gap that had not experienced a major earthquake since 1835. The vast majority of the rupture zone is located offshore. Therefore, in order to study the portion of the subduction mega-thrust which slipped, it is necessary to conduct marine studies. In order to better constrain the geometry of the rupture zone and its lateral extent, a temporary offshore seismic network was installed during the period July-September 2010. 17 OBS (Ocean Bottom Seismometers) from the National Taiwan Ocean University and the Central Taiwan University were deployed within the central portion of the rupture zone from roughly 36°S to 34.5°S and recorded aftershocks for two three-week periods during July - September 2010. The OBS used are the "micrOBS" type (designed by Ifremer and constructed by Sercel). The instruments were deployed and recovered using the Chilean fishing vessel Gardar. We report here on preliminary relocation of earthquakes from the first period 15 July - 6 August 2010. Four moderate events (magnitudes 4.3 - 4.8) available from the NEIC-PDE catalog, occurred during this period within the network and are used as test events to calibrate the earthquake relocation procedure. Relocation was performed using the software package SYTMIS (INERIS Nancy, France).
Finite-element modeling of the Chile forearc thermal structure was performed in order to determine the expected limits of the seismogenic zone (typically between 100-150°C and 350-450°C). Results indicate a seismogenic zone extending from 30km from the trench to 150km from the trench. These limits are then compared to the observed distribution of aftershock hypocenters.