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Seismicity and velocity structure in Southern Chile (between 37° and 39°S): First results from the TIPTEQ network

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Subduction zones generate the world's largest and most destructive earthquakes. Understanding the factors leading to these earthquakes in the coupling zone of convergent margins and their interrelation with surface deformation are the main aims of the international and interdisciplinary research initiative TIPTEQ (From The Incoming Plate To megaThrust EarthQuake Processes) which is financed by the German Ministry for Education and Research (BMBF). These aims shall be achieved by obtaining high resolution images of the seismogenic zone and the forearc structure, which will form the base for identifying the processes involved. Our studies focus spatially on the nucleation zone of the Mw=9.5 1960 Chile earthquake, the worldwide largest instrumentally ever recorded earthquake.

Within this project a large temporary seismological network was installed in southern Chile between November 2004 and October 2005, covering the forearc between 37° and 39°S. It consisted of 120 digitally recording and continuously running seismic stations equipped with short period sensors. The onshore network was complemented by 10 ocean bottom seismometers/hydrophones (OBS/OBH). The stations in the central part of the network have very small station spacings which will assure an increased quantity of P and S phase onset times and which will achieve the observation of the whole wavefield (coherent waveforms). We collected about 1.2 TByte of data. First steps of the data processing are the event detection, the onset time picking, and the

localisation of the (local) earthquakes (catalog). Later steps include the determination of the velocity and attenuation structure (tomography), the analysis of the stress field by moment tensor inversion, the analysis of later phases such as guided waves and scattered/converted/reflected arrivals, the analysis of teleseismic recordings (receiver functions, anisotropy), and many more. The results will be jointly interpreted with the findings of controlled source seismic studies, magnetotelluric measurements, and surface geological studies.

Each day 2 to 3 local earthquakes and several teleseismic events were recorded. We present first results including data examples, seismicity distribution, and velocity models. Most of the crustal seismicity in the network is concentrated in several clusters close to the coast line. Seismicity at a depth between 20 and 30 km close to the coast line might be located in the seismogenic coupling zone or its vicinity. Benioff seismicity is found down to a depth of 100 km.