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The TIPTEQ seismological network in Southern Chile - Studying the Seismogenic Coupling Zone

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The Southern Chilean subduction zone is an ideal natural laboratory to study the world's largest and most destructive earthquakes. Understanding the factors leading to these earthquakes in the coupling zones 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 are achieved by deploying dense passive seismic networks to obtain high resolution images of the seismogenic zone and the forearc structure, which will form the base for identifying the processes involved.

Within this project two amphibious passive seismic networks have been installed. A large temporary seismological network operated in southern Chile from Nov. 2004 until Oct. 2005, covering the forearc between 37˚ and 39˚S, and is located the area of the nucleation area of the Mw=9.5 1960 Chile earthquake. It consisted of 120 digitally recording and continuously running seismic stations equipped with short period sensors. The onshore network is complemented by 10 ocean bottom seismometers/hydrophones (OBS/OBH) giving us a full coverage of the seismogenic zone from the upper to lower end. The network is characterized by very short station spacing in the centre ($\sim$5km) which gives an increased quantity of P and S phase onset times and allows the observation and interpretation of the whole wavefield (coherent waveforms). A second network of 20 onshore and 20 offshore stations is installed at and around Chiloe Island for a one year period between Nov. 2004 and Oct. 2005. These two networks are covering different ages of the subducting Nazca plate and thus en-

abling us to study the influence of age and temperature of the downgoing lithosphere on the seismogenic interface.

We have collected about 1.2 TByte of data. First steps of the data processing are event detection, onset time determination, and compilation of a (local) earthquakes catalogue. Later steps will 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. Each day 2 to 3 local earthquakes and several teleseismic events were recorded. First results for both seismic networks including data examples, seismicity distribution, and preliminary 1D velocity models will be presented. Most of the crustal seismicity in the northern network is concentrated in several multiplets close to the shore line. Seismicity at a depth between 20 and 30 km, also close to the shore line, is located in the seismogenic coupling zone or its vicinity. Benioff Zone seismicity can be found down to 100 km depth. Between 41.5° and 43.5° S (at and around Chiloe Island) we also found several earthquakes in the continental crust (forearc and magmatic arc) as well as in the downgoing slab.