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The Onshore Reflection Seismic Survey of Project TIPTEQ: Imaging the Chilean Subduction Zone Using Prestack Kirchhoff Depth Migration

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The Chilean continental margin is one of the most seismically active subduction systems and serves as a natural laboratory to study mega-thrust earthquakes. Investigations with respect to the structural and petrophysical properties of the corresponding seismogenic coupling zone are the key to understand the triggering mechanisms and processes that generate those mega-thrust earthquakes. Amongst 13 sub-projects within the joint project TIPTEQ - from The Incoming Plate to mega-Thrust Earth-Quake processes - the controlled source seismology sub-project aims at the imaging and identification of structural and petrophysical properties in the seismogenic coupling zone.

For these purposes, a 3-component high-resolution survey was set up to illuminate the present state of the ruptured plate interface at the southern Central Chilean margin. The 95 km long profile runs from the Pacific Ocean to the Central Valley along an west-east trending line at about 38° S crossing the relocated hypocentre of the historic 1960 Valdivia earthquake ($Mw = 9.5$). In addition to the near vertical reflection (NVR) profile an expanding spread (ESP) experiment focuses on the down-dip limit (30-50 km depth) of the seismogenic coupling zone. Furthermore a SH-shot configuration was carried out as a pilot study to test SH-wave generation by three-hole (Camouflet) shooting in a crustal regime.

This contribution focuses on the structural imaging results using prestack Kirchhoff

depth migration. Close to the coast the oceanic crust is clearly visible and can be traced below a strongly heterogeneous overburden further inland down to depths of about 50 km. At the eastern end of the seismic section, a strong reflector appears at about 60 km depth, which runs perpendicular to the extrapolated plate interface. Taking into account results from previous experiments and other components of project TIPTEQ, we will present an interpretation of the subduction zone image with special emphasis on its structural features.