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S-wave velocity and Poisson's ratio model in Southern Chile along a transect at 38°15'S from active and passive TIPTEQ data

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Using active and passive seismology data from project TIPTEQ (from The Incoming Plate to mega-Thrust Earth-Quake processes) we derive a shear (S) wave velocity and a Poisson's ratio (σ) model across the Chilean convergent margin along 38°15'S, where the M_w 9.5 Valdivia earthquake is believed to have occurred. The obtained S-wave velocity model consists of three different tomographic images that were merged together. In the upper part (0 - 5 km depth), controlled source data from explosions were used to obtain a S-wave travel-time tomography. In the middle part (5 - 20 km depth) a dispersion analysis and then a noise tomography were carried out in two different ways: one used the dispersion curves to obtain a 3D S-wave velocity model in one step and the other used the dispersion curves to obtain surface-wave velocity tomographic images for different periods and then used the surface-wave velocity values every 10 km along the profile to obtain 1D S-wave velocity profiles every 10 km that were then interpolated to obtain a 2D S-wave tomography. Both methods produce similar S-wave travel-times. In the lower part (20 - 75 km depth, depending on the longitude) an already existent S-wave velocity model from local earthquake tomography was merged with the other two sections. The final S-wave velocity model and already existent compressional (P) wave velocity models along the same transect allowed us to obtain a Poisson's ratio model. The results show that the velocities and Poisson's ratios in this part of the Chilean convergent margin can all be explained in terms of normal rock types. There is no requirement to call on the existence of significant amounts of present-day fluids in the continental lithosphere above the plate interface in this part of the Chilean convergent margin, to explain the derived velocities and Poisson's ratios.