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The effect of seamount subduction on the stress field of the oceanic plate and the accretionary prism offshore Valparaiso, Central Chile

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Seamounts associated with the Juan Fernandez Ridge on the Nazca plate are currently subducting beneath the South America plate, in a region characterized by a change in the configuration of the slab subduction angle, in the structure of the continental margin and in the sediment filling at the trench. We present here a study of the effect of seamount subduction on the stress field of the accretionary prism and of the subducting lithosphere. 2-D numerical modeling is performed to test patterns of shear failure developing as a consequence of seamount subduction. The model context is that of an accretionary prism where we include the first 40 km of the oceanic plate. The interplate geometry is modified to account for the presence of a relatively rigid seamount and its root within the oceanic plate, which slides under the upper plate. This assumption leads to rheological discontinuities at which shear zones develop. Results are compared with the recent offshore seismicity and in particular are used to understand the effect of 2 seamounts: the Papudo seamount, a recent subducting seamount north of latitude 33S (little trench sediments, active accretion, flat subduction), and the San Antonio seamount, a deeper subducting seamount south of latitude 33S (thick trench sediments, no active accretion, normal subduction). We analyse the effect of these seamounts on the seismic coupling and on the nucleation of large subduction earthquakes. In particular, the San Antonio seamount could be the asperity responsible for the 1985 (Mw=7.8) Valparaiso earthquake.