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Thermo-mechanical segmentation of the Nazca plate in Central Andes

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The dynamics of the Chilean subduction is not uniform and presents along-strike variations controlled by plate interactions and pre-existing heterogeneity's in the upper plate. This study determines the variations of thermo-mechanical characteristics of the subducting Nazca plate before subduction, and their relations with the known South America plate segmentation. Thermal variations are derived from the regional depth anomalies of the seafloor. Seafloor depth anomalies are used to obtain maps of corrected ages and thickness of the oceanic lithosphere and compared to the heat flow anomaly data. It is abnormally colder/thicker to the north of the Iquique Ridge at 22°S and hotter/thinner to the south. Mechanical characteristics come from the shape of the bending prior to subduction. After age correction and filtering of the bathymetric data, the along-strike variations of the elastic thicness are traduced in mechanical thickness. A limit between strong and weak lithosphere appears at 28°S. To completely describe the Nazca plate and its correlation with interplate seismicity, the compositional characteristics are the third and necessary parameter. Finally, the Nazca plate can be divided in five main segments directly correlated with the seismic segmentation of the subduction. One interesting point is that the wavelength of measured lithospheric anomalies in front of the flat-slab is greater than the Juan Fernandez (JF) Ridge. It strongly suggests that it the oceanic lithosphere that is responsible for the flat-slab, and not only the JF Ridge.