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Stress anomaly and gravitational potential energy of the Andean convergent margin from gravity modelling

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Estimates of stress anomaly and Gravitational Potential Energy (GPE) of the Nazca plate and the Andean convergent margin, as derived from gravity modelling and constrained by results of seismic experiments and other prior information, are presented.
The normal stress anomalies onshore have been computed at the plate interface between the subducting slab and the overriding South American plate, and offshore on top of the oceanic Nazca plate. The GPE estimates have been made for the entire region using a 100 km vertical depth as reference level for the computation.
The normal stress anomaly map of the Nazca plate, except the Nazca ridge, shows generally uniform distribution of stresses. The relatively high values of stress over the Nazca ridge are attributed to high elevation associated with young crust of the ridge. The fore-arc region is characterized by trench parallel low and high stress anomalies. The latter, which is higher by 50 to 100 MPa than in the adjacent regions, might be attributed to high density structures above the plate interface and might indicate regions of enhanced strain energy. Furthermore, the peaks of the high stress anomaly, except in the region of Iquique, correlate reasonably well with the seismicity of the trench.
The high topography of the Andean mountains and the ridges in the Nazca plate exhibits high GPE values relative to the ocean. The resulting stress from GPE could influence the state of stress in the Nazca plate and adjacent regions.
Provided that gravity models are well constrained, the resulting density structures could be used to infer the state of stress in the lithosphere and the associated GPE distributions.