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Towards asperity mapping using satellite-derived gravity gradients

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Major subduction-zone earthquakes have recently been shown to coincide with locations of high isostatic residual- and seismic b-values. Concerning the South-American active margin of Chile, these locations can be interpreted as regions of positive inner-crustal density anomalies that contribute to asperity generation and interface locking. By using 3D density forward modelling, we show that the measured spatial derivatives of the gravity field at orbit height deliver sharper signals of density anomalies in the underground, when compared to the gravity field itself. Furthermore, invariant combinations, e.g. the determinant of the gravity gradient tensor, were used in order to emphasize location and shape of density anomalies. With this presentation we aim at highlighting the required parameter ranges for anomalous structures in the overriding plate of a subduction zone for detection when using satellite-derived data. We estimated the minimum size of such structures as a function of density contrast to generate a gravity/gradient signal in the order of GOCE's gradiometer system resolution at orbit height. Presently, we are working on the calculation of regional isostatic fields at the Pacific-Chilean margin with the Lithoflex software package so that we are also going to show results on isostatic residual fields and flexural rigidity supported by GOCE gravity data joint interpretation.