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Gravity signature of a large active intrusion in the central Andes

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Almost two decades of ground uplift centered around Uturuncu volcano, in southern Bolivia, is interpreted to result from an active magmatic intrusion. The 70 km wide footprint of this deformation anomaly constrains the source of this deformation at 15 to 20 km depth in the middle crust, in a region that other regional geophysical data indicate is the top of a thick region of hot partially molten rock. Given that there has been no surface volcanism at Uturuncu for 270 ka, the current uplift is a very good candidate for pluton intrusion and provides an outstanding opportunity to constrain key parameters in the dynamics of how magma bodies are assembled in the crust, and which geodetic and geophysical signatures mirror these assemblages. As part of an integrated multidisciplinary investigation of the uplift, we are interested in understanding the constraints of sub-surface architecture and regional structures on the spatio-temporal variations in geophysical parameters during the emplacement and evolution of this active mid-crustal intrusion. Herein, we present preliminary results from a field survey during which we obtained static gravity data around Uturuncu with average station spacing of about 4 km using two spring gravimeters collocated with GNSS receivers. We achieved data uncertainty of well below 500 nm/s2 for individual readings allowing for unprecedented precision of the anomalous gravimetric signature. Data are employed to construct a detailed Bouguer anomaly map of the deformation anomaly as well as a 3D model of the subsurface density distribution from data inversion. The inversion routine builds a subsurface model defined by the 3D aggregation of parallelpiped cells, based on a controlled 'growth' process of anomalous density bodies by means of an exploratory approach.