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Lateral variations of crustal structures in eastern Himalayas: a 3d modelling approach constrain by terrestrial and satellite gravimetry

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Crustal geometry of collisional belts is a key information to constrain the evolution of orogens. The shape of the plates involved in the collision allows to determine the isostatic state of the range, to assess their rheologies and also to estimate their seismic potential.
Over the last three decades, several geophysical studies, including gravimetry and seismology, have been undertaken in the Himalayas to decipher the deep sctructure of the orogen. Most of these studies focused on individual cross sections and 2D models, especially in Central Nepal. Due to the sparseness of available geophysical data the question of lateral variability of crustal structures remains unanswered. Topographical and geological map show significant variations along the arc and some studies proposed a segmentation of the Main Himalayan Thrust. Investigating lateral variations at depth is therefore crucial.
In the past three years, we have carried out gravity measurements during four terrestrial gravimetry field campaigns. We have measured 366 new data points to fill the gap in Central and Western Nepal and in Bhutan. In addition with the existing data in Eastern Nepal and in Sikkim, as well as further to the North and South, terrestrial gravity is now covering more than 1200 km of the Himalayan arc. The Bouguer anomaly profiles across the arc show an East-West variation in the shape of the underthrusted India plate especially between Nepal and Bhutan. The deepening of the crust beneath Bhutan is more abrupt than in Nepal. To clarify this variation in crustal structures, we jointly use the new terrestrial gravity dataset and satellite gravity gradients provided by GOCE to constrain a 3D thermo-mechanical flexural model.