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A new gravity model of Tien Shan: constraints for structure and evolution.

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The main goal of this study is construction of an integrated model of Central Tien Shan, which is based on a joint analysis of the gravity, GPS and geophysical data. Tien Shan is one of the most active intraplate orogens in the world, located ∼1500 km north of the convergence between Indian and Eurasian plate, and surrounded by stable Kazakh platform to the north and the Tarim block and Parim block to the south. Despite this area was extensively studied during last decades, several principal problems, related to its structure and tectonics, remain unsolved up to now:
1. Several geodynamic scenarios have been discussed so far to explain tectonic evolution, such as a direct "crustal shortening", intracontinental subduction and some others, but no clear evidences for any of them have been found.
2. A significant disagreement exists between the shortening rates of ∼20 mm/yr (from GPS measurements) and ∼10 mm/yr (from geological and seismic data).
3. Still it is not clear why Tien Shan grows so far from the plate boundary and Himalayan collision zone.
Density variations within the Earth represent one the main factors, which control tectonic evolution at all levels. Therefore, gravity modeling can provide important constraints to resolve these questions. Preliminary results of this study evidence that:
(1) There exists a very strong deflection of the Tien Shan lithosphere from isostatic equilibrium. The best fit of the modelling results is found for the model according to which the Tarim plate partially underthrusts Tien Shan; (2) It is necessary to assume partial detachment of the Tarim lithosphere; (3) Large density anomalies in the upper mantle possibly relate to magmatic underplating during the initial stage of the tectonic evolution. Therefore, the weak lithosphere could be the factor that initiates mountain building far away from the collision zone.