



High resolution 3D underground model of the seismically active region of Almaty (Kazakhstan)

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The city of Almaty is located in front of the Northern Tien Shan at the boundary to the sedimentary basin of the Ili River. The boundary is defined by the still active Almaty fault, which crosses the city from the west to the east. Hence, the region of Almaty was destroyed in many earthquakes; the last one occurred 1992 with a magnitude of 7.3. Thus, a high scientific and economic interest exists to understand the earthquake mechanism and to determine the seismic hazard for this region. A three-dimensional (3D) gravimetric model can help to gain more information about the geometry and structure of the bedrock, which plays an important in the seismic hazard analysis.

In this study, a 3D density model of the subsoil is developed using gravity data from Kazakhstan, collected in the 1970's and 1980's. The gravimetric modelling reveals three geological units as sources for the distinctive gravity anomalies around Almaty: the crust-mantle boundary (CMB), the sediments of the Ili basin, and a metamorphic complex in the mountains of the Tien Shan. The CMB is characterised by a steep gradient in the centre of the model, correlating well with the elevation. The modelled crustal thickness is consistent with previous investigations concerning the CMB for the Tien Shan. The sediment thickness varies between 0 and 6 km in the Ili basin. The locations of the geological units on the surface of the gravimetric model correspond to the geological mapping of this region. Small residuals demonstrate the high quality of the gravity model.