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Structural study of crust and lithosphere beneath Zagros mountain range by gravity and geoid data modeling

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Extended Abstract

Summary

Specific geological and economic features of the Zagros orogeny region have made this region an important subject to study. Therefore, in this research, we explore the structure of the crust and lithosphere of this region by forward modeling of gravity and geoid data The survey area is located in the Zagros mountain range comprising of all major structural domains from Persian Gulf to central Iran. According to our results, crustal thickness is minimum beneath Persian Gulf increasing toward northeast and reaches to its maximum of 66 km underneath main Zagros thrust. Passing through the Sanandaj-Sirjan zone, crustal thickness decreases again below the central Iran. The depth to the boundary between lithosphere and asthenosphere changes from ~220 km beneath Arabian plate to 100 km beneath central Iran.

Introduction

Zagros orogeny is one of the most active orogenic belts among the mountain ranges extending approximately 2000 kilometers from the Anatolian fault in eastern Turkey to the Minab fault in southern Iran. Concerning the importance of this region, structural analysis of Zagros mountain range has been regarded in this research. The Bouguer anomaly data that we have used in this paper, are the ground gravity data with resolution of 2 arc-minute. In order to constrain the results of gravity data modeling and due to inherent non-uniqueness of gravity modeling solution, information from other resources including geomagnetic data, geological studies and seismology have been used.

Methodology and Approaches

In this research, density model is created using IGMAS+ software (Interactive Gravity and Magnetic Application System). This method is based on the analytic solution of the volume integral for the gravity and geoid effect of a homogeneous object in which the integral over the polyhedral is transformed into line integrals.

The structure of the model is divided into vertical and parallel sections, and other elements forming the geometry of the model are defined in these vertical sections. In the forward modeling, the gravity and geoid effect of the model is compared with the observed values. In the case of non-conformance between them, the necessary changes are applied in the model and anomaly is recalculated. This process continues until desired adaptation between the calculated and observed gravity is established.

Results and Conclusions

In this research, the structure of crust and lithosphere in the Zagros continental collision zone was investigated using forward modeling of gravity and geoid data. The use of high-precision ground gravity data, which is more accurate than satellite data, allows us to detect and model the smaller internal structures in the Zagros region. For estimation of the final model, the data and results of geophysical studies as well as geological information of the region have been used as additional information. According to the results of the modeling, the Moho depth below the Persian Gulf basin is the lowest, which is gradually increasing to the northeast to a maximum of 66 km below

the main fault of Zagros. Furthermore, the resulting model indicates the thinning of the lithosphere below the Iranian plate, which confirms previous studies in this region.