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TESTING THE IRANIAN GRAVIMETRIC GEOID

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ABSTRACT

To test the accuracy of the Iranian gravimetric geoid computed by the IfAG group, we used 55 points of Global Positioning System (GPS) network with stations of Iranian first order leveling network, chosen in different parts of the country. In order to study the effect of topography and gravity data coverage on geoid accuracy we also select five traverses in different part of the country from these points. According to the results of this research the absolute accuracy of IfAG computed geoid is estimated as 1.56 m; similarly, for the five selected profiles we get respectively accuracy with the range of 0.90 m to 1.92 m. The best results are seen in the west and center of country (0.90 and 0.91 m respectively) and the worst in the north and south-east (1.92 and 1.27 respectively). It can be clearly shown that in these areas have the greatest lack of gravity points. To test the relative accuracy of the geoid, we computed relative geoidal undulations for all possible baselines and separately for the five above selected profiles. The average relative accuracy of the IfAG computed geoid is 36 PPM for all possible baselines (using 55 points) and 21.3 - 57.7 PPM for the five selected profiles for average baseline length. Again we get the worst results in the north and southeast of country (35.2 and 57.7 PPM).

In order to absorb the effect of the long-wavelength errors of geopotential models, bad gravity coverage (the north and south-east of the country are not well covered), bad elevation datum for the gravity observations (since barometric leveling was mostly used), systematic errors in the differential leveling and problems in the GPS datum, a simple datum shift is determined by a regression. The results improve slightly: the RMS of geoids fits reduce from 1.38 m to 0.99 m and we get the average accuracy of the geoid equal to 1.17 m. It is noted that the corresponding datum shift parameters are of the order of 4 to 15 m and are therefore unrealistic as a true datum shift. But the shift seems useful for absorbing the long-wavelength geoid errors.

In testing any gravimetric geoid it is usual to test its internal estimate of accuracy against another independent approach such as GPS/leveling. In this research however we can not get any reliable values from the IfAG groups. According to a personal feeling of one members of the IfAG group it can't be much better than about 1 m. the results of this research should that even the expected value of 1 m is rejected against 1.56 m (my external estimation of absolute accuracy).