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Establishment of National Gravity Base Network of Iran

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A gravity base network is supposed to be a set of benchmarks uniformly distributed across the country and the absolute gravity values at the benchmarks are known to the best accessible accuracy. The gravity at the benchmark stations are either measured directly with absolute devices or transferred by gravity difference measurements by gravimeters from known stations. To decrease the accumulation of random measuring errors arising from these transfers, the number of base stations distributed across the country should be as small as possible. This is feasible if the stations are selected near to the national airports long distances apart but faster accessible and measurable by a gravimeter carried in an airplane between the stations. To realize the importance of such a network, various applications of a gravity base network are firstly reviewed.
A gravity base network is the required reference frame for establishing 1st , 2nd and 3rd order gravity networks. Such a gravity network is used for the following purposes:
a. Mapping of the structure of upper crust in geology maps. The required accuracy for the measured gravity values is about 0.2 to 0.4 mGal.
b. Oil and mineral explorations. The required accuracy for the measured gravity values is about 5 μGal.
c. Geotechnical studies in mining areas for exploring the underground cavities as well as archeological studies. The required accuracy is about 5 μGal and better.
d. Subsurface water resource explorations and mapping crustal layers which absorb it. An accuracy of the same level of previous applications is required here too.
e. Studying the tectonics of the Earth's crust. Repeated precise gravity measurements at the gravity network stations can assist us in identifying systematic height changes. The accuracy of the order of 5 μGal and more is required.
f. Studying volcanoes and their evolution. Repeated precise gravity measurements at the gravity network stations can provide valuable information on the gradual upward movement of lava.
g. Producing precise mean gravity anomaly for precise geoid determination. Replacing precise spirit leveling by the GPS leveling using precise geoid model is one of the forth coming application of the precise geoid.
A gravity base network of 28 stations established over Iran. The stations were built mainly at bedrocks. All stations were measured by an FG5 absolute gravimeter, at least 12 hours at each station, to obtain an accuracy of a few micro gals. Several stations were repeated several times during recent years to estimate the gravity changes.