A modern Astro-Geodetic approach to determination Geoid, Case study: Iran

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A broad range of geodetic, geophysical, oceanographic and precise engineering applications exist, rendering the need for precise Geoid determination methods more pressing than ever. The classical Astro-geodetic leveling is a reasonably accurate method to derive the terrestrial Geoid, provided there are enough astronomical data in the area. Astro-geodetic Geoid solutions are computed by the spatial integration of the two components of vertical deflections. Astro geodetic vertical deflections (VD) are more effective for a precise Geoid than gravimetry or other methods, for example, about 20 gravity points are necessary to "replace" one VD in a certain location.

Astro geodetic was 'out' for 10 or 20 years but now we see a renaissance, caused by modern Astro geodetic methods, high efficiency and ideal conditions to combine with geological and satellite data. Modern Astro geodetic methods use satellite measurements (optical and electronically, LASER etc.), with CCD observations, and combinations of terrestrial and GPS data (especially for precise height and for the stabilization of Geoid solutions).

In this paper, we could obtain a Geoid profile along the astronomical stations and combinations of terrestrial and GPS data. From two methods this profile was obtained, Helmert's and UNB methods. The computations were done on the both Hayford and WGS84 ellipsoids. From UNB method Geoid was approximated with second order

polynomial for Iran area. At the end, after comparing the results, it was found that for Geoid determination from relative vertical deflection components, the UNB method is more convenient.