



## **Studying subsidence in Iran with leveling and permanent GPS observations**

M. Amighpey(1), Z. Mousavi(1), H. Nankali(1), S.Arabi(1), M. Sedighi(1), S. Hosseini(1)

(1) Geodetic and Surveying Dept., National Cartographic Center, Tehran, Iran  
(Amighp@ncc.neda.net.ir)

Studying earth surface changes as pre-determined of huge events such as earthquake, detect and management of subsidence area has been considered. Earth subsidence due to impolitic extraction of ground water and other ground sources is one of difficulties that occurred in recent decade in various areas in Iran. In this article, we considered subsidence in some of these areas. Based on precise leveling observations and result of the processing of Iran global permanent GPS network, Neishaboor, ghareghashlagh and Gorgan, had considerable subsidence.

Geodynamic research in Iran started for monitoring of earth surface changes at National Cartographic Centre (NCC) of Iran from 2004. For this purpose, Iranian Permanent GPS Network (IPGN) include of 108 stations is established according to tectonic, seismic hazard and population parameters. As a result of GPS Data, Neishaboor, Garegeshlag, Gorgan, have 100mm in 2 years, 80mm in 1.5 years, 60mm in 1year subsidence, respectively.

In the other hand, according to first order precise leveling network repetition , we compared these two epochs of observations and reach the height changes of first order leveling routs. First order precise leveling network of Iran include of 235 leveling routs with 29000 Km length. According to leveling observation results, Neishaboor, Garegeshlag, Gorgan, have 1.06 m in 15 years, 1m in 17 years and 1.24m in 16years subsidence, respectively.

Result of IPGN is close to leveling and reduction of ground water area. It should be mentioned that Gorgan and Garegeshlag subsidence because of sharp raining in fall and autumn stop in during this period and even in Gorgan station we observe uplift. This indicates that at heavy rain area extraction of ground water is occurred with high rate so that nature can't compensate this ground water extraction.