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# Investigation of subsidence and vertical displacements in Iran using gravity, GNSS and precise levelling data

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## Abstract

Population growth, coupled with the expansion of exploitation of groundwater resources for agricultural and industrial purposes, has led Iran to face the adverse consequences of the quantitative and qualitative aspects of water resources. In this regard, the necessity of proper use and sustainable management of existing water resources is quite obvious. Increasing the use of underground water has led to land subsidence in different parts of Iran. In order to understand the wide range of deformations caused by underground water changes, valuable geodetic data collected in gravity, GNSS and precise levelling networks developed throughout Iran can be used. Based on re-measurement of 1st order precise leveling network of Iran, about 44 subsidence areas were identified and informed authorities in disaster management of the country. Also, the continuous data collected in the Iranian permanent GNSS and geodynamic network (IPGN) indicates that the elevation of the vertical movement in some part of the country is more than one meter. The absolute gravity campaigns performed in Iran in 2017 in cooperation EOST Strasbourg team by establishing new absolute gravity stations as well as repeating former stations established between 2000 and 2007, showed that the gravity values of many stations have changed, which could be due to land subsidence and groundwater harvesting.

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