



Study of Hydrological Changes in Hawraman in Last Two Decades Using Satellite Gravimetry and Hydroclimatological Models

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Abstract

Global warming and climate change are having a significant impact on the Middle East. However, the intensity of the impact is not the same everywhere. Studies on water mass fluctuations have mostly focused on national and regional scales rather than local scales. In this study, the impact of climate change on water fluctuations in the Hawraman region (western Iran) during the last two decades is investigated. This study is based on the level-2 data of GRACE and GRACE-FO missions, which are delivered by five different centers. In the pre-processing stage, the Hawraman's signal is highly improved by using a filter optimization method. In addition, the spatial leakage error from neighboring water bodies is estimated. To differentiate water balance components and evaluate the results derived from gravimetry, a series of hydroclimatic models are used, including models for precipitation, surface temperature, terrestrial water storage, evapotranspiration, and canopy water content. There is an acceptable correlation between the results of the different gravimetry series, also between gravimetry and the results of hydroclimatic models. The gravimetry results include seasonal, interannual and long-term variations. The long-term trend includes an average water decline of 6.7 mm/year, of which 2.3 mm is due to groundwater. However, the slope of decrease in Hawraman during the studied period is lower than in neighboring areas in the Middle East. Comparisons indicate on a remarkable precipitation shift (from snow to rain) as the main reason of groundwater depletion. The results of the models also show that the surface temperature increased significantly during the studied period. However, the evapotranspiration component, which is affected by temperature and water availability, shows complex variations.

Keywords: Satellite gravimetry, Groundwater, Precipitation type, Hawraman.

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