Multi-sensor approach to address land subsidence in Mashhad, northeast Iran

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ABSTRACT:

In this article we provide a multi-sensor approach to study land subsidence in Mashhad, northeast Iran. Previous studies using a few Envisat data showed that Mashhad aquifer is subsiding with the rate of 17 cm per year. The main subsidence bowl has mainly affected agricultural regions, but also influences part of the residential areas in the city. In this study we complement previous studies, use more SAR data from both Envisat and ALOS satellites to monitor ground deformation in the year 2003-2011. The SAR data include 26 ASAR single-look-complex images from Envisat satellite covering 2003 -2008 and 13 PALSAR dual pole images of ALOS satellite from 2007 to 2011. The data are processed using both Persistent Scatterer (PS) and Small Baseline Subset (SBAS) methods to evaluate the capability of these techniques for monitoring rapid subsidence in agricultural regions.
In addition we analyse gravimetric data acquired from GRACE and GOCE in combination of Piezmetric data for ground water level monitoring, MODIS data for estimating evapotranspiration and identifying landuse land cover and weather data such as precipitation to detect recharging rate of water reservoir.
In the end, all data are combined in a hydrological model in GIS to assess and model the effect of each parameter in the rate of subsidence derived from SAR data.

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