



Land subsidence due to groundwater withdrawal detected by InSAR time-series in Tazerbo well field, Libya

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The Tazerbo well field is one of the well fields designed within the Great Man-Made River Project (GMMRP), which aims to deliver water to the eastern coast of Libya through an underground pipe network. It consists of 108 wells in three rows, where the wells are separated 1.3 km in longitude and 10 km in latitude. The planned total groundwater withdrawal from all wells is 1 million m³/day. The water is pumped from the deep sandstone aquifer (Nubian sandstone), which is overlaid by a thick mudstone-siltstone aquitard. Being heavily pumped, the aquifer and fine-grained sediments of the aquitard are expected to compact in time resulting in land subsidence. In order to investigate the surface deformation caused by groundwater pumping in the Tazerbo well field, Interferometric Synthetic Aperture Radar (InSAR) technique was utilized. InSAR is widely used for monitoring land subsidence and can provide sub-cm scale deformation information over large areas. Using the Persistent Scatterer method, SAR time series of 20 Envisat images, spanning from 2004 to 2010, are employed to analyze spatial and temporal distribution of land subsidence induced by groundwater withdrawal. The results are in a good agreement with simulated subsidence. In addition, the spatial distribution of InSAR observations seems to be promising in terms of detecting spatial heterogeneity of aquifer material.