Geophysical Research Abstracts, Vol. 9, 05366, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-05366

Land subsidence in the Tehran region as a consequence of steady reservoir discharge mapped by InSAR, GPS and leveling

A. Schenk (1), M. Motagh (2), Y. Djamour (3), J. Hoffmann (4), S. Arabi (3), H. Nankali (3)

(1) Department of Applied Geophysics, Technical University Berlin, (2) Department of Earthquake Risk and Early Warning, GeoForschungsZentrum Potsdam (GFZ), (3) Geodesy and Geodynamics Department, National Cartographic Center of Iran (NCC), (4) German Remote Sensing Data Center, German Aerospace Center (DLR)

Groundwater discharge has exceeded natural recharge in the greater Tehran region over the last years, causing a steady drawdown. Due to the presence of compressible interbedded clay deposits in the alluvial sediments of the Tehran and Varamin plains this drawdown has caused significant land subsidence. In this study we use a combination of InSAR, GPS, and leveling observations for detection and monitoring of surface displacements over extensive areas and with great spatial and temporal detail. The data include 36 interferometric displacement maps, derived from Envisat ASAR data acquired in descending and ascending geometries between 2003 and 2005 and ERS SAR data acquired between 1998 and 1999, campaign and continuous GPS observations from 40 stations, and leveling surveys from a dozen monuments across the Tehran plain made to specifications required for first-order precise leveling. We compile an optimally accurate displacement time series from all interferometric subsidence maps using a weighted least squares approach that accounts for the variances and covariances of estimated atmospheric error contributions. The combination of InSAR, leveling and GPS provides a comprehensive and detailed view of land subsidence, bringing new insights into the elastic and inelastic properties of the aquifer system and their spatial variability in the greater Tehran area.