EGU21-16000, updated on 12 Jun 2021
https://doi.org/10.5194/egusphere-egu21-16000
EGU General Assembly 2021

Improving global land subsidence analysis

Pablo Ezquerro[1,4], Gerardo Herrera-García[1,2,3], Roberto Tomás[2,5], Marta Béjar-Pizarro[1], Juan López-Vinielles[1,6], Mauro Rossi[7], Rosa M. Mateos[1,3], Dora Carreón-Freyre[2,8], John Lambert[2,9], Pietro Teatini[2,10], Enrique Cabral-Cano[2,11], Gilles Erkens[2,12,13], Devin Galloway[2,14], Wei-Chia Hung[2,15], Najeebullah Kakar[2,16], Michelle Sneed[2,17], Luigi Tosi[2,18], Hanmei Wang[2,19], and Shujun Ye[2,20]

[1]Geohazards INSAR Laboratory and Modelling group, Instituto Geológico y Minero de España, Madrid, Spain.
[2]Land Subsidence International Initiative (LASII), UNESCO, Paris, France.
[3]Geological Surveys of Europe, Brussels, Belgium.
[4]Escuela Técnica Superior de Ingenieros de Caminos, Canales y Puertos, Universidad Politécnica de Madrid, Madrid, Spain.
[5]Departamento de Ingeniería Civil, Universidad de Alicante, Alicante, Spain.
[6]HEMAV SL, Castelldefels, Barcelona, Spain.
[7]Istituto di Ricerca per la Protezione Idrogeologica, Perugia, Italy.
[8]Centro de Geociencias, Universidad Nacional Autónoma de México, Queretaro, Mexico.
[9]Deltares, Delft, The Netherlands.
[10]Department of Civil, Environmental and Architectural Engineering, University of Padova, Padova, Italy.
[11]Departamento de Geomagnetismo y Exploración, Instituto de Geofísica, Universidad Nacional Autónoma de México, Mexico City, Mexico.
[12]Deltares, Utrecht, The Netherlands.
[13]Utrecht University, Utrecht, The Netherlands.
[14]U.S.Geological Survey, Solsberry, IN, USA.
[15]Department of Civil Engineering, National Chiao Tung University, Hsinchu, Taiwan.
[16]Department of Geology, University of Balochistan, Quetta, Pakistan.
[17]U.S.Geological Survey, Sacramento, CA, USA.
[18]Institute of Geosciences and Earth Resources - National Research Council, Padova, Italy.
[19]Shanghai Institute of Geological Survey, Shanghai, China.
[20]Department of Hydrosciences, School of Earth Sciences and Engineering, Nanjing University, Nanjing, China

Land subsidence associated with groundwater withdrawal is often an underestimated geological hazard that may produce important damage to buildings and infrastructure, change flood risk in some areas, and cause loss of groundwater storage capacity. In the current framework of global climate change, the increasing agricultural and urban use of groundwater resources is a growing problem, especially in arid and semiarid areas. Because monitoring subsidence in these areas is important for management, but early detection is difficult due to slow displacement rates, we developed global groundwater induced land subsidence probability maps. Global land subsidence probability was calculated by applying statistical methods to a set of susceptible geographical, environmental and geological properties based on known, documented subsidence affected areas. Highest values of subsidence probability are concentrated over flat areas composed of unconsolidated sediments, and in agricultural or urban areas subject to prolonged dry periods.

Including water scarcity and groundwater use data resulted in an estimation of a proxy land subsidence hazard. Calculated probability does not imply that all the high value areas are currently incurring land subsidence, but it can alert policymakers and groundwater managers to areas that have potential exposure to subsidence hazards and warrant monitoring. The complete results of this work are published in Science Policy Forum section under the title “Mapping the global threat of land subsidence” DOI: 10.1126/science.abb8549