United Nations Educational, Scientific and Cultural Organization

Intergovernmental Hydrological Programme

UNESCO Land Subsidence International Initiative

Newsletter of the Unesco Land Subsidence International Initiative

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Conference Call

From Claudia Meisina (Univ. Pavia) we received following:

We would like to bring your attention to the "A7.05 InSAR for the groundwater management" session scheduled at the upcoming LIVING PLANET SYMPOSIUM that will be held in Bonn (Germany) from 23th to the 27th May 2022.

The submission deadline is set for ***26th November 2021***.

You can get further information on the congress online on the dedicated congress website at: https://lps22.esa.int/.

A more detailed description of the session follows at the end of this email or at Living Planet Symposium webpage:

https://lps22.esa.int/frontend/index.php?folder_id=4294&page_id=#themeA7.

The abstract should not exceed 1500 words.

A submission fee of 75 euros (25 euros for students) will apply for each abstract.

We look forward to receiving your contributions,

Carolina Guardiola-Albert (Instituto Geológico y Minero de España IGME);

Claudia Meisina (University of Pavia)

Pietro Teatini (Università di Padova)

Roberto Tomás Jover (Universidad de Alicante);

A7.05 InSAR for the groundwater management

Topic: A07. Hydrology and water cycle

Convenors: Claudia Meisina (University of Pavia); Carolina Guardiola-Albert (Instituto Geológico y Minero de España IGME); Roberto Tomás Jover (Universidad de Alicante); Pietro Teatini (Università di Padova)

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Sustainable groundwater management is one of the most important challenges in groundwater field, especially in arid regions. The lack of relevant information on aquifer systems represents a critical drawback for an integrated and sustainable water resources management challenging our understanding of the current status of the water resources, the impacts of climate change in terms of water availability, and the possibility to plan adaptation and mitigation measurements coping with future potential threats. Earth Observation (EO) technology, and particularly InSAR, can help us to fill this information gap by assessing and monitoring environmental variables related to groundwater resources at adequate temporal and spatial scales. InSAR techniques have evolved rapidly over the last few years and are fostered by the increasing availability of SAR datasets and the advancement of processing algorithms and software tools. Particularly, the Sentinel-1 satellites are the first globally acquiring SAR systems optimized for InSAR ground displacement measurement. They are designed with a high repeat pass frequency and spatial resolution for production of accurate ground deformation maps (e.g., due to groundwater extraction) and, consequently, to infer groundwater depletion at regional/basin scale. In facts, satellite interferometric data may support the measurement of land subsidence and can be used together with sparse piezometric head records to improve the calibration of hydrogeologic parameters, i.e., aquifer characterization.This session is aimed to collect contributions on state of the art and perspectives of the use of InSAR products (displacement maps, velocities and time series of radar scatterers) in the framework of groundwater management. Studies concerning the value and limits of InSAR techniques for groundwater management purpose are welcome.

Topics of interest mainly include (but not limited to):

• Use of InSAR data for mapping and monitoring ground deformation due to groundwater extraction;

• Use of ground displacement measurements provided by InSAR to characterize aquifer properties and their changes along time (e.g. groundwater storage changes);

• Exploit InSAR data to quantify aquifer storage and pumping rates in areas where in situ data are insufficient or to fill gaps in monitoring data;

• Aquifer-system and deformation modelling taking advantage of InSAR data;

• Use of InSAR movement information to simulate future scenarios of land subsidence as a constraint to limit groundwater withdrawals;

• Past and present experiences of integration of InSAR outcomes into management plans of aquifer systems;

• Unravelling processes not related to aquifer exploitation (e.g., shallow natural compaction, drainage of urban areas and farmlands, newly urbanizations, hydrocarbon production) in InSAR products.

New Literature

General, worldwide

Benjamin H. Strauss et al.,

Unprecedented threats to cities from multi-century sea level rise.

https://iopscience.iop.org/article/10.1088/1748-9326/ac2e6b/pdf

Australia, New South Wales

https://www.mdpi.com/2071-1050/13/19/11011/pdf

Indonesia, Jakarta

Hasanuddin Zainal Abidin et al., The investigation on high-rise building tilting from the issue of land subsidence in Jakarta City.

https://www.readcube.com/articles/10.1051%2Fmatecconf%2F201927006002

Indonesia, Jakarta and Semarang

B Pramono 2021 IOP Conf. Ser.: Earth Environ. Sci. 874 012001

https://doi.org/10.1088/1755-1315/874/1/012001

Nigeria, Lagos

Femi Emmanuel Ikuemonisan et al.,

Investigation of Sentinel-1-derived land subsidence using wavelet tools and triple exponential smoothing algorithm in Lagos, Nigeria

https://www.springerprofessional.de/investigation-of-sentinel-1-derived-land-subsidence-using-wavele/19787288

PR China, Beijing Plane

Lei, K. et al., Three-Dimensional Surface Deformation Characteristics Based on Time Series InSAR and GPS Technologies in Beijing, China.

Remote Sens. 2021, 13, 3964.

https://doi.org/10.3390/rs13193964

Taiwan, Changhua

The Project Of Niaozueitan Artificial Lake In Wu River (including subsidence maps)

https://en.wrap.gov.tw/cp.aspx?n=26457

USA, California

Detection and Measurement of Land-Surface Deformation, Pajaro Valley, Santa Cruz and Monterey Counties, California, 2015–18

Open-File Report 2021-1101

Water Availability and Use Science Program

Prepared in cooperation with the Pajaro Valley Water Management Agency

By: Justin T. Brandt, Marisa M. Earll, Michelle Sneed, and Wesley R. Henson

https://doi.org/10.3133/ofr20211101

USA, Southern USA

Allen, T. et al., Anticipating and Adapting to the Future Impacts of Climate Change on the Health, Security and Welfare of Low Elevation Coastal Zone (LECZ) Communities in Southeastern USA. J. Mar. Sci. Eng. 2021, 9, 1196. https://doi.org/10.3390/jmse9111196

https://www.mdpi.com/2077-1312/9/11/1196

Mining

Poland

Tajduś, K.; Sroka, A.; Misa, R.; Hager, S.; Rusek, J.; Dudek, M.; Wollnik, F. Analysis of Mining-Induced Delayed Surface Subsidence. Minerals 2021, 11, 1187. https://doi.org/10.3390/min11111187

https://www.mdpi.com/2075-163X/11/11/1187

PR China

Xu, C., Assessment of coal mining land subsidence by using an innovative comprehensive weighted cloud model combined with a PSR conceptual model. Environ Sci Pollut Res (2021). https://doi.org/10.1007/s11356-021-17052-x

Sroka, A. et al., A Discrete Model of Rock-Soil Medium Response in the Determination of Horizontal Strain Values. Appl. Sci. 2021, 11, 10022. https://doi.org/10.3390/app112110022

PR China, Guquiao Coal Mine

Chen, C. and Lu, H. (2021) Evaluation of Mine Geological Environment of Guqiao Coalmine. Journal of Geoscience and Environment Protection, 9, 110-117.

doi: 10.4236/gep.2021.910008.

https://www.scirp.org/journal/paperinformation.aspx?paperid=112657

USA, Minnesota

U.S. plan would block Antofagasta Minnesota copper mine

https://www.reuters.com/article/usa-mining-twin-metals-idCNL1N2RG1W3

Monitoring

Sousa, J.J. et al., Geohazards Monitoring and Assessment Using Multi-Source Earth

Observation Techniques. Remote Sens.2021, 13, 4269.

https://doi.org/10.3390/rs13214269

https://www.mdpi.com/2072-4292/13/21/4269/pdf

Peat

General, Worldwide

This is an important overview of worldwide peatlands, their treats, mapping and recommendations for the future.

https://www.fao.org/3/ca8200en/CA8200EN.pdf

General

Kreyling, J., Tanneberger, F., Jansen, F. et al. Rewetting does not return drained fen peatlands to their old selves. Nat Commun 12, 5693 (2021). https://doi.org/10.1038/s41467-021-25619-y

Germany

Haojie Liu et al., Impact of land management on available water capacity and water storage of peatlands,

Geoderma, Volume 406, 2022, 115521, ISSN 0016-7061, https://doi.org/10.1016/j.geoderma.2021.115521.

(https://www.sciencedirect.com/science/article/pii/S0016706121006017)

Abstract: Peatlands around the world have been drained for agriculture and forestry practices over the last century, leading to carbon loss, water loss, and soil degradation. Soil available water capacity (AWC, the amount of water a soil can provide for plants) is one of the most important soil properties regulating the water balance and plays a pivotal role in plant growth. Compared to most mineral soils, our understanding of the impact of land management on the AWC (applies to the root zone of 0.7 m) and water storage of peat (the amount of water that is stored over the whole peat profile) is limited. In this study, we aimed to deduce possible alterations of the AWC and water storage of peat following peatland drainage and rewetting. We analyzed a comprehensive dataset (676 measurements from boreal and temperate peatlands) to seek relations between bulk density (BD) as a proxy for soil degradation, and field capacity, wilting point as well as AWC. The analyses showed that the AWC increases with BD up to a value of 0.2 g cm−3, and a further increase in BD leads to a considerable decrease in AWC. The function between BD and AWC enables to upscale the AWC to a regional scale using readily available peat BD data. The average AWC of agricultural peatlands in Germany was estimated to be 37.8 ± 11.3 vol% (mean ± standard deviation). Currently, the average water storage of agricultural peatlands in Germany is approximately 19.3 km3 (1.3 m3 per m2), which is less than half of the overall water storage in the natural peatlands in Germany prior drainage (39.6 km3). The conversion of pristine peatlands into agricultural land through artificial drainage resulted in a water storage loss of approximately 20.3 km3, which roughly corresponds to 27 times the volume of the lake Müritz (largest lake entirely within German territory). We conclude that several decades of peatland rewetting would have a limited role in water storage recovery due to a substantial peat thickness loss prior rewetting and low porosity of (formerly) degraded peat.

PhD position in the Netherlands

PhD Position in Experimental Soil Mechanics

Delft

Full time

Job description

Soft highly organic soils are widespread in the foundation layers of the built environment all over the world. They contain organic matter, roots and fibres, which improve their mechanical response. However, these soils are extremely vulnerable to climate-related hazards. Increasing climatic stresses, such as heat waves, drought, and more frequent intense precipitation accelerate the degradation of organic soils, by increasing their drying and shrinkage rate above the water table and their decomposition rate under water, with gas generation and exsolution. Both these mechanisms, drying and gas exsolution, ultimately contribute to significant land subsidence and reduction in available resistance. Quantifying the geotechnical engineering consequences of seasonally varying loads, including drying-wetting, temperature cycles and degradation, on organic soils is extremely challenging due to the complexity of a proper description of multi-physics gas-liquid-solid interaction. The project aims at deepening the understanding and the modelling of these coupled processes, to mitigate the climate-related hazard in natural soils and to assist in the design of durable innovative green solutions.

To apply: https://magnet.me/nl-NL/vacature/290754/phd-position-in-experimental-soil-mechanics

Postdoc Position in the Netherlands

A full-time postdoc position for 3 years in Delft is available for following project:

Postdoc Living on Soft Soils: Subsidence & Society: Identifying Measures for Dealing with Land Subsidence

https://carriere.nrc.nl/vacatures/technische-universiteit-delft-tud/postdoc-living-on-soft-soils-subsidence-society-identifying-measures-for-dealing-with-land-subsidence-471e5

For the same project a position in Utrecht

Postdoctoral researcher (3 years, 1,0 fte) predictive modelling

https://www.uu.nl/en/organisation/working-at-utrecht-university/jobs/postdoctoral-researcher-3-years-10-fte-predictive-modelling

Projects

USA, Texas Coastal Bend

Living with Sea Level Rise in the Texas Coastal Bend.

Research Area(s): Coastal Change / Natural and Nature-based Features, Sea Level Rise; Other Topics / Sponsored Research

Region(s) of Study: Waterbodies / Gulf of Mexico; U.S. States and Territories / Texas

Primary Contact(s): trevor.meckley@noaa.gov

his project began September 2021 and is projected to be completed in August 2024

The Coastal Bend of Texas includes eleven coastal counties encompassing the Corpus Christi metropolitan area, characterized by a system of barrier islands, lagoons, and estuaries on a broad coastal plain. Communities embedded in this dynamic system engage in a wide range of economically important activities. However, sea level rise (SLR) poses a threat to the region due to low-lying gently sloping topography, land subsidence, small estuarine tide ranges, and exposure to hurricanes. To retain and plan for future resiliency in this growing economic setting, communities need information on the impacts of future sea level rise and the effectiveness of natural and nature-based features (NNBF), which can mitigate coastal risk while offering a diversity of additional co-benefits.

https://coastalscience.noaa.gov/project/living-with-sea-level-rise-in-the-texas-coastal-bend/

From the Press

Indonesia, Jakarta

Prevent Jakarta from Sinking by Curbing Land Subsidence Rate.

https://en.tempo.co/read/1514410/prevent-jakarta-from-sinking-by-curbing-land-subsidence-rate-expert

Vietnam, Mekong Delta

Mekong Delta region faces water shortages, saline intrusion

https://en.vietnamplus.vn/mekong-delta-region-faces-water-shortages-saline-intrusion/209889.vnp