<div align="center">**FORM FOR EMPLOYERS**</div>

INSTITUTION: AGH University of Krakow

DEPARTMENT: Faculty of Geo-data Science, Geodesy, and Environmental Engineering

CITY: Cracow

POSITION: assistant research (Postdoctoral researcher)

DISCIPLINE Earth and related environmental sciences, civil engineering, geodesy and transport, environmental engineering, mining and energy

EXPIRES: 17.05.2024

WEBSITE:. https://www.agh.edu.pl/o-agh/praca-w-agh

KEY WORDS: numerical modeling, deformation, InSAR, sinkhole

DESCRIPTION (field, expectations, comments, requirements):

Description of tasks:

As a postdoctoral researcher, you will play a crucial role in modelling rock mass deformation processes, analyzing land surface strain tensors, and studying environmental interactions in the area of sinkhole formation. Additionally, you will be actively involved in the majority of project tasks, from analyzing InSAR processing results to identifying sinkhole precursors.

Your specific tasks will include:

Task 1: Estimation of the Spatial and Temporal Pattern of Sinkhole Development
You will analyse interferograms generated by differential (DInSAR), permanent scatters (PSInSAR), small baseline (SBAS), and Offset-Tracking (OT) methods. By creating interferograms with advanced satellite data processing techniques, you will achieve high spatial coverage and accurate land surface displacement measures. Multiple sensors will provide a more detailed analysis of land surface movements and optimize computational parameters. Information on amplitude normalized radar backscatter will also be determined. By integrating these data sets (phase, amplitude, and time series) across time and space, you will establish the spatio-temporal deformation patterns associated with sinkhole formation.

Task 2: Strain Tensor Analysis
You will investigate the horizontal strain tensor associated with the displacement field observed by InSAR. Line-of-sight (LOS) projections of land surface movements will be decomposed in areas with double-geometry radar imaging. This will provide a characterization of the displacement field, including vertical and horizontal displacements. You will calculate a strain deformation tensor using this data to study compression and tension zones and rotation of the strain tensor. These insights will provide valuable information about land surface deformation characteristics in the sinkhole area, serving as potential precursors to the deformation process. In this stage, you will also use numerical modelling to simulate the observed sinkhole theoretically, allowing for the investigation of stress distribution and the mechanism of sinkhole formation.

Description of the project:
As a response to climate change, sinkholes are appearing due to the rapid thawing of Arctic permafrost and intensified droughts, contributing to rising CO_2 emissions and causing severe environmental changes. Despite being a global issue, their monitoring is underdeveloped compared to other deformations. This project aims to leverage remote techniques such as Satellite Radar Interferometry (InSAR), Numerical Modelling (NM) and Machine Learning (ML) to understand sinkhole formation physics and effectively detect developing sinkholes. The interdisciplinary approach will allow us to assess the accelerating deformations caused by climate change.
This research will integrate historical sinkhole data with current and archived InSAR data to analyze displacement and strain tensor fields in sinkhole-prone areas. Meteorological data will supplement the InSAR observations, with ML tools used to identify forming sinkholes and the mechanisms driving their deformation fields. The outcome will be a novel methodology for identifying sinkholes, which will be compared with existing risk assessment methods for effectiveness and efficiency.
The research will enhance our understanding of sinkhole formation mechanisms and improve the detection of their precursors. In regions where irrigation systems or closed mines contribute to sinkhole formation, our findings will illuminate rock mass reaction mechanisms. Additionally, our project will allow for a more accurate estimation of potential CO_2 and methane emissions from sinkholes, thereby improving climate model calibrations and assessments of greenhouse gas impacts on climate change, both regionally and globally.
This postdoctoral research opportunity offers a significant step forward in addressing and combating a major environmental and climatic issue.

Supervisors and Team:
The postdoctoral researcher will work under the primary supervision of Dr. Wojciech Witkowski, with additional guidance from Dr. Artur Guzy.

You will have the opportunity to work within the dynamic and stimulating environment of the Land Subsidence and Hazard Mitigation Group (visit our website for more information: https://land-subsidence.com/).

To learn more about the specific project details, you can visit the following link: https://projekty.ncn.gov.pl/opisy/539896-en.pdf, https://home.agh.edu.pl/~wwitkow/Sonata_grant/ or contact us directly (wwitkow@agh.edu.pl, aguzy@agh.edu.pl) .

This is a unique opportunity to join a young, vibrant research group that is making significant strides in understanding and mitigating the impacts of land subsidence and related hazards.

Qualifications:
Required:
1) PhD Degree in Environmental Engineering, Geodesy, Mining, Geography, Remote Sensing, Hydrogeology, or related sciences,
2) scientific achievements documented by publications from the JCR list,
3) proficiency in skills related to numerical hydrogeological modelling and land subsidence,
4) knowledge of issues related to InSAR (satellite radar interferometry),
5) fluent in English at least B-2 level (applies to candidates for whom English is not their native language),
6) strong organizational skills for both personal and project work,
7) a passion for research, balanced with the ability to enjoy other important aspects of life,
8) predispositions to teaching work.

Terms and Conditions:
Deadline: May 17th, 2024
Start date: July 1st, 2024.
Employment: Full-time PostDoc (40 hours/week on a task-based working time system) for the duration of the project.

DOCUMENTS REQUIRED
1) scientific CV and cover letter,
2) list of publications (track record),
3) copy of the doctoral degree,
4) a document confirming language skills (English - at least B-2 level) - applies to candidates for whom English is not the native language.

DOCUMENTS MUST BE SUBMITTED AT:

Documents should be submitted electronically to: elatom@agh.edu.pl or at the Office of the Dean of the Faculty of Geo-Data Science, Geodesy, and Environmental Engineering, al A. Mickiewicza 30, 30-059 Kraków, pav.C4, room 113.

The AGH University will be the candidate's main place of employment.

Cracow, on ....

....
          name and surname

CONSENT TO PERSONAL DATA PROCESSING
(recruitment - employee)

Pursuant to Article 6(1)(a) of the Regulation (EU) 2016/679 of the European Parliament and of the Council of April 27, 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation), [OJ EU . L. 2016.119.1, May 4, 2016] hereinafter referred to as "GDPR", **I consent to the processing of my personal data other** than the data mentioned in Article 22[1] § 1 of the Labour Code and contained in my CV and other application documents, and to the reproduction of my physical likeness **for the purposes of recruitment and selection for the position of** .... (contest notice no. …………………).

In addition, I declare that the request for consent has been presented in a clear and understandable manner and that I have been informed about a possibility of withdrawing my consent at any time as well as about consent accountability. The withdrawal of consent to have personal data processed shall not affect the legality of the processing, which is carried out on the basis of such consent prior to its withdrawal; The consent may be withdrawn by submitting a written representation on consent withdrawal at a place that was indicated in the contest notice as the place for submitting documents.

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          Date and signature