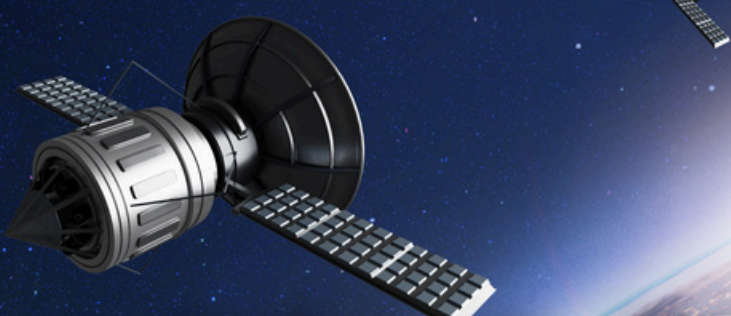




LSGI & RILS RESEARCH SEMINAR

Uncovering Hidden Instabilities: InSAR Observations of Human-Induced Ground Deformation in Permian Basin, USA

 **31 OCT 2025 (FRI)**

 **9:30 AM - 10:30 AM**

 **Z406, POLYU**

 **ENGLISH**

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Professor

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ABSTRACT

The Permian Basin in West Texas, a major U.S. energy-producing region, is underlain by water-soluble layers and multiple hydrocarbon-rich formations. Intensive oil and gas activities have altered subsurface stability, causing long-lasting surface subsidence, uplift, sinkholes, and fissures that threaten critical infrastructure such as pipelines, roads, and hydrocarbon facilities. Using interferometric synthetic aperture radar (InSAR), we mapped the temporal evolution of ground deformation and compared it with records of anthropogenic activities to identify causal links between specific operations—such as wastewater injection, CO₂ flooding, abandoned wells, salt dissolution, and mining—and observed instabilities. Numerical poroelastic modeling further quantified stress and pressure redistribution in the subsurface and their contribution to surface deformation. Our results reveal clear connections between human activities and ground instability, providing a scientific basis for risk mitigation and supporting informed decision-making by public authorities and industry to reduce environmental and financial impacts while promoting sustainable energy development.

BIOGRAPHY

Prof. Zhong Lu's research centers on the development and application of synthetic aperture radar (SAR) and interferometric SAR (InSAR) techniques. He specializes in multiple-interferogram InSAR processing, cross-platform InSAR processing, and the design of automated SAR/InSAR processing systems. He has applied his expertise to a variety of application areas, including using InSAR to image ground-surface deformation associated with volcanic, seismic, tectonic, and hydrologic processes, as well as conducting tasks such as wetland water-level mapping, vegetation characterization, and fire scar mapping.

Prof. Zhong Lu currently holds the position of Shuler-Foscue Professor of Earth Sciences at Southern Methodist University, and Professor at China University of Mining and Technology. He has published highly cited work in prestigious journals including Nature Geoscience, Nature Communications, and Remote Sensing of Environment. His research projects have been funded by renowned agencies including the USGS, National Aeronautics and Space Administration (NASA), European Space Agency (ESA), Japan Aerospace Exploration Agency (JAXA), and German Space Agency (DLR).

Moderator: Prof. Guoqiang SHI, Assistant Professor, LSGI, member of RILS

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