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InSAR mapping of subsidence hazard in metropolitan areas

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22.11.2021

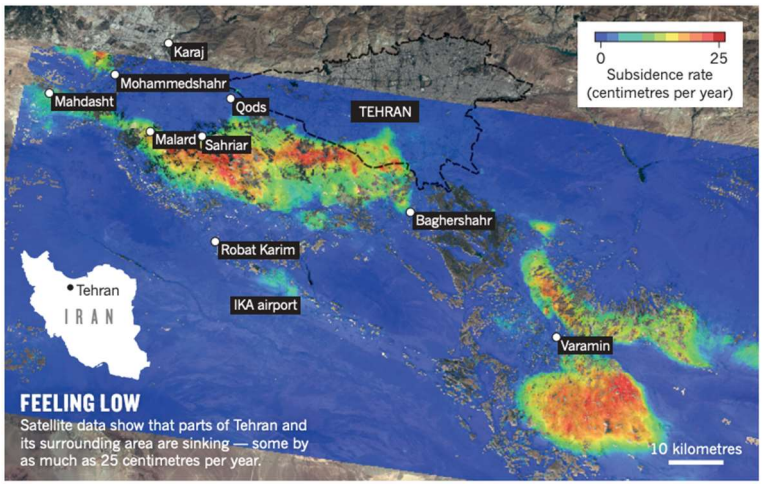
Groundwater is the primary source of water in many metropolitan areas across the world. Consequently, over-extraction of groundwater causes rapid subsidence in numerous densely populated areas and poses a severe hazard to population and infrastructure. Nevertheless, identifying areas vulnerable to subsidence is time-consuming and challenging. Synthetic Aperture Radar Interferometry (InSAR) has been broadly used in the past few decades to identify and monitor land subsidence in different regions but at a local scale. Today, Copernicus Sentinel-1 mission acquires SAR data worldwide, allowing routine monitoring of land subsidence in any place. However, InSAR processing of a large amount of data is both resource-demanding and time-consuming. Therefore, several cloud-based platforms were developed to provide InSAR products that can be used for further multi-temporal analysis. They routinely generate the data for selected regions. For other regions, they have on-demand processing.

This thesis will use various cloud-based processing platforms products to identify land subsidence in metropolitan areas in arid and semi-arid regions across the globe. First, the interferograms will be obtained either from archives or from on-demand platforms. Then, a Small Baseline Subset analysis will be performed on the data. Errors, particularly from the troposphere, will be analyzed to separate subsidence deformation from errors. After identifying land subsidence, the results will be combined with population and infrastructure data to analyze the risk of land subsidence.

To successfully complete this thesis, good programming knowledge, preferably in python or Matlab, is required. Basic familiarity with Linux and the command line will be an advantage but can also be learned during the thesis. In this thesis, the student will work with practical applications of InSAR time series analysis as a powerful tool for geodetic measurements.

This thesis will be supervised by Dr.-Ing. Mahmud Haghshenas Haghighi.

Figure 1: Example of land subsidence in Tehran metropolitan area identified by multi-temporal InSAR analysis of Sentinel-1. Source: Nature.



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