# Assessment of geolocation error in InSAR time series analysis

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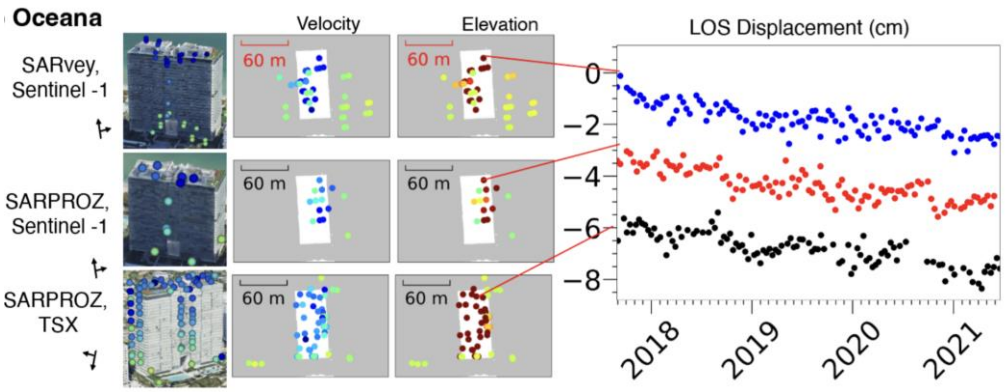
10.12.2024

Interferometric Synthetic Aperture Radar (InSAR) has emerged as a tool for assessing earth surface deformation across a wide range of applications. Its ability to capture detailed information about small movements makes it particularly useful in structural health assessment and geodetic measurements of deformation. One of the primary challenges faced during the analysis is accurately assigning pixels in the radar image to their corresponding objects on the ground. Particularly in urban areas, this task is complicated by the unique characteristics of urban landscapes. Two major considerations must be taken into account in densely built urban environments. First, there is the need to distinguish targets originating from the buildings and those from surrounding areas. Second, within the same building, there is the challenge of differentiating between various targets. Effective separation of these targets is essential for a precise understanding of deformation patterns and better monitoring and assessment of structural integrity over time.

Various studies addressed geolocation errors of high-resolution data in urban areas. They primarily benefit from the long perpendicular baselines of multi-temporal images to estimate and geolocation errors. In contrast, Sentinel-1 is a medium-resolution sensor and, as a mission designed for deformation analysis, has a relatively narrow orbital tube, making it challenging to estimate the geolocation errors. This thesis will focus on a thorough assessment of geolocation errors associated with Persistent Scatterer InSAR time series analysis of Sentinel-1 in densely built areas characterized by high-rise skyscrapers. In the initial step of the study, Sentinel-1 data will be processed to generate Persistent Scatterer outputs using the SARvey software. Following this step, a detailed analysis will be conducted to analyze different error sources that affect the geolocation of individual pixels. The ultimate goal of this research is to establish reliable measurement points that can be accurately assigned to individual targets on buildings.

Throughout this thesis, the student will engage in a practical application of InSAR time series analysis as a powerful tool for geodetic measurements. An ideal candidate for this thesis possesses proficient knowledge of Python programming and is willing to learn command-line tools and software in Linux. This thesis will be supervised by Dr.-Ing. Mahmud Haghshenas Haghighi.

Figure 1: An example of a Persistent Scatterer InSAR results in Miami Beach.

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