

Monitoring Coastal Subsidence in Southeast Florida Using InSAR and GNSS

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The US Atlantic coastal communities are highly vulnerable to coastal flooding hazards due to low-lying elevation, large population density, and high economic importance. In the past decade, many coastal communities in southeast Florida have experienced a significant increase in coastal flooding events, which has caused significant damage to the environment, economy, and society. Coastal subsidence further increases the coastal flooding hazard by lowering the elevation of the coast relative to sea level rise. Therefore, it is important to monitor coastal subsidence to devise necessary mitigation measures to improve coastal flooding hazards.

This study aims to monitor coastal subsidence in Southeast Florida and identify the factors contributing to the coastal subsidence. We used Sentinel-1 data acquired during 2016-2022 to investigate coastal subsidence using InSAR time series analysis. The 'ISCE topStack' is used to obtain the stack of unwrapped interferograms, and 'MintPy' is used for InSAR time series analysis. Our preliminary results at 50 m pixel resolution indicate that most of the area in Southeast Florida is stable while few areas experienced localized subsidence of rate 3-5 mm/year. We identified that soil consolidation contributed to the observed subsidence. We also compared the observed InSAR vertical displacement rate with GNSS vertical displacement rate. The comparison showed a good agreement between the two datasets, indicating the reliability of the InSAR results. Next, we will investigate coastal subsidence in the same study area at 30 m pixel resolution.



Figure 1: Location map of our study area and GPS stations in Southeast Florida