Sentinel–1A Insar Time Series Analysis for Monitoring of Surface Subsidence in Coastal Louisiana

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ABSTRACT

While it is well known that coastal Louisiana is subsiding at one of the most rapid rates in the world today, much less is known about the spatial and temporal variability in subsidence rates and the causes of this variability. This is a critical knowledge gap because subsidence amplifies sea level rise and vast areas of the Louisiana coastal zone are currently at risk from rising relative sea-levels that threaten the health of coastal wetlands, adversely affect the stability of levees, roads and bridges, and increase flood risks to homes and communities. This collaborative project is expanding on the limited amount of knowledge about subsidence in coastal Louisiana using a combination of geophysical methods. This project combines the Interferometric Synthetic Aperture Radar (InSAR) remote sensing data with Real Time Kinetic (RTK) GPS data for measuring and improving the accuracy and spatial precision of the subsidence rates in the Lafourche transect of the Louisiana coastal zone. SAR time series images from February 2017 to January 2018 acquired by the comparatively new satellite Sentinel–1A of the European Space Agency (ESA). InSAR time series have been calculated on the ascending scenes using the Small Baseline Subset (SBAS) method. The preliminary results obtained indicate the efficiency of Sentinel-1A in monitoring land surface subsidence. The estimated subsidence rate ranges from 0.2–1.64 cm/yr. Nearly 100 RTK GPS points were collected in July 2018 to create an updated elevation database of specific locations in the Lafourche transect of the Louisiana coastal zone to calculate the rate of subsidence

Sung, J., B. Crooke, D. Carsten, C. Woock, R. Amer, and A. Kolker, 2019, Sentinel–1A insar time series analysis for monitoring of surface subsidence in coastal Louisiana: GeoGulf Transactions, v. 69, p. 643–644.

and evaluate the results of Sentinel–1A. InSAR time series will be calculated from Sentinel–1A ascending images for 2019. Another set of RTK GPS points will be collected in July 2019 for ground truthing and evaluation of InSAR results. Geographic information systems (GIS) are being used to compare subsidence rates with soil types, water level changes, land use and land cover changes. This project will provide an improved understanding of subsidence rates using advanced remote sensing technologies, which will likely identify infrastructure at risk from its location over subsidence in coastal Louisiana.