

OIL DETECTION IN A COASTAL MARSH WITH POLARIMETRIC SAR

Elijah Ramsey III¹, Amina Rangoonwala², Yukihiro Suzuoki³ and Terri Bannister²

¹U.S. Geological Survey, National Wetlands Research Center

²Five Rivers Services, LLC at U.S. Geological Survey, National Wetlands Research Center

³ASci Corp.Inc

ABSTRACT

The NASA UAVSAR was deployed June 2010 to support Deep Water Horizon oil spill response activities specifically, oil detection and characterization, oil extent mapping in wetlands, coastal resource impact detection, and ecosystem recovery. The UAVSAR platform demonstrated enhanced capability to act rapidly and provide targeted mapping response. Our research focused on the effectiveness of high spatial resolution and fully polarimetric L-band Synthetic Aperture Radar (PolSAR) for mapping oil in wetlands, specifically within Barataria Bay in eastern coastal Louisiana. Barataria Bay contained a numerous site observations confirming spatially extensive shoreline oil impacts, multiple oil spill UAVSAR collections, and a near anniversary 2009 collection. PolSAR oil detection relied on decomposition and subsequent classifications of the single look complex (SLC) calibrated radar cross sections representing the complex elements of the scattering matrix. Initial analyses results found that shoreline marsh structural damage as well as oil on marsh plants and sediments without canopy structural damage were exhibited as anomalous features on post-spill SLC scenes but were not evident on the pre-spill SLC scene collected in 2009. Pre-spill and post-spill Freeman-Durden (FD) and Cloude-Pottier (CP) decompositions and the Wishart classifications seeded with the FD and CP classes (Wishart-FD) also highlighted these nearshore features as a change in dominate scatter from pre-spill to post-spill. SLC analyses also indicated penetration of oil laden waters into interior marshes well past the immediate shorelines; however, these post-spill SLC analyses results could not be validated due to the lack of observational data and possible flooding in the pre-spill SLC scene.