Coastal areas represent worldwide key environments for economy, tourism, trading and society. Hence, a continuous and updated remotely observation is needed for retrieving information on the urbanization rate, agricultural land cover, environmental sustainability, etc. Synthetic aperture radar (SAR) allows providing synoptic maps of the observed scene with fine spatial resolution in almost any illumination and weather condition. In addition, in the last decade a large set of polarimetric SAR (POLSAR) data, collected at different wavelengths and polarizations, has been made available to take full benefit of the physical information they offer. Several approaches based on POLSAR data have been proposed for classification purposes. Most of them rely on scattering models to characterize the physical mechanisms that rule the observed scene [1-3]. Model-based classifiers deal with different decomposition schemes of polarimetric observables in order to associate, for each pixel of the observed scene, the elementary scattering mechanisms that may occur [4-5]: i) surface scattering due to flat or slightly rough surfaces, ii) double-bounce scattering typical of the ground-buildings or ground-trunks interaction, 3) volume scattering related to completely random behavior or to inclusion into the observed layer, 4) helix scattering that characterizes non-reflection symmetric scenarios. In this study, the coastal area of the Bohai sea where the Yellow River flows is analyzed. The Yellow River is the most sediment-filled river and the sixth-longest one in the world. It is characterized by a huge amount of silt and carried sediment, and it is affected by both natural and human-related activities including erosion, floods and pollution. The Yellow River is of paramount importance for safe navigation and local economy (farms, aquacultures). Nevertheless, it represents a challenging environment where different scenarios are present: forest, river, sea, urban, intertidal zones, beaches, swamps, ponds, etc. In this work, a polarimetric study of the scattering properties that characterize the different scenarios of that coastal area is performed using actual L- and C-band fully-polarimetric (FP) SAR data in order to investigate their scattering properties. This can be done using suitable electromagnetic modeling and analysis tools. Such information extracted from multi-frequency POLSAR data is then combined together with backscattering information provided for different transmitted polarizations. This can be accounted for using conventional electromagnetic models that predict the backscattering coefficient for reference scenarios (rough surfaces, randomly oriented structures, etc.). Further, the modeling needs the knowledge of physical parameters that affects the backscattering coefficient through salinity, roughness, soil composition, etc. This approach allows improving scattering model-based classification results in case of classes characterized by the same polarimetric properties, i. e., sea and river, or beaches and intertidal areas. The analysis results are compared with optical images and ground truth data collected over the Yellow River delta during an in-situ ship-based campaign.

REFERENCES:


