Radar Observations In The German North Sea Wadden Sea

Martin Gade [(1)], Kerstin Stelzer [(2)] and Jörn Kohlus [(3)]

(1) Universität Hamburg, 20146 Hamburg, Germany
Telephone: +49 40 42838 5450 Email: martin.gade@uni-hamburg.de
(2) Brockmann Consult, 21502 Geesthacht, Germany
Telephone: +49 4152 889307 Email: kerstin.stelzer@brockmann-consult.de
(3) LKN Nationalparkverwaltung, 25832 Tönning, Germany
Telephone: +49 4861 61646 Email: joern.kohlus@lkn.landsh.de

High-resolution multispectral remote sensing data from satellite-borne optical sensors are already being used for the classification of sediments, macrophytes, and mussels on exposed intertidal flats in the German Wadden Sea. Since the use of those sensors in northern latitudes is strongly limited by clouds and haze, we included Synthetic Aperture Radar (SAR) data, allowing for an observation of intertidal flats that is independent of cloud coverage and daytime. Three main test areas on the German North Sea coast were identified, which represent areas of typical sediment distribution on intertidal flats, but also include vegetated areas and mussel and oyster beds. During summer season, some regions are covered by sea grass and green algae. Thus, a simple classification method that assumes bare sediments cannot be applied in those areas. We demonstrate that SAR data have great potential to improve an existing monitoring system for intertidal flats and to complement the classification of sediments, macrophytes, and mussels in the German Wadden Sea. Multi-satellite SAR data acquired at different radar bands (L, C, and X band, from ALOS PALSAR, from ERS SAR, Radarsat-2 and ENVISAT ASAR, and from TerraSAR-X , respectively) were used to analyse their potential for crude sediment classification on dry-fallen intertidal flats and for detecting benthic fauna such as blue mussel or oyster beds. We show that both multi-satellite and multi-temporal analyses provide valuable input for the routine monitoring of exposed intertidal flats on the German North Sea Coast. In addition, we demonstrate that high-resolution SAR is capable of detecting residuals of historical land use in areas that were lost to the sea during major storm surges in the 13th and 17th centuries. For the first time, X-band (TerraSAR-X) and C-band (Radarsat-2) SAR images are being used to help local archaeologists in identifying those residuals and their spatial extent.