

Automatic classification of coastline and prediction of change - an exemplary study for the North Sea and Baltic Sea

Automatic coastline classification based on machine learning is proven to be robust for sandy beaches on regional and global scales. However sandy beaches only make around one third of the world's ice-free shoreline. The rest consists of mudflats, cliffs, different types of vegetation and human constructions. Classification of these features is

more challenging. For instance, mild foreshore slopes resulting in large horizontal tidal excursions and high water content impede shoreline identification and classification in mudflats. Seasonal growth cycles pose difficulties in classification of vegetation.

Here we present a classification method based on an existing ground type classifier developed for Sentinel 2 data, which is able to identify the mentioned features including sandy beaches. In a later stage of the project the developed model will be used to identify the changes of the different coast types in the North and Baltic Sea within the past four decades. Generating the labelling data is a crucial task to achieve the required model performance. In order to minimize the effort to label the huge amount of available data most efficiently (Landsat and Sentinel) an active learning approach was chosen which will be presented together with some preliminary classification results.

The presented results will ultimately be used to generate a map, indicating hotspots of coastline erosion and deposition in the North and Baltic Sea. Combining these results with climate data (winds, storms, waves, surges, currents) utilizing explainable AI can provide further insights into the drivers of coastline evolution. In a final step possible coastline development until the end of the century may be predicted. The latter will not be part of the presented results.

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