

## **Coastal erosion - knowing and monitoring the submerged part is essential for effective action**

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Coastal erosion strongly depends, among others, on the distribution of different substrates, on morphology, on marine conditions, and mostly on cross-shore and longshore sediment imbalance. When coastal erosion occurs, changes in the coastline position is the most obvious and measurable phenomenon. However, the result of the coastline retreat is often the manifestation of a larger sediment imbalance, which generally begins in the submerged part of the beach system as it usually constitutes a larger sediment catching area than onshore. Knowing the morphological dynamics of the foreshore area and quantifying the erosion that occurs are key elements in sizing the weakness of the littoral system, its instability, and the ways to adapt or protect.

Within the ESA Coastal Erosion Project, the Space for Shore consortium has developed several products that focus on submerged and intertidal areas. As a first step, structures that are temporarily or permanently covered by water are identified. Then, their temporal and spatial changes are monitored, and finally, these changes are related to the various processes that happen on shore. This workflow provides tools to assess changes and has potential to predict risk areas of increased coastal erosion.

In this contribution, we will present three sets of submerged and intertidal coastal indicators derived for various time scales and in several coastal regions of Germany, Romania, and France, using hundreds of optical, infrared, and SAR satellite images. These indicators highlight the migration of submerged sandbars in foreshore areas, the spatio-temporal changes in bathymetry, and the dynamics of intertidal flats. We will demonstrate how our automated processing schemes lead to an assessment of fore-shore changes, and how they can help coastal managers in their decision-making, without the common delays for similar surveys during field campaigns.

Within the consortium, we are also investing a lot of effort in providing this type of information, which is not always familiar to local authorities and decision makers. Correlations were noticed between the dynamics of these submerged features and the shoreline changes over time. However, the interpretation of the achieved results often remains complex, hence our goal in this project is to make them accessible and understandable to users, and to provide them with additional information and tools to further analyze their coastal systems.

