

Watching out large-scale shoreline monitoring in Europe, comparison study from the Portuguese, French, German, Romanian, Norwegian, and Greek sandy coasts.

Contribution of the Space for Shore consortium to the ESA's Coastal Erosion Program

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ABSTRACT

Coastline monitoring is a valuable tool used by the scientific community and coastal managers to assess the sustainability of their littoral and to assist them in their decision-making.

In this context, our approach is based on the most frequently used coastline indicators and covers all types of European coasts. These indicators have been extracted from high resolution satellite imagery, which remains today the best resource for a comprehensive assessment of the past, recent, and current state of the coastal continuum at the European scale.

Various methods were experienced, some already existing in-house, others newly developed for the purpose of extracting nearly 4,000 km of coastline, on several types of beaches having micro to macrotidal regimes at mid to high latitudes. These beaches are distributed across France, Greece, Portugal, Germany, Norway, and Romania. Also, to cover the entire Danube Delta, Ukraine was included in this scope. Using optical and SAR satellite images, we monitored a variety of coastline indicators, e.g., waterlines, swash excursion limits, beach widths, dune foot, and seaward vegetation edges.

Different time periods were studied to match local dynamics, from long-term trends (up to 25 years) to the assessment of impacts induced by episodic storm events. We adapted the temporal frequencies to the natural environmental dynamics of each study area, with monthly, seasonal, and annual rhythms. Coastal changes were estimated and mapped using different statistical methods, including cross-shore migration and surface changes. Our large-scale demonstration provides an overview of the hotspots of vulnerable coasts in Europe, with various diagnoses of recent, accelerated, and extensive coastal erosion.

In this presentation, we will highlight our main results of monitoring coastline change and some typical examples of highly erosive coasts. This is the case along the Danube Delta (Romania) which has retreated locally up to 330 m over the last 30 years, or on the Cotentin Coast (France), where the Eleanor storm induced an erosion of several tens of meters of the dune foot in a few days, or during the last summer (2021), where the coastline of Evia Island (Greece) suffered dramatic damage after large fires and heavy flooding that followed. We will also show erosion hotspots on the highly touristic coasts of Portugal and the German island of Sylt, which has experienced coastal erosion of several tens of meters over the last ten years.