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Spanish coast resilience face to storm and beach renourishment monitored from space.

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The increasing storm frequency and strength due to climate change, coupled with human activities along the coast unbalance the coastal dynamics. A constant monitoring is necessary to better understand and mitigate the effect on Spanish coastal environments. Spain has around 8 000 Km of coastal areas along the Iberian Peninsula, the Balearic and Canary island. These coasts have a high coastal geomorphology variability, from rocky coasts with large estuaries on the Atlantic face in the northwest of the Iberian Peninsula, to long sandy beaches with dunes systems and large wetlands in the southwest. On the Mediterranean coast, low rocky cliffs and sandy beaches with a wide variety of coastal infrastructures and deltas. Although in-situ measurements are highly efficient on capturing coastal parameters and features at a given time, the cost of continuous acquisition campaigns for the whole coast is dissuasive. Earth Observations provide wide spatial coverage over a large temporal scale allowing us to develop a methodology adapted to all coastal morphologies and dynamics to follow the impact of climate change and human activities on Spain's top touristic attraction, its coasts.

Our developed methodology uses the instantaneous boundary between land and sea on satellite images extracted using an algorithm based on the Liu & Jezek methodology. The use of the Canny edge detection is improved by a local adaptive threshold applied on a band ratio image. NDVI, BNDVI, GNDVI or others are applied depending on coastal features and natures to extract with high precision the land/ sea interface. Is then applied to the obtained waterlines waves, slope and tide correction to obtain inter-comparable lines to build some time-series product at different time scale. The spatial scale of the changes due to coastal dynamics within the coastal environment is a challenge for change detection due to the shifts between earth observations. The application of a geo-location method helps with the spatial accuracy constraint and ensure an accurate change detection by monitoring real movements and therefore allow us to capture coastal change at different temporal and spatial scales.