



## **Accurate mapping of a shallow, channelized tidal lagoon: Óbidos Lagoon (Portugal).**

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The increasing performance and sophistication of numerical models make the level of accuracy in morphological mapping a critical limitation for morphodynamic modelling studies of shallow coastal systems. As surveying of large intertidal areas incised by deep meandering channels frequently leaves gaps, modellers have often to use older data or interpolation methods to fill in shadow zones. The highly dynamic character of shallow areas implies that reliability of older data for this purpose must be ensured. Furthermore, depending on the data spatial coverage, the generation of physically meaningful digital elevation models (DEM) is not always straight forward, as interpolation can smooth or cut channels.

Satellite TerraSAR-X images offers the possibility to obtain predictable and frequent (daily) high definition (up to 1 m) ocean surface roughness information. Under favourable weather conditions, smooth water surface allows SAR detection of flooded areas. Extracted waterlines can then be used, for instance, to identify channels and shoals inside a lagoon. Here, waterlines have been used to check the quality of a generated DEM, as well as to facilitate the choice of points for interpolation in any defined area, in concert with survey data. In addition, SAR derived waterlines have been used to validate the use of data from surveys carried out at different periods.

A methodology for generating DEMs that integrates topographic data from different dates with TerraSAR-X images is presented, which aims at ensuring objective consistency between DEMs and morphological reality.

The study area is the Óbidos Lagoon, which is located on the mesotidal western Portuguese coast. The lagoon is connected to the ocean by a highly dynamic tidal inlet and displays an extensive and complex flood-tidal delta morphology.

Three good quality images, acquired within a 12-day period, are used to obtain waterlines for different (tidal) water levels. The images are georeferenced and orthorectified in a GIS environment. Image orthorectification is performed using a spline transformation: based on previously orthorectified aerial photographs, ground control points are added until roads, buildings and streams around the lagoon present a good match on both images. Waterlines are then digitised. While a topo-hydrographical survey carried out within the period of image acquisition is used for the most dynamic region of the lagoon (near the inlet), a 6-year older survey is considered for the more stable area of the flood-tidal delta.

Four DEMs are generated using two interpolation methods, respectively Delaunay triangulation and Kriging interpolation, with and without the waterlines. The waterlines are used as boundaries which are helpful in the selection of survey points to be used for each morphological feature (e.g. channels or sandbanks). These preliminary results highlight how the integration of a new type of geographic information can improve morphological characterization of shallow coastal systems together with traditional and still widely used land survey methods.