BATHYMETRY ESTIMATES FROM SATELLITE

Application: Allows users to estimate bathymetry particularly for badly monitored areas where measurements are difficult to make or not recently updated.
Users: Planners and decision makers in the aquaculture sectors.
Availability: On demand – each bathymetry computation comes from a specific analysis. Spatial resolution is 10 to 30 metres, over shallow and clear waters (e.g. less than 8m depth).

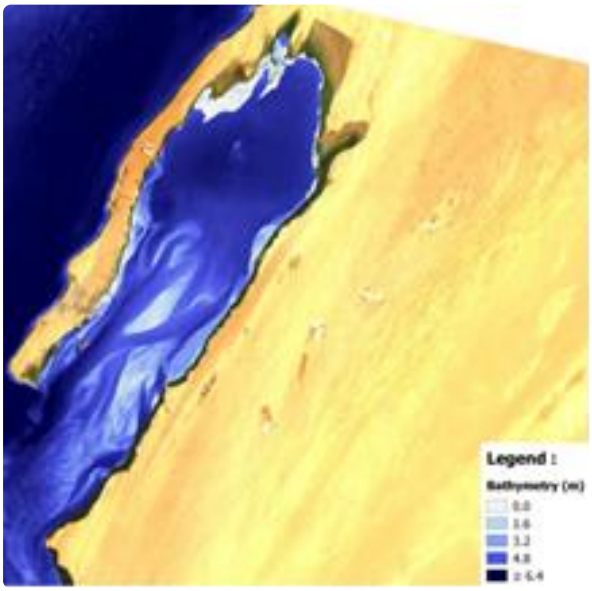

FIGURE 1: ESTIMATION OF SATELLITE BATHYMETRY, DAKHLA, SOUTH MOROCCO

FIGURE 2: SENTINEL 2 - SATELLITE TECHNOLOGY FOR SEA-BED MEASUREMENTS

Source data: Earth Observation images of the areas of interest are needed as well as reference measurements of water depths at a similar time. Satellite sources include LandSat7, LandSat8 and Sentinel 2.

Methodology: Consists of the coincident exploitation of reference water depths, and Earth observation from satellites of the water column to fit an inversion model between the colour observed by the satellite sensor and the water depth. The method is based on the hypothesis that the sea bottom is of the same nature over the area of analysis (Pennucci *et al.,* 2007). This assumption can be relaxed by using Lee *et al. (*1998, 1999) inversion models. The tidal level at the date of the satellite measurement is considered and added to the reference water depths used. Then a colour/depth model is applied to the other images available over the area. Finally, all bathymetry estimated for each satellite image over a significant period are averaged to derive a consolidated product.

Limitation: Bathymetry can be estimated in areas where the sea floor can be observed from space and where the seabed is homogenous over an area. Optical satellite images are not exploitable in cloudy conditions.

A demonstration product with satellite derived-bathymetry over the bay of Dakhla in the South of Morocco shows a reliable level of confidence compared to nautical charts for depths less than 6.4 metres. This allows for monitoring of sea bottom evolution.

References: G. Pennucci, R. Grasso, C. Trees, Bathymetry estimation from high-resolution satellite images, Poster at NURC REA Conf., 25-27/09/2007, Lerici, Italy. Lee, Z., Carder, K. L., Mobley, C. D., Steward, R. G., & Patch, J. S. (1998). Hyperspectral remote sensing for shallow waters. I. A semianalytical model. Applied Optics 6329-6338 Lee, Z., Carder, K. L., Mobley, C. D., Steward, R. G., & Patch, J. S. (1999). Hyperspectral remote sensing for shallow waters: II. Deriving bottom depths and water properties by optimization. Applied Optics, 38(18), 3831-3843.

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