

Water Monitoring Sentinel Cloud Platform: Water Monitoring Platform Based on Satellite Imagery and Modeling Data

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Abstract : Water is under severe threat today because of the rising population, increased agricultural and industrial needs, and the intensifying effects of climate change. Due to sea-level rise, erosion, and demographic pressure, the coastal regions are of significant concern to the scientific community. The Water Monitoring Sentinel Cloud platform (WORSICA) service is focused on providing new tools for monitoring water in coastal and inland areas, taking advantage of remote sensing, in situ and tidal modeling data. WORSICA is a service that can be used to determine the coastline, coastal inundation areas, and the limits of inland water bodies using remote sensing (satellite and Unmanned Aerial Vehicles - UAVs) and in situ data (from field surveys). It applies to various purposes, from determining flooded areas (from rainfall, storms, hurricanes, or tsunamis) to detecting large water leaks in major water distribution networks. This service was built on components developed in national and European projects, integrated to provide a one-stop-shop service for remote sensing information, integrating data from the Copernicus satellite and drone/unmanned aerial vehicles, validated by existing online in-situ data. Since WORSICA is operational using the European Open Science Cloud (EOSC) computational infrastructures, the service can be accessed via a web browser and is freely available to all European public research groups without additional costs. In addition, the private sector will be able to use the service, but some usage costs may be applied, depending on the type of computational resources needed by each application/user. Although the service has three main sub-services i) coastline detection; ii) inland water detection; iii) water leak detection in irrigation networks, in the present study, an application of the service to Óbidos lagoon in Portugal is shown, where the user can monitor the evolution of the lagoon inlet and estimate the topography of the intertidal areas without any additional costs. The service has several distinct methodologies implemented based on the computations of the water indexes (e.g., NDWI, MNDWI, AWEI, and AWEIsh) retrieved from the satellite image processing. In conjunction with the tidal data obtained from the FES model, the system can estimate a coastline with the corresponding level or even topography of the inter-tidal areas based on the Flood2Topo methodology. The outcomes of the WORSICA service can be helpful for several intervention areas such as i) emergency by providing fast access to inundated areas to support emergency rescue operations; ii) support of management decisions on hydraulic infrastructures operation to minimize damage downstream; iii) climate change mitigation by minimizing water losses and reduce water mains operation costs; iv) early detection of water leakages in difficult-to-access water irrigation networks, promoting their fast repair.

Keywords : remote sensing, coastline detection, water detection, satellite data, sentinel, Copernicus, EOSC

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