

EGU23-9375, updated on 06 Jun 2023

<https://doi.org/10.5194/egusphere-egu23-9375>

EGU General Assembly 2023

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Generation of multi-resolution, daily and gap-free ocean colour satellite products for coastal applications: the MultiRes project

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Coastal ocean areas are very dynamic regions subject to strong anthropogenic pressure (e.g. industry, tourism, renewable energies, population). Satellite data constitute a unique tool to study and monitor these complex areas at high spatial and temporal resolutions. While “traditional” ocean colour satellites like Sentinel-3 provide daily temporal resolution, their sensors do not measure at the spatial resolution needed to correctly resolve complex coastal dynamics. On the other hand, while high spatial resolution sensors, like the MSI onboard Sentinel-2 (10m - 60m resolution), are able to resolve these small scales, their revisit time is far from optimal (2-5 days for the Sentinel-2 A & B tandem). Additionally, both high spatial resolution datasets and traditional ones are hindered by the presence of clouds, resulting in a large amount of missing data.

Given the high complementarity of these two measurement strategies (Sentinel-3 and Sentinel-2), we present a methodology to derive gap-filled multi resolution ocean colour products from the synergistic use of Sentinel-2 and Sentinel-3 data. Applying DINEOF (Data Interpolating Empirical Orthogonal Functions), we exploit and combine both the high-resolution spatial variability information contained in Sentinel-2 products as well as the high temporal information of Sentinel-3. Both Sentinel-2 and Sentinel-3 products are generated using the Copernicus Marine High-Resolution processor, which uses automated switching algorithms adapted to the local water conditions (at the pixel level) to retrieve optimal remote sensing spectra and water quality variables. With this approach, we address the high variability of different water types with small scale changes. The combined Sentinel-2 and Sentinel-3 products consist of Chlorophyll-a concentration and turbidity retrieved through a multi-algorithm approach with optimized quality flagging.

An analysis of turbidity and chlorophyll daily data at 100m resolution in the northern Adriatic Sea and the Belgian coastal zone will be presented, alongside an analysis of the spatial scales resolved by the original and merged DINEOF datasets.