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Coastal Currents from Observations, an integrated multi-source approach to analyse surface currents.

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The ocean surface is a key area where processes driven by the atmosphere take place, with important phenomena happening at small scales of turbulence in the surface layer. The analysis and extraction of surface currents in different basins have been carried on by different methods. However, there are still gaps and elements to improve to obtain high-quality maps with increased resolution. These small-scale variations in surface currents are key to understanding phenomena affecting elements like commercial shipping to biological and chemical impacts. To improve the quality of the surface currents products, a novel approach is intended to be used in the Mediterranean basin, a key economic area for 3 continents and several countries. By using Data Interpolating Variational Analysis in n-Dimensions (DIVAnd), a method that interpolates observations on a regular grid using a variational inverse method including dynamic constraints related to coastal currents, three different datasets are set to be applied, altimetry data from satellites, drifter data and high-frequency radar data, the latter has already been used for the reconstruction of surface currents in areas of the Mediterranean as the Balearic islands. By modifying the interpolation method initially designed for HF radar data, we look forward to interpolating and obtaining ocean surface currents maps from the three different datasets. Partial results for the available dates (from 1992 to 2022) have been obtained with outputs and maps that match the circulation of the Mediterranean Sea and show high detail of elements such as gyres and strong signals currents as the Algerian, selected outputs also show the strong seasonality of some of these features. This work is part of the BlueCloud2026 project.