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Improvements of CMEMS altimetry gridded products on estimates of mesoscale activity in the Mediterranean Sea

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Mesoscale circulation features in the Mediterranean Sea play an important role in the transport of water masses throughout the basin and therefore in the maintenance of its thermohaline circulation. The spatial and temporal variability of mesoscale activity at the sea surface can be assessed from remotely sensed observations of sea level anomalies (SLA). L4 gridded products, obtained after filtering and interpolation of "along-track" satellite measurements, are commonly used.

In this work, we investigate the extent to which the DUACS-DT2018 altimetry product for the Mediterranean Sea affects the description of mesoscale activity provided by the presently available satellite specific SLA product for the basin released by CMEMS. The aim is to assess the refinements of the former in terms of identification of mesoscale features in the basin, paying close attention to the coastal area. We use eddy identification and tracking tool to both identify and quantify mesoscale eddies generated in the basin. Moreover in-situ drifter data retrieved in the framework of two experiments conducted in the Alboran Sea (western Mediterranean); together with in-situ observations for the whole basin compiled in a specific CMEMS product are used to compare absolute surface velocities as obtained from these three datasets with geostrophic velocities derived from absolute dynamic topography for the two altimetry products in order to estimate altimetric errors.

Overall, the variability (in terms of variance) explained by the DUACS-DT2018 product is 14% larger than that explained by the CMEMS current product. Differences of around 3 cm are observed close to the coast in the westernmost part of the Alboran Sea, sparse points of the Algerian coast and the northernmost part of the Adriatic Sea. It represents around 40% of the variability for the new product. The greatest differences are located in the Aegean and Marmara Seas. Drifter observations confirm that the DUACS-DT2018 product offers an enhanced description of mesoscale activity in the Mediterranean Sea. The intercomparison between in-situ velocities computed from drifters and geostrophic velocities derived from altimetry showed an improvement of 7% in the correlation coefficient; and 5% in the root mean square error between both datasets ($\sim$14 cm/s). As a result, eddies showing larger amplitudes and lower radius are observed due to the refinements in the characterization of mesoscale features in the DUACS-DT2018 product, which also returns higher eddy kinetic energy levels.