Geophysical Research Abstracts
Vol. 21, EGU2019-13378, 2019
EGU General Assembly 2019

An OSSE to quantify the reliability and the accuracy of automatic eddy detection performed on gridded altimetric product

Briac Le Vu (1), Alexandre Stegner (1), Elodie Charles (2), and Yannice Faugere (2)

(1) Laboratoire Météorology Dynamique (LMD), Ecole Polytechnique, Palaiseau, France (briac.le-vu@lmd.polytechnique.fr), (2) Collecte Localisation Satellites (CLS), Toulouse, France

Automatic eddy detection algorithms are widely used to identify and track coherent structures on gridded altimetric products (SLA, ADT or surface velocities). However, these gridded products have significant spatial and temporal limitations. Even if daily maps are provided, the frequency of the altimetric tracks is too low to follow accurately the dynamical evolution of eddies below a characteristic time scale of 6-10 days. On one hand, a meso scale eddy may totally disappear between consecutive maps if altimetric tracks do not cross the structure for several days. On the other hand, the optimal interpolation technique which is used to fill the gaps between the altimetric tracks may induce ghost eddies which are not real. In order to provide a quantitative assessment of these errors made on the eddy detection, we performed an Observing System Simulation Experiment (OSSE). We used the outputs of one year (2004) of a data-assimilated numerical simulation (NEMO-MEDRYS1V2 gridded at $\sim$1/12°) in the Mediterranean Sea for the reference fields. From this reference SSH, synthetic gridded products were constructed, in a similar way as the CMEMS/DUACS multi-mission altimeter 1/8° gridded SLA product (formerly distributed by AVISO) as following. First, a real constellation of four satellites was used to build a synthetic altimetric signal along each track. Then, gridded maps of SLA and ADT were reconstructed using an optimal interpolation scheme of CLS. This scheme was optimized for the Mediterranean basin meso-scale variability specifically for this study. Finally, the surface geostrophic velocity fields were derived.

Then we applied two different eddy detection algorithmes on both the reference and the OSSE fields. We were then able to identify three types of eddies: the « missed », the « ghost » and the « detected » ones. The missed (ghost) eddies correspond to the coherent structures detected (not-detected) in the reference field and not-detected (detected) in the OSSE while the « detected » eddies are the one located both in the reference and the OSSE field. Our statistical analysis shows that the percentage of missed and ghost eddies could vary from 80% to less than 1% depending on their size and intensity: large and intense structures are more reliable than small or weaker ones. Besides, we built a density parameter, quantifying the number of altimetric tracks inside a given eddy during a given period. This dimensionless parameter is a first proxy to quantify the reliability (i.e. probability to be a ghost) and the accuracy of the estimated size and intensity of any detected eddy in comparison with the reference one. Such estimation of the reliability and the accuracy of the detected eddies may improve the near real time monitoring of large meso scale eddies and the statistical analysis of long term series.