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Cyclone-Anticyclone asymmetry of eddy detection on gridded altimetry product in the Mediterranean Sea

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Thanks to a Observing System Simulation Experiment (OSSE) that simulate the along-track satellite measuring process on the sea surface of the high resolution model CROCO-MED60v40-15-16 we investigate how the reliability and the accuracy of the detected eddies are influenced by the satellite sampling and the mapping procedure. The main result of this study is that there is that there is a strong cyclone-anticyclone asymmetry of the eddy detection on the altimetry products AVISO/CMEMS in the Mediterranean Sea. Large scale cyclones having a characteristic radius larger than the local deformation radius are much less reliable than large scale anticyclones. We estimate, that less than 60% of these cyclones detected on gridded altimetry product are reliable, while more than 85% of mesoscale anticyclones are reliable. Besides, both the barycenter and the size of these mesoscale anticyclones are relatively accurate. This asymmetry comes from the difference of stability between cyclones and anticyclones. Large mesoscale cyclones often splits into smaller sub mesoscale structures hav ing a rapid dynamical evolution. The high resolution model CROCO-MED60v40 shows that this complex dynamic is too fast and too small to be accurately captured by the gridded altimetry products based on a strong spatio-temporal interpolation. The later smooth out this sub mesoscale dynamics and tend to generate an excessive number of unrealistic (i.e. unreliable) mesoscale cyclones in comparison with the reference field. On the other hand, large mesoscale anticyclones, which are more robust and that evolve more slowly, can be spatially resolved and accurately tracked by standard altimetry products. However, we confirm that gridded altimetry products have a systematic bias on the eddy intensity and especially for anticyclones. The azimuthal geostrophic velocities are always underestimated on the AVISO/CMEMS products even for large mesoscale anticyclones.