Remote Sensing of Environment

Assessing the accuracy of satellite derived ocean currents by comparing observed and virtual buoys in the Greater Agulhas Region

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Abstract

In this study, we assess the accuracy of a combined geostrophic and Ekman current product (GlobCurrent) that estimates ocean currents at 15 m depth, by coupling it to a synthetic particle tracking tool and comparing the virtual trajectories to those of surface drifting buoys drogued at 15 m in the Greater Agulhas Current Region. The velocities from a total of 1041 drifters are compared and evaluated to the synthetic particle-derived velocities for the period 1993–2015. On average the GlobCurrent underestimates the velocity in the Greater Agulhas Current by approximately 27%. The underestimation ranges from 4 to 64% in different regions, with the smallest error found in the Agulhas retroflection region, and the highest in the Benguela Upwelling System. Furthermore, we compare the time taken for the separation between the virtual and real drifters to reach 35 km. The mean separation time was found to be 78 h, with the shortest time (35 h) found in the Agulhas Current and the longest time (116 h) located in the Agulhas Return Current. Deploying 10,000 virtual drifters in a 1° × 1° box within the southern Agulhas Current shows a convergence of trajectories towards the core of the current, while higher divergence is evident in the Agulhas retroflection. To evaluate the utility of this synthetic particle tracking tool coupled with GlobCurrent in open ocean search and rescue operations, two test cases are examined: (1) a capsized catamaran spotted south of Cape Recife and recovered 5 days later south of Cape Agulhas; and (2) a drifter trajectory in the same region. The comparison suggests that the GlobCurrent forced synthetic particle tracking tool is not appropriate for predicting the trajectory of a capsized catamaran that does not have the same drift characteristics as a surface drifting buoy drogued to 15 m.