GLOBAL COMPARISON OF SEA SURFACE CURRENTS DERIVED FROM DRIFTER AND ALTIMETRY OBSERVATIONS

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A global comparison of sea surface currents is conducted between *in situ* drifter velocities and currents derived from along-track satellite altimetry. The drifters are Surface Velocity Program (SVP)-type satellite-tracked buoys drogued at 15m to follow upper ocean currents (Sybrandy and Niiler,1992; Lumpkin and Pazos, 2007). Drifter velocities are estimated from the differences in satellite location fixes, lowpassed to remove inertial and tidal fluctuations, and decomposed into time-mean and time-varying (anomaly) components. The Ekman component is estimated using an empirical model and removed to estimate drifter-derived geostrophic velocity anomalies. Coincident measurements between the drifters and altimetric sea level anomaly estimates are identified for every time that a drifter trajectory crosses a satellite groundtrack within a one-day window. The alongtrack sea level anomaly gradients and geostrophic components of the across-track drifter-derived velocity anomalies are linearly regressed for every set of coincident observations.

Earlier comparisons between drifters and Geosat (Willebrand *et al.*, 1990) or Topex/Poseidon altimetry data (Ichikawa et al., 1995; Niiler et al, 2003) showed that satellite observations were correlated with surface current variability observed by drifters in regions of the ocean with high eddy kinetic energy. However, the gridded surface topography fields used in those studies were considerably smoothed using optimal interpolation, with consequent smoothing of mesoscale features and potential impacts upon correlations and gain coefficients. This limitation is overcome here using the alongtrack altimetry data instead of gridded data, focusing on the acrosstrack component of the velocity fields as done by Uchida *et al.,* (1998). Global fields of regression parameters are presented.

Results obtained in this study indicate that the correlation between drifter and altimeter-derived geostrophic velocity anomalies is large (>0.6) throughout the global ocean in regions where EKE exceeds around 300 cm^2/s^2 (with the exception of the equatorial band where near-inertial merges with the quasigeostrophic). Regions of low correlation exist where the signal-to-noise ratio is very small, such as in the eastern subtropics, and throughout the North Pacific subpolar gyre. Altimetry-derived estimates of EKE are larger than those from drifters, in contrast to published results (e.g., Niiler et al., 2003) derived from gridded altimetry products. A hypothesis based on different time and space filtering in the processing of both datasets is provided to explain this discrepancy. The decomposition into time-mean and anomaly of drifter-derived velocities is evaluated via a regression bias. Large biases are found in regions of strong currents, such as the Gulf Stream, Kuroshio and Antarctic Circumpolar Current. These biases indicate discrepancies between the time-mean fields removed from each data set, and can be used to consistently match altimetric and drifter-derived velocities. We speculate that they are due to inhomogeneous sampling by the drifters.

Results obtained from this work will allow complementing the ocean observing system by providing velocity estimates derived from altimetry where drifter coverage is not adequate, and can be used to estimate the potential bias in satellite-derived currents as a function of the observing system configuration.

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