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Supporting Information for

**Eddy-induced acceleration of Lagrangian floats**

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**Text S1. Metrics to assess sensitivity to isotropic diffusivity**

To quantify the effect of the horizontal and vertical viscosity of 10-5 m2 s-2, we evaluate the dispersion of particle acceleration with varying isotropic diffusivities (Kh) relative to particle acceleration when Kh =0 m2 s-2. Here we define dispersion based on the difference in acceleration. The values indicate the impact of Kh on the particle motion. We expect the dispersion to rise for large Kh, since this will replicate the effect of a large random walk (Hunter et al. 1993). The results (shown in Figure S2) indicate that Kh must be larger than 10 m2 s-2 to have a dominant influence on the flow. When Kh=105 m2 s-2, the trajectories are completely dominated by viscous processes, leading to large differences in particle acceleration rates. However, when Kh is <1 m2 s-2, particle trajectories are dominated by the background advective flow. Therefore, the results at Kh=10-5 m2 s-2 and Kh=0 m2 s-2 are inferred to be statistically equivalent. Though the effect of a non-zero Kh is statistically small, it is nevertheless important: the diffusion term represents sub-grid-scale eddy motions and therefore allows floats to deviate from a purely deterministic trajectory.



Figure S1. Speed differences (unit: cm/s) between B-C derived velocities VB-C and A-D derived velocities VA-D. Black dots denote regions where the mean speed differences are greater than 10% of the mean velocity.



Figure S2. Acceleration dispersion (defined by the difference between the acceleration at a specified Kh and that at Kh=0 m2 s−1) as a function of Kh. The inset shows the same quantity on a log-log axis