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## **Eddy Diffusivity Estimates from Lagrangian Trajectories Simulated with Ocean Models and Surface Drifter Data—A Case Study for the Greater Agulhas System**

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## **Supplemental Material**

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1 **Supplementary information: the impact of non-uniform sampling arrays on pseudo-**  
2 **Eulerian mean EKE and velocity**

3

4 Figure S1 shows a comparison of the pseudo-Eulerian mean velocity and EKE obtained from  
5 Lagrangian experiment SIMeddy-5d considering all particle positions and only release  
6 positions.

7 The relative difference of both can be regarded as measure of the array bias associated with  
8 the pseudo-track approach, which is caused by the non-uniformity of the sampling array.

9 Davis (1991b) showed that a mean circulation map computed from non-uniformly distributed  
10 drifter data can be significantly biased because drifters tend to diffuse away from regions of  
11 high concentrations (cf. Poulain 2001) and high diffusivities.

12 Maximal values of EKE for the case in which only release positions are considered are  
13 weaker, since maximal EKE sites correspond to maximal eddy diffusivity sites, and particles  
14 display a tendency to leave maximal diffusivity sites thereby decreasing the pseudo-Eulerian  
15 EKE. If only considering the release positions instead of all positions from the simulated  
16 trajectories, the pseudo-Eulerian mean velocity and EKE between SIMeddy-5d and OBS  
17 agree better (cf. Figure 5 in main manuscript). This may be due to a weaker array bias in OBS  
18 than in SIMeddy-5d, which could be explained by the fact, that in OBS the maximal  
19 EKE/diffusivity sites are probably relatively more populated with drifters because  
20 investigators tend to deploy drifters preferably in the most energetic sites of interest.

21

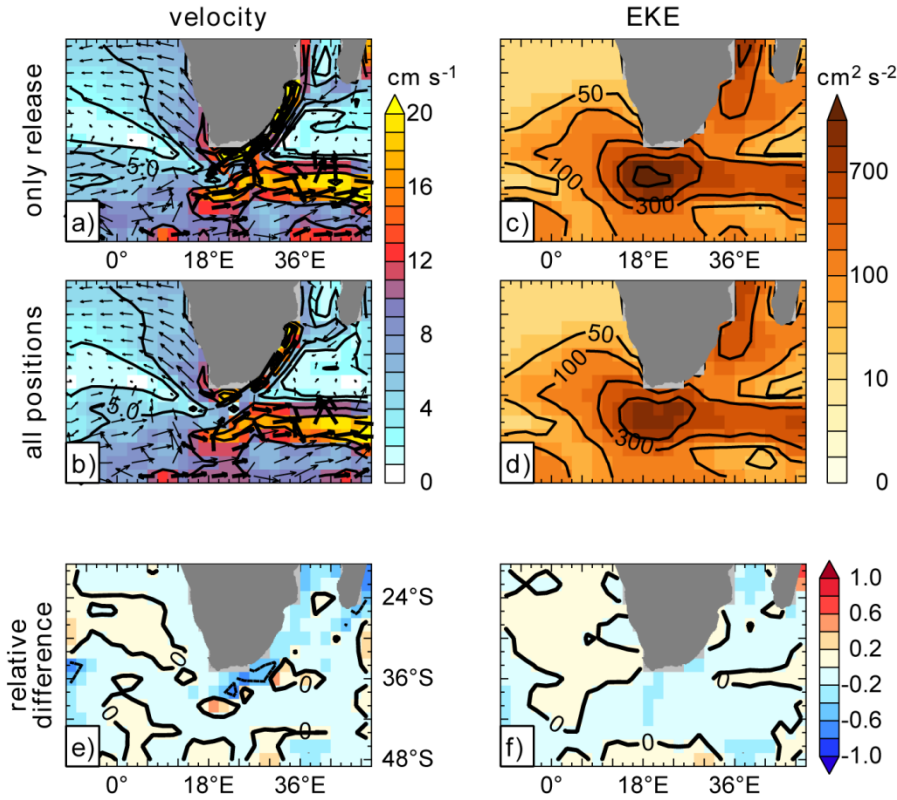
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28 **Figure S1: Near-surface pseudo-Eulerian mean velocity and EKE.** Shown are results  
 29 obtained from Lagrangian experiment SIMeddy-5d considering only release positions (middle  
 30 panels) and all particle positions (upper panels). a-b) Mean speed (contours and color  
 31 shading), and direction (vectors) of the pseudo-Eulerian mean velocity. Contours are  
 32 displayed every  $5 \text{ cm s}^{-1}$ , velocity vectors for speeds  $> 10 \text{ cm s}^{-1}$  are displayed thick and at  
 33 half-length compared to vectors for speeds  $< 10 \text{ cm s}^{-1}$ . c-d) Pseudo-Eulerian EKE, contours  
 34 are displayed for 50, 100, 300, 700, and  $1300 \text{ cm}^2 \text{ s}^{-2}$ . e-f) Relative difference defined as [all  
 35 positions – only release]/only release, contours are displayed at a distance of 0.5.