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Eddy diffusivities in the Benguela upwelling region

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The Benguela upwelling system off the coast of Namibia is characterized by rich meso- and submesoscale features, such as eddies and filaments. We estimate eddy diffusivities from surface drifters deployed in the region during a cruise in Nov/Dec 2016 and investigate for what spatial scales the eddy-diffusion model is appropriate. We compare single- and pair particle statistics and discuss the relation of the diffusivities to the mean flow, the existing energy cascades and the presence of eddies.

Eddy diffusivities and their evolution with scale separation depend on the location of drifter release: diffusivities for the release in a filament are smaller and more anisotropic than the ones for the release close to the main upwelling cell, owing to the existence of strong mean flows. Diffusivities converge after time scales of > 70 days, corresponding to spatial scales of > 500km. Different methods of mean-flow subtraction are tested and results are compared to analyses of numerical trajectories in an eddying ocean model with a resolution of 9km in the region. We discuss to what extent the model reproduces the observed statistics and relate the results to what kind of energy cascade exists at what scale.