Ocean Sci. Discuss., 6, S116–S117, 2009
www.ocean-sci-discuss.net/6/S116/2009/

Ocean Science Discussions

Interactive comment on "Ekman layers in the Southern Ocean: spectral models and observations, vertical viscosity and boundary layer depth" *by* S. Elipot and S. T. Gille

Anonymous Referee #1

Received and published: 9 April 2009

In the paper entitled " Ekman layers in the Southern Ocean : spectral models and observations, vertical viscosity and boundary layer depth " the authors investigate the capacity of different Ekman models to reproduce the spectral characteristics of the upper ocean response to wind stress as measured by lagrangian velocity measurements. This is an extremely interesting paper that clearly illustrate the difficulty of 'simply' modelling the oceanic boundary-layer response to wind stress. Despite the fact (somehow disappointing !) that at the end none of the model proposed in the study is fully satisfying, the exercise done by the authors to understand the physical significance of the fitted parameters for the two best solutions leads to a number of very interesting considerations about the physics of Ekman currents.

I strongly recommend publication of this study with very minor revisions.

One point that might be further discussed is the extraction of the ageostrophic component from the drifting buoy velocities :
The authors subtract from the in-situ velocities the geostrophic component of the surface currents as derived from altimetry. The mean component of the geostrophic circulation is inferred from a Mean Dynamic Topography based on GRACE data ; by construction, the spatial scales of the mean currents are therefore greater than around 400km (because GRACE based geoid models don't resolve shorter spatial scales). This means that the geostrophic velocity component is not fully extracted and that a residual from the mean (mainly oriented eastward in the direction of the Antarctic Circumpolar current) is included in the ageostrophic velocity observations used to derive the transfer function.
The authors dedicate a full page to discuss the influence of the wind slip but results may also be biased by the incomplete retrieval of the geostrophic component, at least at frequency=0.

The authors assess the quality of the models by considering the minimized cost function value. It might be interesting to give an idea of how each model performs by computing the percentage of variance it allows to explain compared to the observation variance.

Legends of Figures 7 to 10 have been mixed up :
- Legend of Fig.7 goes with plot of Fig. 10
- Legend of Fig. 8 goes with plot of Fig. 7
- Legend of Fig. 9 goes with plot of Fig. 8
- Legend Of Figure 10 goes with plot of Fig. 9

Interactive comment on Ocean Sci. Discuss., 6, 277, 2009.

OSD

6, S116–S117, 2009

Interactive Comment