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Interactive comment on “An empirical stochastic model of sea-surface temperature and surface wind over the Southern Ocean” by S. Kravtsov et al.

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We thank this reviewer for his/her positive evaluation of the quality and the potential usefulness of our work.

Specific comment:

We think that our empirical model fails to capture the skewness of surface winds not because of any intrinsic problem with the methodology, but because of a particular problem with the data sets at hand. Please note that our EMR methodology is able to simulate 3rd-order moments, as perfectly illustrated, for example, in the empirical ENSO model of Kondrashov et al. (2006) but in the present case we need to choose

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which processes we resolve and which we don't.

The skewness of surface winds is due here to processes that work on smaller scales than resolved at present by the data, namely the mesoscale, to be precise. Because of the limited resolution of the data, we chose to concentrate on the leading, large-scale EOFs: their PCs are, in fact, not skewed, since the mesoscale processes decorrelate spatially over fairly small distances.

The local-vs.-nonlocal empirical modeling and the compromises one needs to make when choosing one or the other model type are discussed in section 1.2.4. Our reasoning as to the model's lack of skill in simulating the observed skewness of surface winds is included in section 4.2, p. 1910, ll. 4–25.

Technical corrections:

p. 1904, ll. 9–10: We listed two reasons that support, indirectly, our conjecture about the leading SST modes being due to intrinsic ocean dynamics: (i) the lack of local correlation between the leading EOFs in SSTs and in winds; and (ii) the very long time scale of the SST anomalies, which is not consistent with estimates based on the mixed layer's thermal inertia. The SST modes visualized in Fig. 5 have large-scale patterns, indeed; but we think that this property cannot be invoked to differentiate between these modes being either intrinsic to the ocean or forced by the atmosphere, since intrinsic oceanic modes can have a whole range of spatial scales, from meso- to basin-scale.

- We use the quadratic, SLW-only model at this point. The first sentence of the section should be modified as follows: We illustrate the performance of the empirical models by examining first local aspects of the simulated SLW variability, based on the output of the quadratic, SLW-only model.

- The red and blue lines in Fig. 1 are, in fact, dashed and solid lines, too, but we do plan to change their description accordingly in the paper's revised version.

- We would appreciate the reviewer's pointing out which reference is wrong, and will be

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happy to correct it.

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