

***Interactive comment on* “On fluctuating air-sea-interaction in local models: linear theory” by Achim Wirth**

Anonymous Referee #1

Received and published: 18 March 2019

This study uses a set of idealized linear models of air-sea interaction to assess the importance of including ocean velocity in computations of surface momentum fluxes. Fluctuation-dissipation results are also discussed for these models.

I am unable to recommend publication of this study in its present form. The fact that accounting for surface currents (or not doing so) changes the surface momentum budget is true by definition; the existence of consequences for the energetics is also well-known. The models used here are not needed to demonstrate these points, and are too simple to quantify the implications meaningfully. In particular, the models' assumption that variations in surface currents are entirely driven by local momentum fluxes from the atmosphere is far too large an oversimplification to allow for a meaningful quantification of the importance of these currents on surface coupling.

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There is also nothing new in the fact that these linear models, when cast as linear stochastic differential equations with solutions which are Markov processes, satisfy fluctuation-dissipation theorems: they are after all just multivariate Ornstein-Uhlenbeck processes. The fact that non-Markov state variable subspaces (such as obtained in the case of red noise forcing without augmenting the state space appropriately) do not satisfy a FDT is also a standard result.

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2018-300>, 2019.

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