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Ocean Science Discussions

Interactive comment on “Sensitivity study of wind forcing in a numerical model of mesoscale eddies in the lee of Hawaii islands” *by* M. Kersalé et al.

Anonymous Referee #5

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General comments

This study investigates the sensitivity of the oceanic circulation around the Hawaiian archipelago predicted by a regional numerical model to the spatial resolution of the wind stress used to force the model (namely the 1/2-degree COADS and 1/4-degree QuikSCAT monthly mean climatologies). The paper is well organized and concise, but unfortunately it does not bring any new result compared with those reported in Calil et al. (2008), who undertook a similar study. Calil et al. (2008) considered in addition a third wind stress dataset, namely a blending of QuikSCAT with the predictions of a regional mesoscale atmospheric model (MM5) to produce a 9-km resolution dataset, and they also used a daily 1/4-degree QuikSCAT dataset to investigate the sensitivity

to the temporal resolution as well. The authors refer to the study by Calil et al. (2008), stating that they were not aware of this work at the beginning of their own work. While this is very unfortunate, this does not justify publishing similar results twice. The authors add on p. 480 that similarities and differences between their results and those of Calil et al. (2008) will be treated in the discussion section, but I could not find any discussion of eventual differences with the results of Calil et al. (2008) in this paper. Therefore, I think that this paper cannot be accepted for publication in its present form.

To make a new contribution, the authors would have to investigate other topics that were not addressed by previous studies of the oceanic circulation around the Hawaiian archipelago, such as whether the interaction between the oceanic flow and topography around the islands is important in the formation of mesoscale eddies, or the impact of the eddies on the nutrient supply to the euphotic zone by combining the ROMS model with a biogeochemical model.

Specific comments

1. p. 479, l. 3-8: the authors seem to state that the Hawaiian Lee Counter Current (HLCC) is generated by the eddies in the lee of the Hawaiian archipelago. While Lumpkin (1998) showed that there was an eddy-to-mean kinetic energy conversion at the latitude of the HLCC immediately west of the Island of Hawaii, simple Sverdrup balance predicts an HLCC from the wind stress curl dipole in the lee of the island of Hawaii (Chavanne et al., 2002). Yu et al. (2003) showed that further west the eddies actually extracted energy from the wind-curl-driven HLCC, reducing its westward extension.
2. p. 479, l. 17-19: at which latitude do the authors place the HLCC? Lumpkin (1998) showed that the HLCC was centered on 19.5N, which intersects the middle of the Island of Hawaii, just in-between the positive and negative wind stress

curl areas in the lee of the island. Therefore, the wind-driving mechanism generates cyclonic eddies north of the HLCC, not south of it. The cyclonic eddies can sometimes drift to the south of the HLCC, but they are not generated there. South of the HLCC, both the negative wind curl and the bottom and lateral topographic forcing on the oceanic flow may act together to generate anticyclonic eddies.

3. p. 485, l. 16-17: the authors clearly place the HLCC too far north compared with its *observed* latitude. The HLCC may be predicted to be centered farther north by numerical simulations using wind stress forcing with low resolution, which does not resolve the individual wind stress curl dipoles in the lee of each island, but it is observed to be centered at 19.5N (Lumpkin, 1998), to the south of the Alenuihaha Channel, which is therefore located on the cyclonic edge of the HLCC, not the anticyclonic edge.

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