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Ucertainties of equatorial Atlantic seasonal cycles in an Ocean General Circulation Model induced by wind products during 1979-2001

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Ocean models are very effective tools to analysis and quantify the ocean heat budget. However, the model performance largely depends on the choice of atmospheric forcing. In this study, 5 experiments are done to examine the sensitivity of the heat budget to wind forcing in equatorial Atlantic Ocean by using the OPA OGCM and LIM3 sea ice model. The wind forcing in the simulations are from 5 different reanalysis datasets during 1979-2001. In addition, the 5 experiments use exactly the same model configuration. The results show that equatorial eastern Atlantic is much more sensitive to wind forcing than equatorial western Atlantic in spite of the larger difference in winds above western Atlantic ocean. The maximum difference of temporal mean (1979-2001) SST among the 5 experiments in eastern Atlantic is as large as 0.7 °C while it is only 0.3 °C in western Atlantic. As for the differences of the 5 simulations in amplitude of SST seasonal cycle, they are also lager in eastern Atlantic and smaller in western Atlantic. Further analysis indicates that the larger differences existing in equatorial Atlantic is mainly due to the heat budget there, which is greatly affected by wind forcing. The largest different component of the heat budget comes from vertical mixing in the mixed layer in boreal summer. Moreover, the horizontal advection and net heat flux of the heat budget in each simulation are also affected by wind forcing, but they are smaller when compared with vertical mixing. In this situation, the contributions of each item (i.e. horizontal advection, net heat flux and vertical mixing) are different in all the simulations. Consider this study, we should be careful to choice wind forcing in equatorial eastern Atlantic study.