Geophysical Research Abstracts
Vol. 21, EGU2019-15138-1, 2019
EGU General Assembly 2019

An estimate of potential surface flux errors in asynchronous coupling

Xavier Perrot (1), Jean Philippe Duvel (2), Hugo Bellenger (1), and Lionel Guez (1)
(1) LMD, ENS,Paris, France, (2) LMD, Jussieu, Paris, France

In coupled general circulation model, the accuracy of momentum and energy exchange at the air-sea interface is still a potential source of significant bias. In the framework of the COCOA project we investigate new methods (both mathematical and numerical) to have a more correct flux representation. One important source of error is the asynchronous coupling between oceanic and atmospheric model. Indeed, the time step of the coupling is generally longer than time steps used by either the atmospheric or the oceanic model. This introduces inconsistencies between the free evolution of the two models and the exchange parameters that are held constant since the last coupling time step. In particular, non-synchronous exchange coefficients may lead to error in the diurnal evolution of the coupled system, or to bias in the ocean mixed layer temperature for period where surface fluxes increases or decrease linearly.

In order to evaluate the potential amplitude of this error, and its regional and seasonal distribution, we use the hourly fluxes that are available in the new ECMWF ERA5 re-analyses. The error due to asynchronous coupling is thus evaluated by inspecting the flux difference between two successive time-steps. Results show more important differences over the western boundary currents and the circumpolar current for all the fluxes except for the solar flux. We also observe larger differences in summer compared to winter in the respective hemisphere. In addition, positive and negative flux differences have different distributions (e.g. fewer positive errors of larger amplitude). This asymmetry could generate long term bias in the ocean mixed layer temperature. Consequently we investigate the impact of these errors on the evolution of the temperature in a simple mixed layer model at different time scales.