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Analysis of the time evolution of the Atlantic Equatorial Mode mixed layer heat budget with a coupled GCM

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The Equatorial Mode (EM), or Atlantic Niño, is tightly associated with the West African Monsoon (WAM) interannual variability. Several works based on observations and model experiments have explained how positive Sea Surface Temperature (SST) anomalies influence the rainfall over the Gulf of Guinea through a decrease of the local surface temperature gradient, weakening the monsoon flow and the surface convergence over the Sahel. Regarding the processes controlling SST anomalies, there is agreement in the determination of the latent heat turbulent fluxes as the major component in damping the SST anomalies, although the generation of the mode is still controversial. Some authors find the anomalous surface wind to be also responsible through heat fluxes and the mixed layer changes. However, the Ekman transport and the oceanic wave propagation have been also identified as possible important processes explaining the time evolution from Angola/Benguela region to the Equator. Besides, there are still open questions about the feedback mechanisms at work in the actual TA EM. In the present work, we revisit the EM evolution in a full coupled GCM simulation of the last decades by analysing each process contribution in a closed oceanic heat budget. We have found that vertical processes as well as surface heat fluxes are important for the generation of EM in the couple GCM and it mainly develops in the regions where the model is not able to reproduce the seasonal cycle. A straightforward implication of this work is the understanding and thus the improvement of the bias over the Equatorial Atlantic in coupled models.