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Growth and decay of the equatorial Atlantic SST mode by means of closed heat budget in a coupled general circulation model

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Tropical Atlantic variability is strongly biased in coupled General Circulation Models (GCM). Most of the models present a mean Sea Surface Temperature (SST) bias pattern that resembles the leading mode of inter-annual SST variability. Thus, understanding the causes of the main mode of variability of the system is crucial. CGCM control simulation with the IPSL-CM4 model as part of the CMIP3 experiment has been analyzed. Mixed layer heat budget decomposition has revealed the processes involved in the origin and development of the leading inter-annual variability mode which is defined over the Equatorial Atlantic (hereafter EA mode). In comparison with the observations, it is found a
reversal in the anomalous SST evolution of the EA mode: from west equator to southeast in the simulation, while in the observations is the opposite. Nevertheless, despite the biases over the eastern equator and the African coast in boreal summer, the seasonality of the inter-annual variability is well-reproduced in the model. The triggering of the EA mode is found to be related to vertical entrainment at the equator as well as to upwelling along South African coast. The damping is related to the air-sea heat fluxes and oceanic horizontal terms. As in the observation, this EA mode exerts an impact on the West African and Brazilian rainfall variability. Therefore, the correct simulation of EA amplitude and time evolution is the key for a correct rainfall prediction over tropical Atlantic. In addition to that, identification of processes which are responsible for the tropical Atlantic biases in GCMs is an important element in order to improve the current global prediction systems.