Sensitivity of resolved convection in the Atlantic Basin to modes of Atlantic SST variability

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One of the most important modes of variability over the tropical Atlantic basin is the Atlantic Meridional Mode (AMM). Its main features consist of a meridional dipole of sea surface temperature (SST) anomalies coupled to cross-equatorial low level winds that affect the position of the Intertropical Convergence Zone (ITCZ) and therefore, modify the rainfall patterns over neighbouring continents. In this study we investigate the relationship between precipitation and the AMM in observations and model simulations using different resolutions and different representations of moist convection.

From the observations, we isolate the strongest AMM events as those that exceed one standard deviation above and below the mean value of the AMM time series. As found in previous studies, the most consistent characteristics among all the events are observed over northern South America during March to May season. A positive (negative) AMM is related to a northern (southern) displacementof the ITCZ and more (less) precipitation over northern South America, whereas negative (positive) precipitation anomalies are typically observed near the coast of Northeast Brazil. Positive AMM events are more uniform among them, while negative events show more variability as the spatial distribution of the rainfall response varies considerably in some regions. Moreover, negative AMM events tend to produce greater precipitation anomalies than the positive AMM ones. The spatial rainfall pattern of the negative AMM also differs from the positive AMM over the eastern basin, as the dipole of precipitation anomalies is observed up 20W and it is not clearly noticed over western Africa. Based on these so defined strong AMM events we build composites of SST patterns for the positive and negative AMM phases that we use to force simulations performed with the ICON model.