Session 3 – Climate Prediction

Title: Reducing climate model systematic error in the tropical Atlantic sector by enhancing atmospheric resolution: implications for seasonal to interannual variability and predictability

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Abstract: We investigate the influence of atmosphere model resolution on tropical Atlantic sector mean climate, seasonal to interannual variability and its predictability in the Kiel Climate Model (KCM). Biases typical for state-of-the-art climate models such as large errors in the sea surface temperature (SST) over the eastern tropical Atlantic can be strongly reduced in the KCM by employing high atmospheric resolution, horizontal and vertical. At high atmospheric resolution, simulation of the mean three-dimensional atmospheric circulation over the tropical Atlantic and the adjacent continents is much enhanced, which in turn improves simulation of tropical Atlantic ocean circulation and SST. Companion uncoupled atmosphere model simulations with observed SST reveal that the errors in the mean atmospheric circulation are systematic to the atmosphere model.

The enhanced mean state and seasonal cycle improves the simulation of tropical Atlantic interannual SST variability and its seasonal phase locking. Further, monthly to seasonal predictability of tropical Atlantic SST is enhanced at high atmospheric circulation, as well as the representation of the West African Monsoon and its relationship to the cold tongue development in the tropical Atlantic. We conclude that sufficiently high atmospheric resolution is a prerequisite to reduce climate model biases in the tropical Atlantic sector.