Geophysical Research Abstracts
Vol. 20, EGU2018-2335, 2018
EGU General Assembly 2018


# Quantifying systematic climate model errors in the simulation of interannual and decadal climate variability in the tropical Atlantic region

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The climatology simulated by current coupled climate models is affected by systematic errors compared to observations regarding mean state, seasonal cycle and interannual internal variability. Of these, the warm bias affecting south-eastern tropical Atlantic sea-surface temperatures is among the most critical.
In this contribution, we will illustrate two state-of-the-art statistical models for the quantification of the impact of climate model biases on the simulation of interannual and decadal climate variability in the tropical Atlantic region. Both models, developed within the European Project PREFACE, build on the state-space approach and share a Bayesian hierarchical framework. They are targeted at different aspects of the problem: The first model is focused on estimation of the purely temporal component of systematic model errors through structural decomposition, and uses the evolution of sea-surface temperature drifts in the Tropical Atlantic region from decadal climate predictions as a test bed; the second model is focused on the spatio-temporal assessment of the bias in a multi-model ensemble, and uses near-surface air temperatures over the Tropical Atlantic region from CMIP5 historical simulations as a test bed.

We will provide illustrative examples to demonstrate how the proposed methodology can help improving the characterization and understanding of the temporal as well as spatio-temporal evolution of systematic climate model errors, and hence for a more reliable interpretation of simulated interannual-to-decadal tropical climate variability. Additionally, we explore the possibilities offered by the aforementioned general methodology for characterising the biological aspects of an eastern boundary upwelling system such as that located in the North West African region.