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Oral
Incorrect model representations of tropical convective variability and air-sea coupling are known to be important sources of error that strongly impact sub-seasonal predictability in the Tropics, and lead to forecast error propagation from tropics to midlatitudes. In this study, a suite of recently developed diagnostics is used to assess the representation of tropical convective variability and air- sea coupling in the NOAA Unified Forecast System (UFS), and to identify sources of systematic forecast errors and model biases. The diagnostics assess model representation of:
a) Moisture-convection coupling
b) Relative sensitivity of convection to variations in humidity and/or CAPE
c) Relationship between shallow, mid-level, and deep convective cloud populations and moist static energy (MSE) variability
d) Relationship between shallow, mid-level, and deep convective cloud populations and upper ocean heat content (OHC) variability
e) The role of convection in coupling MSE and OHC variability

Together, the diagnostics provide a deeper process level evaluation of the thermodynamic aspects of tropical convective variability. The diagnostics are applied to UFS climate simulations, and UFS “replay” experiments, where the tropics are regularly nudged towards reanalysis. While analysis of the climate simulations help characterize the preferred mean state of tropical convective variability in the UFS and the biases therein, the replay runs help understand what processes are dominant in sustaining those model biases when the model is being continuously forced to overcome those biases. Primary sources of UFS model errors are discussed, and potential approaches for addressing these errors are presented.
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