Verification of decadal forecasts: Decadal predictability of tropical Indo-Pacific Ocean temperature trends due to anthropogenic forcing in a coupled climate model

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To what extent decadal climate forecasts will be useful will depend upon whether these forecasts can provide skill on 10-30 year timescales. To assess where this skill comes from it is necessary to be able to separate the natural internal variability from the externally forced variability. This has proven to be a challenge since the forced and internal variability are of the same order on these timescales. The similarity between natural internal variability and the projected response to external forcing has made it difficult to determine to what extent changes in natural variability are contributing to long-term climate change in the Pacific. Tropical Indo-Pacific ocean temperatures from a large ensemble of anthropogenically-forced (A1B scenario) coupled climate runs of the NCAR CCSM3 are decomposed into "ENSO" and "non-ENSO" variability. Removing ENSO variability from the forced integrations results in ocean temperature trends with significantly reduced ensemble spread that are correspondingly more predictable on decadal time scales. While the total trend has characteristics similar to three-dimensional structures associated with ENSO, the predictable component has features more consistent with those suggested by the "ocean dynamical thermostat" and a cooling in the South Pacific due to increased southeast trades superimposed upon a uniform warming. This analysis is shown to provide insight into the role of ENSO in modeled 20th Century ocean temperature trends.