SESSION: (B5) Hindcast and forecast quality assessment

(B5-04)

Canonical skill analysis of tropical Pacific variability in the CCCma decadal hindcasts

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This study identifies the predictable components and the canonical skill components of winter tropical Pacific sea surface temperature anomalies (SSTAs) in decadal hindcasts from the Canadian Centre for Climate Modelling and Analysis (CCCma) CanCM4 climate model. Predictable components are obtained by applying a principal component analysis to the hindcast ensemble that maximizes the signal-to-noise ratio, a procedure known as predictable component analysis (PrCA). Canonical skill components are derived by finding the spatial weights of the signal portion of the hindcasts (in the sense of PrCA) and those of the verifying observations that maximize the temporal mean square skill score of modeled and observed averaged SSTAs, a procedure that is analogous to canonical correlation analysis. The conditional bias of these averaged hindcasts vanishes resulting in canonical mean square skill scores that equal the square of the canonical correlations. It is shown that the actual correlation of the filtered hindcasts and the raw observations can be expanded exactly by the sum of the correlation of the canonical patterns multiplied by the canonical correlations, plus a residual representing a portion of the observed variance that can be made arbitrarily small. This decomposition enables one to determine the components of the hindcasts that contribute to actual skill. The hindcasts filtered by predictable component analysis and canonical skill analysis are shown to be generally more skilful than the raw hindcasts on seasonal to multi-annual time scales.