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Title: The impact of the external forcing on the PDF spread for seasonal atmospheric variability
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Abstract:
In prediction of atmospheric seasonal mean climate variability, the signal-to-noise ratio provides a classic measure of predictability. The signal component is the atmospheric response to the slowly evolving boundary conditions such as ENSO SST or from smaller spread from initial conditions for shorter lead forecasts in an initialized prediction system. The noise component results from the internally generated variability of atmospheric states around the ensemble mean. The high signal-to-noise ratio leads to high prediction skill and predictability. Statistically, the signal can be quantified by the mean shift of the atmospheric states to its climatology, the noise by the spread of the probability distribution function (PDF) of atmospheric variability, and the predictability by the relative displacement of the PDF for the atmospheric variable from its climatological distribution. Therefore, it is essential for understanding the predictability to know if there is change and how significant the change is in the PDF spread of atmospheric variable due to changes in external forcing (e.g., ENSO SST; CO2 etc.) through the years. These issues are the focus of this study. Specifically, by using 31 years (1982-2012) seasonal hindcast data from NCEP Climate Forecast Systems version2 (CFSv2), we analyzed the variations of the PDF spread for the seasonal variability of precipitation and near surface land temperature associated with changes in external forcing. The results include (1) its year to year variations for target seasons; (2) its seasonality and geographic dependence; and (3) its lead time dependence in the initialized prediction system.

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