Circulation Regimes and Regime Transition Probabilities in the COLA C20C Integrations: Dependence on The Slowly Varying Climate State and SST Forcing

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A recently developed approach to analyzing the covariance of monthly mean states has led to the ability to separate the slowly varying, predictable component of seasonal means from that component which is a residue of weather noise. Application of this theory to the wintertime seasonal mean fields of height and precipitation over the Pacific North-America region in the ensemble of 10 COLA AGCM C20C simulations has identified those winters in which the predictable signal is the strongest. Analysis of the circulation regimes in a combined height / precipitation state space during those seasons helps to understand how the internal variability depends on the predictable signal, a dependence which is quite distinct from that of the circulation regimes on SST (see, for example, Straus and Molteni, 2004).

The probability of transitions between regimes is studied using the Markov Chain approach of Crommelin (2004), which allows for rigorous statistical significance testing. Again, the dependence of the set of probability transitions as both a function of SST and the slowly varying predictable state will be assessed.

This research will allow us to estimate how regimes in which various weather elements are embedded (e.g. blocking in the Alaskan Ridge regime, Pacific storms in the Pacific Trough regime) change with both SST and slowly varying climate states. A comparison to the results from the NCEP reanalysis (Straus, Corti and Molteni, 2007) will be made to the extent possible with the limited reanalysis data set length. Implications for seasonal forecasting will be discussed.

References:

Crommelin, D. T. 2004: Observed Nondiffusive Dynamics in Large-Scale Atmospheric Flow, *J. Atmos. Sci*., **61**, 2384-2396.

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