



Nonlinear phase synchronization and teleconnections in the climate system on intra-seasonal and inter-annual timescales

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The atmosphere is well known to exhibit irregular cyclic oscillations on timescales from ~ 20 days to several years. Intra-seasonal oscillations may be restricted to certain regions, and include features such as the 30-60 day Madden-Julian oscillation at tropical latitudes and extra-tropical oscillations on similar timescales. Inter-annual oscillations include both stratospheric and tropospheric quasi-biennial oscillations (QBOs) with periods around 24-30 months, and the global El Niño Southern Oscillation (ENSO) phenomenon. These oscillations have tended to be regarded in the past as distinct and unconnected phenomena, confined to specific regions of the atmosphere, but the potential role of weak interactions between these regions in leading to intermittently or partially synchronized behaviour, has so far been relatively little explored. In the present work, we have made use of an extensive dataset of daily measurements of atmospheric angular momentum (courtesy of Dr David Salstein of AER inc.), integrated in the vertical between the surface and 100 mb and partitioned into 23 separate latitude bands, to search for signatures of partial or intermittent phase synchronization. In this presentation we will show first results characterizing possible synchronized teleconnection events on intraseasonal timescales between tropical and extra-tropical latitudes. Similar techniques are also used to investigate possible synchronization between the stratospheric and tropospheric QBOs.