A “Pure” High Note - Two-year Oscillations of the Monsoon and Northern Hemisphere Climate at the Start of the 21st Century

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The tendency for a wet Indian summer monsoon to be followed by a dry monsoon[1] is part of a distinct biennial oscillation of tropical climate[2,3,4]. The tropospheric biennial oscillation (TBO) is thought to arise from air-sea interaction over the Indian and Pacific oceans. However, there are many open questions, such as the relation of TBO with El Nino-Southern Oscillation or with extratropical climate. Here we show using century-long records that there are episodes of "pure" TBO, which are evident in raw data in spite of the presence of low frequency variations. The monsoon, west Pacific sea surface temperature and Arctic Oscillation (a measure of the strength of northern sub-polar westerlies) have three episodes of simulataneous two-year oscillation, in the 1910's, early 1970's and 1999-2005. We document the coherent evolution of northern hemisphere climate during the most recent biennial episode, using daily satellite data and other observations. Modulation of the seasonal cycle gives rise to two-year oscillation in the tropical Atlantic as well as the Indo-Pacific ocean. Winter surface air temperature over north Asia is warm and cold in alternate years, consistent with the Arctic oscillation[5]. The intertropical convergence zone (ITCZ) is shifted and/or intensified towards the warmer hemisphere in all three ocean basins. The observations suggest that rectification of subseasonal (10-60 day period) tropical convection gives rise to seasonal differences, providing a possible connection between the biennial oscillation of Indo-Pacific climate and the Arctic Oscillation.

References

[1] D. A. Mooley and B. Parthasarathy, *Clim. Change.* **6**, 287 (1984).
[2] T. Yasunari, *Meteoro. Atmos. Phys.* **44**, 29 (1990).
[3] G. A. Meehl, *J. Clim.*. **10**, 1921 (1997).
[4] T. Yasunari, *Meteoro. Atmos. Phys.* **44**, 29 (1990).
[5] D. W. J. Thompson and J. M. Wallace, *Geophys. Res. Lett.*. **25**, 1297 (1998).