

Atlantic-induced trans-basin teleconnection as a driving factor for the recent enhancement of global monsoon

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Recent decadal trends of sea surface temperature (SST) during the satellite era since 1979 include Atlantic and Indian Ocean warming and Pacific cooling associated with phase shifts of the Atlantic Multidecadal Oscillation and the Pacific Decadal Oscillation. Global monsoon (GM) circulation and rainfall also show remarkable trends during these three decades especially in the Northern Hemisphere. Li et al. (2016) revealed that the Atlantic warming since 1979 can be a trigger for the observed global SST trend (the Indian Ocean and western Pacific warming and eastern Pacific cooling) through trans-basin interactions including Rossby and Kelvin responses to diabatic heating over the tropical Atlantic. Here we evaluate effects of the oceanic changes (Atlantic warming, Indian Ocean warming, and Pacific east-west warming/cooling asymmetry) on the global and regional monsoon trends by partial ocean temperature restoring simulations in a coupled climate model, similar to Li et al. (2016). Via trans-basin interactions, the Atlantic warming favors the Indian Ocean warming and resultant subtropical tropospheric warming over North and South America, Atlantic, and North and South Africa. The tropospheric warming results in a larger temperature gradient between land and ocean that can track variation of monsoon intensity (Kamae et al. 2017). In contrast, the Indian Ocean and Pacific temperature do not result in the observed GM enhancement. The results of this study indicate that the Atlantic multidecadal variability can explain large parts of the observed decadal climate trends including monsoons.

Reference:

Kamae, Y., et al. 2017. *Clim. Dyn.*, doi:10.1007/s00382-017-3522-3.

Li, X., et al. 2016. *Nature Clim. Change*, 6, 275–279.

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