Relative Roles of the Indian and the Pacific Oceans on the East Asian Summer Monsoon: Observational Aspects

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This study examines the relative influence of the Indian Ocean Dipole Mode (IODM) and the El Nino Southern Oscillation (ENSO) on the East Asian Summer Monsoon (EASM) using data for the 1961-2007 period based on statistical methods. Results reveal that the peak positive phase of the IODM during autumn could suppress the following EASM three seasons later in particular over the Korea-Japan sector, South China and the adjacent West Pacific region. Further analysis suggests that the autumn positive phase of the dipole could induce heavy snow over eastern Eurasia, just north of the Korea-Japan sector, during the subsequent winter/spring seasons. This could increase the temperature gradient conducive to transport cold and dry air from north towards south over the warmer East Asian-West Pacific region during the following summer. The Sea Surface Temperatures (SSTs) reveal that the positive phase of the IODM during autumn is associated with the warm phase (El Nino) of ENSO over the Pacific. As the seasons progress through to summer, the warm phase over the Pacific transforms to the cold phase (La Nina) with warmer SSTs over the West Pacific. Both the anomalous northerly cold winds due to the heavy snow and the anomalous warm SSTs over the West Pacific due to La Nina displace the North Pacific Subtropical High eastwards, resulting in a weak cross-equatorial flow and a weak low-level jet. This could inhibit moisture supply from the Pacific leading to subdued rainfall activity. The footprints of the IODM for the delayed response three seasons later could be carried by the snow distribution over eastern Eurasia. Furthermore, correlation analysis suggests that the relationship of the EASM with IODM is stronger than with the ENSO phenomenon. However, partial correlation analysis suggests that both the IODM and ENSO work co-operatively for the summer monsoon rainfall over the East Asian – West Pacific domain. More details can be found in Kripalani et. al. (2005, 2010)

References

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