Two Distinct Patterns of Spring Eurasian Snow Cover Anomaly and Their Impacts on the East Asian Summer Monsoon

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The Eurasian snow cover anomaly in spring has been considered as one of the important factors affecting East Asian summer monsoon (EASM). The spring snow cover data for the period from 1972 to 2004 are used to extract temporal variations of the dominant spatial patterns over the Eurasian region through Empirical Orthogonal Function (EOF) analysis. The first EOF mode is generally characterized by a basinwide snow cover anomaly over the whole Eurasian region, while the second EOF mode is dominated by an east-west dipole structure. Our study indicates that the dipole-pattern variability is more closely related to the EASM rainfall than the basinwide variability. A strong dipole pattern with positive snow cover anomalies over the western Eurasia signifies enhanced summer rainfalls over East Asia and the apparent Eurasian wave-train pattern. The sensitivity experiments with the Seoul National University atmospheric general circulation model suggest that the dipole pattern in spring snow over the Eurasian region may lead to the strengthening of the EASM rainfall and the corresponding circulation. An important implication of these results is that the spring snow cover anomaly over the Eurasia provides a complementary precursor for EASM variability.

Keywords: Eurasian snow cover; East Asian summer monsoon; dipole-pattern variability; basin-wide variability; wave-train pattern

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