



A comparison of four East Asian winter monsoon indices

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The main components of East Asian winter monsoon (EASM) include the Siberian high (SH), the Aleutian low (AL), the western Pacific subtropical high, the north-westerly flow in the subtropical region of East Asia and the easterly wind in tropic region in the lower troposphere, and the East Asia trough (EAT) in the mid-high level as well with the higher-level subtropical westerly jet (STWJ). Most EAWM indices (EASMI) are defined based on these circulation members. In terms of the monthly NCEP/NCAR reanalysis dataset, four representative EAWMIs are analyzed in this paper. Results show that all the indices have similar interannual variation during the research period and the correlation coefficient between each pair is significant. The power spectrum contains predominant peaks at 3-4, 6.5 and 9-15 years, respectively. Besides, most indices have a significant decreasing trend since the 1980s.

Results also indicate that in stronger EAWM years, both the SH and the STWJ are stronger, the AL and the EAT are deeper than normal. This pattern is favorable for more powerful northwesterly wind and lower temperature in the subtropical region of East Asia, while they are on the contrary in weaker monsoon years. But none of these indices have good relationship with the frequency of cold air activities in China. After stronger (weaker) EAWM, less (more) summer precipitation will be seen over the regions from the Yangtze River valley to southern Japan and more (less) from South China Sea to the tropical western Pacific. Therefore, the EAWM has a remarkable influence on the following summer monsoon.