



Winter Precipitation in Southeast China: Interdecadal and Interannual variability

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Interdecadal variability of observed winter (DJF) precipitation in Southeast China (1961 to 2010) is characterized by the first EOF of the three-monthly Standardized Precipitation Index (SPI) subjected to a 9-year running mean, while the differences from the original describe the interannual fluctuations. For both time scales the dominating spatial modes represent similar features involving the East Asian Winter Monsoon (EAWM) and the Arctic Oscillation (AO). Dynamic composite analysis (based on NCEP/NCAR and ERA-40 reanalyses) reveals the following results: (i) Interdecadal SPI-variations show a nonlinear trend from a dryer state in the 1970s via an increase during the 1980s towards stabilization on wetter conditions commencing with the 1990s. The associated large-scale circulation features are derived from composites of the wetter (1988-2002) and dryer (1962-1976) period. Increasing wetness in Southeast China is attributed to a weakened East Asian Winter Monsoon (EAWM) which, due to weaker northerlies along the east coast of China, favors northward transport of warm and humid air from tropical oceans to South China. After the 1980s the reduced EAWM, in turn, is related to low-level warming over high-latitude Eurasia due to stronger Arctic Oscillation (AO) by warmer zonal temperature advection. This demonstrates the role of AO in determining the nonlinear trend observed in winter precipitation over South China. (ii) Interannual variability of winter precipitation in Southeast China is related to EAWM modulated by the East Asian Trough (EAT); a weaker (stronger) EAT than normal will weaken (strengthen) EAWM, leading to abundant (less) precipitation in Southeast China.