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Title: Prediction of early summer rainfall over South China and East Asia subtropical front
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Abstract:
In early summer (May-June, MJ) the strongest rainfall belt of the northern hemisphere occurs over the East Asian (EA) subtropical front. During this period the South China (SC) rainfall reaches its annual peak and represents the maximum rainfall variability over EA. Hence we establish an SC rainfall index (SCRI), which is defined by the MJ mean precipitation averaged over 72 SC stations (south of 28oN and east of 110oE) and represents superbly the leading empirical orthogonal function mode of MJ precipitation variability over EA.
In order to estimate the predictability of SCRI, we established a physical-empirical model. Analysis of 34-years observations (1979-2012) reveals three physically consequential predictors. A plentiful SC rainfall is preceded in the previous winter by (a) a dipole sea surface temperature (SST) tendency in the Indo-Pacific warm pool, (b) a tripolar SST tendency in North Atlantic Ocean, and (c) a warming tendency in Northern Asia. These precursors foreshadow enhanced Philippine Sea subtropical High and Okhotsk High in early summer, which are controlling factors for enhanced subtropical frontal rainfall. The physical-empirical model built on these predictors achieves a cross-validated forecast correlation skill of 0.75 for 1979-2012. Surprisingly, this skill is substantially higher than four-dynamical models¡¯ ensemble prediction for 1979-2010 period (0.36). The results here suggest that the low prediction skill of current dynamical models is largely due to models¡¯ deficiency and the dynamical prediction has large room to improve.
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