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Predictability of the western North Pacific summer climate demonstrated by the coupled models of ENSEMBLES

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In this study, a comprehensive assessment of the interannual predictability of the WNP summer climate has been performed using the 1-month lead retrospective forecasts (hindcasts) of five state-of-the-art coupled models from ENSEMBLES for the period of 1960?2005. Spatial distribution of the temporal correlation coefficients (TCC) shows that the interannual variation of precipitation is well predicted around the Maritime Continent and east of the Philippines. The high skills for the lower-tropospheric circulation and SST spread over almost the whole WNP. These results indicate that the models in general successfully predict the interannual variation of the WNP summer climate.

The WNP lower-tropospheric circulation index (WNPMI), have been used to quantify the forecast skill. The correlation coefficient between five models multi-model ensemble (MME) mean prediction and observations for the WNPMI reaches 0.68 for the during 1960?2005. The WNPMI-regressed anomalies of lower-tropospheric winds, SSTs and precipitation are similar between observations and MME.

On the other hand, the prediction of the WNP summer climate anomalies exhibits a remarkable spread resulted from uncertainty in initial conditions. The anomalous atmospheric circulation related to the prediction spread, including the SST and precipitation anomalies, shows a Pacific-Japan (PJ) or East Asia-Pacific (EAP) pattern, with a wave-like distribution in the meridional direction over the WNP, Comparing with those in the MME prediction, the summer anomalies related to the WNP prediction spread are relatively weaker over the tropical and subtropical WNP and resemble better the anomalies in observations over the mid-latitude WNP. Our further investigations suggest that the WNPMI prediction spread arise mainly from the internal dynamics in local air-sea interaction over the WNP, since the anomalies associated with the spread are dynamically consistent with each other and to some extent independent of the remote forcing from the tropical Ocean.

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