

Improvement of the APCC probabilistic multi-model seasonal prediction by systematic error correction and uncertainty estimation

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Efforts have been devoted to improving a probabilistic multi-model prediction (PMMP) system in the Asia-Pacific Economic Cooperation (APEC) Climate Center (APCC). This system, consisting of seven two-tier and three one-tier prediction models, has been used for the APCC operational seasonal climate forecast. The PMMP, targeting one-month lead, tercile-categorical probabilistic seasonal forecast for temperature and precipitation, was established with retrospective forecast (hindcast) for the 23 years of 1981-2003 and used for real-time forecast during 2008-2010. The novelty of the improved PMMP system is the use of upgraded multivariable version of a stepwise pattern projection method (SPM) in conjunction with a quantification of the forecast uncertainty due to models' systematic errors in terms of probabilities. The proposed approach in this study advances the PMMP forecast skill for temperature and precipitation in June-July-August (JJA) in terms of reliability and resolution during both cross-validated hindcast and independent real-time forecast periods. The new PMMP has the area-averaged relative operating characteristic (ROC) score of 0.7 (0.65) for JJA temperature (precipitation) during cross-validated hindcast period while the uncalibrated raw-models' PMMP has the ROC score of 0.63 (0.56). Key improvement of the PMMP system is attributed to the correction of predicted seasonal mean anomalies using the upgraded SPM and the optimal estimation of forecast uncertainty taking into account the inflation of the predicted variance to match for the corresponding observed.