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Seasonal Forecast Skill of the NMME over Tropical Regions: Case Study of Indonesia

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Early seasonal forecasts and warning systems are essential to reduce the risk of extreme events. This work examines the forecast skill of monthly precipitation over Indonesia generated by five models included in the North American Multi Model Ensemble (NMME) i.e. CMC1-CanCM3, CMC2-CanCM4, COLA-RSMAS-CCSM3, COLA-RSMAS-CCM4 and GFDL-CM2p1-aer04. The skill is assessed by calculating the Mean Absolute Deviation (MAD) for the error prediction and the R-square representing the ability of the models to explain the variability of the observed value. Given the lack of station observations of precipitation for the region, data assimilation was carried out via Kalman Filtering to merge available station data with the global meteorological forcing dataset of Princeton University. The assimilation was conducted by considering the seasonal effect and leads to a low bias in the resulting merged field, in particular for the rainy season. The forecast skill of the NMME is evaluated using 30 years of hindcast and forecast data for three climate regions in Indonesia characterized by their rainfall variability. The study shows that all models (except GFDL) have good forecast skill in region A (monsoonal type) and modest performance in region B (equatorial type). Meanwhile, all models have very low forecast skill in region C (local type). The MAD values show that the prediction skill gradually decreased after 4 months lead. In general, the forecast skill of the dry season is better than of the rainy season. The R-square of the forecasts are relatively low, except for CMC models (i.e. CMC1-CanCM3, CMC2-CanCM4) which reached 60% at lead 1 month forecast over the Java Sea. The GFDL has very low skill in all regions. The results indicate potential for using subsets of the NMME or a skill weighted multi-model ensemble over Indonesia for early warning of drought and flood risk.