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Evaluation of precipitation from reanalyses and satellite products in Australia and East Asia

J.L. Peña Arancibia (1,2), A.I.J.M van Dijk (1), and L.J. Renzullo (1)

(1) CSIRO Land and Water, Canberra, Australia (jorge.penaarancibia@csiro.au, +61(2)6246-5800), (2) Environmental Monitoring and Modelling Research Group, Department of Geography, King's College London, Strand, London, WC2R 2LS, UK

Precipitation estimates from reanalyses and satellite observations are routinely used as forcing in global and regional hydrologic models but their accuracy is rarely systematically evaluated. The discrepancies and biases of different precipitation outputs are important, casting potentially high uncertainty in the results from hydrological models and their applications. In this study, we quantitatively evaluated three reanalyses (ERA-Interim, JRA-25 and NCEP-DOE) and three satellite precipitation estimates (TRMM 3B42V6, CMORPH and PERSIANN) as well as a simple ensemble mean of the products. Grid cells with reasonable gauge density from two high resolution gauge-only daily precipitation analyses for Australia (SILO) and East Asia (APHRODITE) were used to evaluate daily time series for 2003–2007. We computed metrics of detection and agreement in daily precipitation. To account for differences in precipitation regime, results were stratified by rainfall seasonality and the geographical domain was divided into southern Australia (SAu), northern Australia (NAu) and south and east Asia (SEA). Reanalyses showed higher detection performance, with best performers being ERA-Interim in SAu and NAu and JRA-25 in SEA, as well as when averaged over the three sub domains. The exception was the monsoon months in SEA; for which satellite estimates from TRMM and CMORPH showed slightly better performance. Over the three sub domains combined, the ensemble mean generally outperformed both reanalyses and satellite precipitation, with higher correlation coefficient, lower root mean square difference and closer agreement in terms of a rainfall intensity proxy (the ratio of monthly precipitation amount to total days with precipitation). The results of the simple ensemble mean show the value in the additional information captured from the (co)variance of the multiple input sources. This finding suggests that, depending on rainfall regime and/or location, a combination of selected reanalysis and satellite products may lead to better precipitation estimates and thus more accurate hydrological applications than any single method.