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Daily evaluation of 26 precipitation datasets using Stage-IV gauge-radar data for the CONUS

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New precipitation (P) datasets are released regularly, following innovations in weather forecasting models, satellite retrieval methods, and multi-source merging techniques. Using the conterminous US as a case study, we evaluated the performance of 26 gridded (sub-)daily P datasets to obtain insight in the merit of these innovations. The evaluation was performed at a daily timescale for the period 2008–2017 using the Kling-Gupta Efficiency (KGE), a performance metric combining correlation, bias, and variability. As reference, we used the high-resolution (4 km) Stage-IV gauge-radar P dataset. Among the three KGE components, the P datasets performed worst overall in terms of correlation (related to event identification). In terms of improving KGE scores for these datasets, improved P totals (affecting the bias score) and improved distribution of P intensity (affecting the variability score) are of secondary importance. Among the 11 gauge-corrected P datasets, the best overall performance was obtained by MSWEP V2.2, underscoring the importance of applying daily gauge corrections and accounting for gauge reporting times. Several uncorrected P datasets outperformed gauge-corrected ones. Among the 15 uncorrected P datasets, the best performance was obtained by the fourth-generation reanalysis ERA5-HRES, reflecting the significant advances in earth system modeling during the last decade. The (re)analyses generally performed better in winter than in summer, while the opposite was the case for the satellite-based datasets. IMERGHH V05 performed substantially better than TMPA-3B42RT V7, attributable to the many improvements implemented in the IMERG satellite P retrieval algorithm. IMERGHH V05 outperformed ERA5-HRES in regions dominated by convective storms, while the opposite was observed in regions of complex terrain. The ERA5-EDA ensemble average exhibited higher correlations than the ERA5-HRES deterministic run, highlighting the value of ensemble modeling. The regional convection-permitting climate model WRF showed considerably more accurate P totals over the mountainous west and performed best among the uncorrected datasets in terms of variability, suggesting there is merit in using high-resolution models to obtain climatological P statistics. Our findings provide some guidance to choose the most suitable P dataset for a particular application.