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A daily high-resolution global gridded precipitation product (1979–2016) based on gauge, satellite, and reanalysis data

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Existing global precipitation (P) products suffer from several limitations, most importantly that they fail to take advantage of the complementary performance of satellite and reanalysis products. In this work we introduce Multi-Source Weighted-Ensemble Precipitation (MSWEP), a daily high-resolution global P product for the period 1979–2016 based on merging the P estimates from different sources with disparate error characteristics. For each grid cell, a normalized (unitless) daily P time series was computed by weighted averaging of bias-corrected estimates from three sources: (i) interpolated maps based on thousands of gauges worldwide; (ii) three satellite products (CMORPH, GSMaP, and TMPA 3B42RT); and (iii) a reanalysis product (ERA-Interim). The weight assigned to the gauge-based estimate was based on the distance to surrounding gauges, while the weights assigned to the satellite- and reanalysis-based estimates were based on their performance at surrounding gauges. The normalized daily P time series were subsequently multiplied by climatic mean P estimates from high-quality global and regional climatic datasets explicitly corrected for orographic effects (WorldClim and PRISM, among others). MSWEP was successfully validated in two ways, (i) by comparing its performance to that of existing P products at several hundred independent gauges, and (ii) by forcing a hydrologic model with MSWEP and existing P products for several hundred small catchments around the globe and comparing the streamflow simulation performance. We expect MSWEP to be useful for numerous large-scale hydrological applications.