



A probabilistic approach for estimating monthly catchment water balances from satellite and ground data

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A probabilistic model is developed to estimate monthly basin-scale precipitation, evaporation, storage and river discharge from open-source data and water balance constraints. Both random and systematic deviations between observed and "true" water balance components are included in the model to account for measurement/processing errors and differences in scale. Model parameters comprise data standard deviations (random noise) and scaling factors (systematic bias). Water balance terms and parameters are estimated using Bayesian inference, yielding posterior distributions for all unknowns. The model is applied to MOPEX basins across the continental US using the following data sources: TRMM-3B43 (precipitation), SSEBop (evaporation), GRACE (storage), and USGS stream gauges (river discharge). Results provide optimal estimates and uncertainty of water balance components and data errors across a range of basin characteristics (size, wetness, etc).