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Development of an Ensemble Gridded Hydrometeorological Forcing Dataset over the Contiguous United States

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Gridded hydrometeorological forcing datasets are inherently uncertain due to myriad factors. These include interpolation from a sparse observation network, measurement representativeness, and measurement errors. Generally, uncertainty estimates are not included in gridded products; or if present, they may be included in an ad-hoc manner. A lack of quantitative uncertainty estimates for hydrometeorological forcing fields limits their utility to support land surface and hydrologic modeling techniques such as data assimilation, probabilistic forecasting and verification.

We present a first of its kind, gridded, observation-based ensemble of precipitation and temperature at a daily increment for the period 1980-2012. Statistical verification of the ensemble indicates that it provides generally good reliability and discrimination of events of various magnitudes, but has a small dry bias for high probability events. The ensemble mean is similar to other widely used hydrometeorological forcing datasets (i.e. Maurer et al. (2002), Daymet, NLDAS-2) but with some important differences. The ensemble product is able to produce a more realistic probability-of-precipitation field, which impacts the empirical derivation of other fields used in land-surface and hydrologic modeling. Additionally, daily maximum, minimum temperature and precipitation accumulation uncertainty can be estimated through the use of the ensemble variance. These types of datasets will help improve data assimilation and probabilistic forecast components of land-surface and hydrological modeling systems and provide a quantitative estimate of observation uncertainty for use in NWP forecast verification.