Incorporating satellite derived cloud climatologies to improve high resolution interpolation of daily precipitation.

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Cloud Climatologies Improve Predictive Accuracy of Interpolation

Can satellite-derived cloud data improve interpolation of station observations?

In contrast to the binary MODIS cloud mask (MOD35), the MODIS cloud product (MOD06) uses multi-spectral reflectance to estimate continuous cloud parameters including effective radius and optical thickness at 1km resolution. Precipitation falls when clouds have sufficient vertical extent (optical thickness) to facilitate the growth of particles with sufficient mass (effective radius) to overcome updraft winds. These parameters have a physical relationship with precipitation. Here we explore their utility aiding the station-based interpolation of precipitation.

Topography only

Topography & MOD06

Cloud Climatologies Increase Spatial Detail of Interpolations

Predictions for mean precipitation in h09v04 in March using a GAM with space and elevation (left) and one that includes several MOD06 cloud parameters (right). The model with MOD06 parameters explains more of the variation in precipitation ($R^2=0.84$ vs. 0.72) and has smaller predictive errors ($RMSE=1.0$ vs 1.4).

Toward global 1km precipitation products

Incorporating satellite derived data into station interpolation has enormous potential to improve the quality of high resolution global climate layers. Through climate-aided interpolation, these climate layers can be used to estimate variability across finer temporal scales (monthly or daily). Our plan is to scale up this approach and develop global 1km daily precipitation surfaces that can then be summarized into finer temporal scales (monthly or daily). Our plan is to scale up this approach and develop global 1km daily precipitation surfaces that can then be summarized into finer temporal scales. We are making progress on the Pacific Northwest and Venezuela regions shown in the Validation Results graph.

Validation results ($R^2$ and RMSE) for all monthly models (detailed on the left) based on 100 holdouts (10%) of repeated random sub-sampling from the two case study regions (fewer models were considered in h11v08 due to fewer available stations). $\ldots$ indicates a smoothed relationship estimated using Generalized Cross Validation (GCV) within the GAM. The gray points indicate each of the 12 months and the black points indicate the overall median for that model.

**Bibliography**