Presentation Title:
A comparison of two analog-based downscaling methods for regional reference evapotranspiration forecasts

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Presentation Abstract:

Accurate estimation of reference evapotranspiration ($E_{To}$) is needed for determining agricultural water demand, reservoir losses, and driving hydrologic simulation models.

A previous study using natural forecast analogs (NA) with a combination of the National Center for Environmental Prediction’s (NCEP) Global Forecast System (GFS) retrospective forecast (reforecast) archive and the NCEP-DOE Reanalysis 2 dataset (R2) produced skillful downscaled $E_{To}$ forecasts using the Penman-Monteith equation in the southeastern United States. Since NA-based forecasts are typically limited by the historical archive available, constructed analogs (CA) have the potential to produce greater skill.

The objective of this study was to compare the performance of NA and CA methods to produce both probabilistic and deterministic downscaled $E_{To}$ forecasts in the southeastern United States. The 1-15 day $E_{To}$ forecasts for 15-members was produced from 1979 to 2009 using GFS temperature, relative humidity, wind speed reforecasts, and climatological values of R2 solar radiation data. Forecasts were downscaled for both NA and CA methods using the North American Regional Reanalysis (NARR) dataset (approximately 32-km resolution). For the NA method, the probabilistic forecasts were determined from the 15 members of the GFS forecasts, and the deterministic forecasts were the ensemble mean of the 15 members; for the CA method, the probabilistic forecasts were calculated from the 15-member forecast determined by constructed analog, and the deterministic forecast was obtained from the ensemble mean of the 15 members. The Brier Skill Score, the relative operating characteristic and reliability diagrams were used to evaluate the skill of downscaled probabilistic forecasts for five categories (upper, middle, and lower terciles, and upper 90th and lower 10th percentiles). The Pearson correlation coefficient, root mean square error, mean bias error, and mean squared error skill score were used to evaluate the skill of the deterministic forecasts. The result showed CA had better skill than NA in terms of both probabilistic and deterministic forecasts in the southeastern United States.