

Exploring changes in the dependability of seasonal climate forecasts due to spatial and temporal downscaling

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Application approach: Determine the relationship between a sequence of climate forecasts and agronomic outcome

Questions: Do we lose forecast reliability as we go downscale in space and time? If so, how much? Is it different for different variables (precipitation vs. temperature) or direction (wet vs. dry, warm vs. cool)? Where? When? Is there any utility remaining in the downscaled forecasts?

Dependability: Our agriculture-centric, two-category measure of forecast reliability

Consider only the forecasts with a departure of at least 8% in probability from Normal, to exclude conditions already accounted for in current Best Management Practices.

Spatial downscaling

We assume that the shift in probability at the Forecast Division scale applies to all sub-areas and locations within it. This 1-to-1 mapping assumption is *not* based on correlations between statistics at the different scales.

Temporal disaggregation

Accomplished in two steps: 1) 3-month to 1-month, 2) 1-month to ensemble of sequences of daily values (using a custom weather generator named SYNTOR)

1. Heuristic approach - use the information provided to infer a set of 1-month forecasts with physically reasonable values. Weight each contributing three month forecast by the climatological ratio of 1- to 3-month means. (Schneider et al., *Weather and Forecasting*, 2005)
2. Use the 1-month mean and a modified weather generator to create an ensemble of sequences (≥ 500 members) of daily weather, each with the statistical characteristics of the downscaled mean and local higher order statistics.

Beware random number generators: check that all resulting sequences actually do reflect the input statistics.

Initial exploration as we refine our analysis techniques: 4 Stations in Oklahoma and north Texas, '97-'98 El Niño driven forecasts, issued July 1997 - March 98

As expected, the loss of dependability tracks with the correspondence between the regional and local 3-month total precipitation. However, the loss due to spatial downscaling is relatively small for these few cases. Again, as expected, the loss of dependability is worse with the temporal disaggregation, and tracks with the correspondence between the regional 3-month and local 1-month precipitation. Good news: not too extreme, at least so far ...order of 20-30%.

