5.1 MEASUREMENT AND MODELING SOIL MOISTURE IN A STATEWIDE METEOROLOGICAL NETWORK IN NORTH CAROLINA.

Dev dutta S. Niyogi, S. Raman, A. Syed, R. C. Gilliam, and R. P. Boyles
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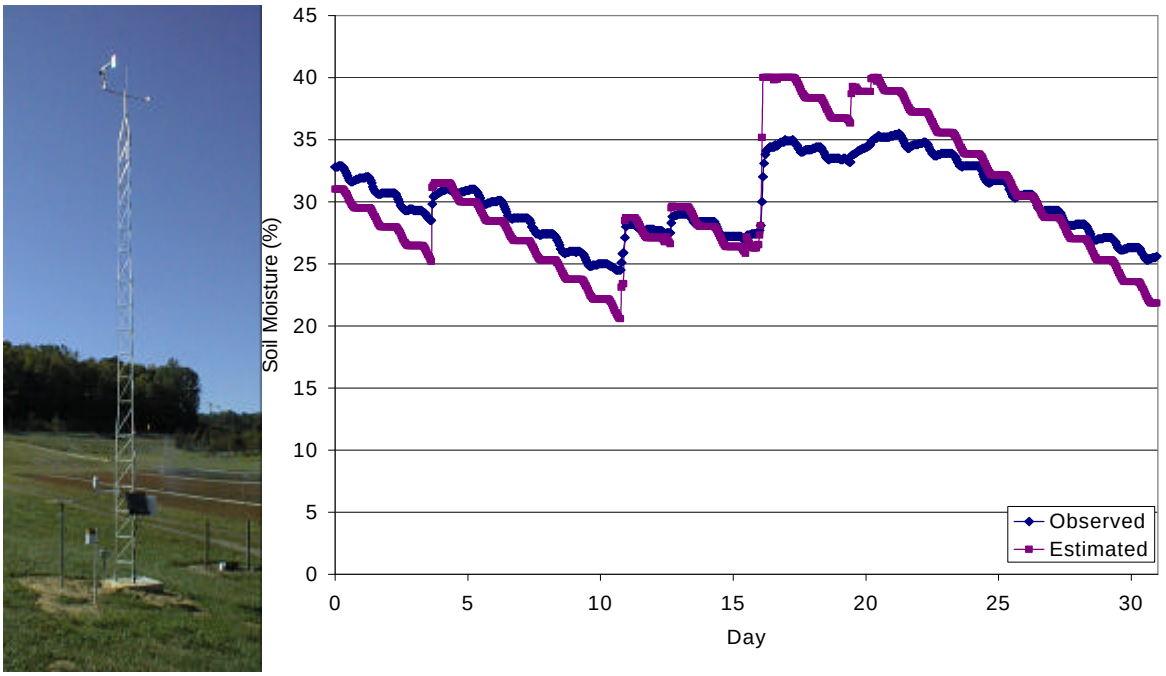
Soil moisture remains one of the most difficult variables to estimate. Yet it is perhaps the most important surface variable needed for weather applications at all scales. Even with insitu monitoring of soil moisture, the representativity of these measurements remains questionable. In that, the point measurements may vary considerably even within a short distance. Further there are several factors, such as soil type, vegetation cover, and slope, which can contribute to the variability in the soil moisture estimates. Hence developing regionally representative soil moisture values remains one of the challenges for the weather and climate monitoring community. In North Carolina, as part of the NC Agricultural Weather and Climate Network (NC AgNet) and the NC Environmental and Climate Observing Network (NC ECO Net), hourly soil moisture measurements are recorded at 25 stations. We will present our experience in managing the network and interpreting, quality controlling the soil moisture observations. In general of all the variables measured as part of the network, soil moisture measurements needed most attention and were prone to largest errors and sensor changes. Within this perspective it is felt that there is still considerable uncertainty in providing regional scale, reliable, representative and quantitative estimates of soil moisture. At best, the measurements can be reliably used for qualitative understanding of whether the soil moisture was high or low. In order to overcome these limitations, we have undertaken a dynamical and a statistical modeling approach. The first involves running a dynamical weather prediction model: ARPS on a daily basis and reviewing the soil moisture patterns obtained as one of the variables from the model output list. The second approach involves using the observed soil moisture values to develop statistical relations with surface variables such as air temperature, relative humidity, and precipitation. We will present results showing how these two models perform and discuss a strategy we are considering for developing a soil moisture estimation database for the entire state with the inclusion of ASOS/ AWOS observations - coupled with the statistical models developed using AgNet/ ECO Net.



Example of observed versus model estimated soil moisture for October 1999 at Castle Hayne AgNet site (www.nc-climate.ncsu.edu)

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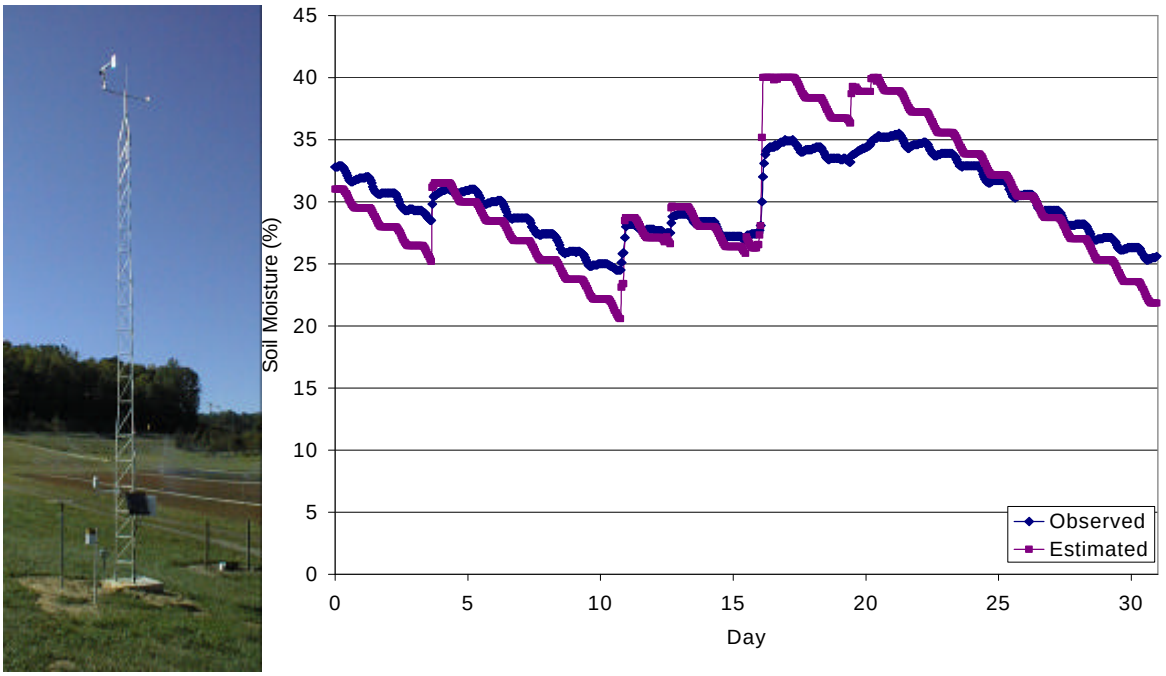

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