

Comparison of Soil Water Content Distributions Between Irrigated and Non-Irrigated Cropland During the BEAREX08 Experiment

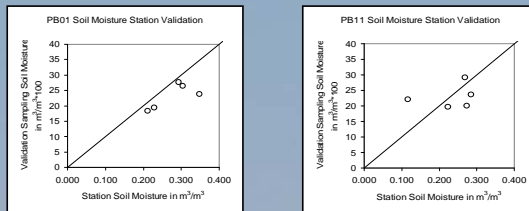
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Abstract

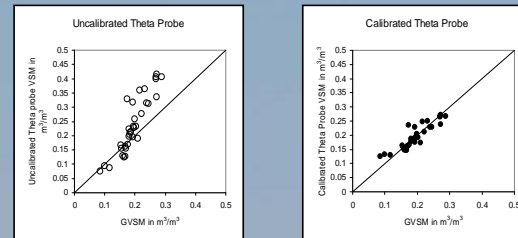
The Bushland Evapotranspiration and Agricultural Remote Sensing Experiment (BEAREX08) was conducted near Bushland, TX during the summer of 2008 in a pair of cotton fields, one irrigated and the other dryland. A large number of evaporative flux and meteorological sensors were installed within the study domain (400m by 400m) to fully characterize each field. To complement this study, two soil moisture content sensor networks were installed, each containing 21 sensors, to monitor the near surface soil water content throughout the growing season and characterize the distributions for the irrigation/dryland regimes. Coupled with these networks, a series of intensive observational periods were conducted in coordination with aircraft overflights and flux monitoring activities to evaluate the accuracy of the networks and determine the scalability of the point measurements to the larger field scale. The networks performed reliably with good accuracy to the larger scale, though there was considerable calibration for the dielectric sensors used for the low and high density sampling. Time series and variance analysis along with wavelet and semivariogram analysis revealed the small scale structure of soil moisture down to the 5cm scale.

Validation of Soil Moisture Stations



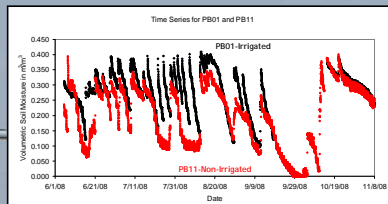
Dielectric soil moisture sampling was done at various times during the experiment to get an estimate of the accuracy of each station. There was reasonable agreement between the stations and the surrounding soil moisture values. Suspect sites were flagged for further analysis and possible elimination from the data record.

Theta Probe Calibration for BEAREX Study Region



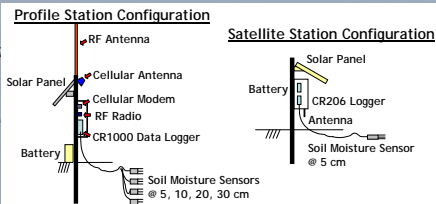
Calibration of the Theta Probe was accomplished by coincident gravimetric and dielectric measurements. Errors were minimized but there was a noticeable decrease in the range of soil moisture values experienced during the physical collection process.

Example of Time Series



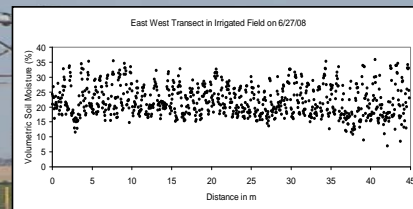
Sample time series for the Irrigated and non-irrigated fields. In the irrigated field, PB01 lost battery strength because the cotton plants became taller than the height of the solar panel for the station and the battery was unable to re-charge.

Soil Moisture Station Configurations

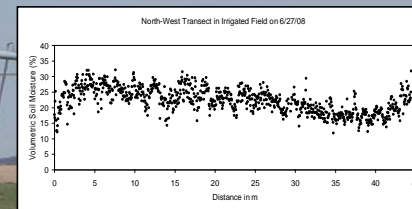


High Density Soil Moisture Transects

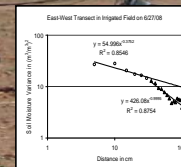
East-West Transect in Irrigated Field 6/27/08



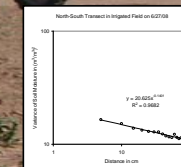
North-South Transect in Irrigated Field 6/27/08



Cotton was planted in mid-May 2008 with the Non-Irrigated field planted after the Irrigated. The irrigated field was irrigated every 2-3 days, when there was not sufficient rainfall. There was substantial growth in the irrigated field, with cotton plants reaching 1.3 meters, while the non-irrigated was less than 1 meter in height.



An East - West soil moisture transect was sampled across the plant rows every 5 cm. By aggregating that signal and calculating the variance, two power law relationships were observed for two ranges, 5-30 cm and 30-100 cm. The break point at the 30 cm distance corresponds to the row spacing and this break point was most evident in the irrigated field which had a more significant row structure than the non-irrigated field.



A North - South soil moisture transect was sampled along the plant row at the ¼ row position every 5 cm. By aggregating that signal and calculating the variance, a power law relationship was observed.

Deployment of Stations at Bushland Experimental Site

