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Climate and ET: Does Plant Water Requirements Increase during Droughts?

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With the expected rise in global warming and increased frequency of extreme climate variability in the coming decades, conservation and efficient use of water resources is essential and must make use of the most accurate and representative data available. Historically, governmental and private organizations have used estimates of plant water use estimated from a variety of methods for long-term water planning, for designing hydraulic structures, and for establishing regulatory guidance and conservation programs intended to reduce water waste. In recent years, there has been an expansion of agricultural weather station networks which report daily ETo (potential evapotranspiration) and commercial irrigation controllers with instrumentation which calculate real-time ETo from weather parameters. Efforts are underway to use this more precise information for regional water planning and ETo is routinely used for designing and implementing drought response programs.

The year 2011 marked the driest year on record in the State of Texas. Compounding the lack of rainfall was record heat during the summer of 2011. In 2011, real-time ETo (reference evapotranspiration) data in Texas was 30 to 50% higher than historic averages. The implications are quite serious, as most current water planning and drought contingency plans do not take into consideration increases in ET during such periods, and irrigation planning and capacity sizing are based on historic averages of consumptive use.

This paper examines the relationship between ET and climate during this extreme climatic event. While the solar radiation was near normal levels, temperature and wind was much higher and dew points much lower than norms. The variability and statistical difference between long term average ETo and ETo measurements (from 2006 to 2011) for selected weather stations of the Texas ET Network.