Field Observations of Soil-Water Tension throughout a Capillary Fringe in New Iberia, Louisiana

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ABSTRACT

The need for an expedient and economical field method for identifying the upper boundary of the capillary fringe (CF) led to an investigation of the clay-rich surficial units of two sites in New Iberia, Louisiana. Tension-sensing instruments capable of indirectly measuring water content were installed to monitor changing subsurface conditions throughout the vadose zone in response to water table fluctuation and rainfall. Tension measurements of 10 kPa and 33 kPa, correlated with the agricultural concept of field capacity by previous studies, functioned as indicators of two possible upper capillary fringe surfaces. Interpreted tension boundaries were plotted at depth to outline temporal changes in capillary fringe thicknesses, which ranged from approximately 1–5 ft depending on rainfall rates.

A comparison of gravimetric water content profiles with interpreted tension boundaries suggested that CF thickness was heavily influenced by the presence and composition of surficial fill, root systems, and the depth of the shallow water table. Collected tension and water content measurements were plotted as water retention points onto a series of estimated soil water retention curves (SWRCs). The hysteretic nature of soil-water retention relationships of the clay-rich media, evidenced by several examples of near equivalent water contents corresponding to vastly different tension measurements, and vice versa, illustrated the potential errors in basing capillary fringe thickness solely on tension measurements. While tension measurements did prove useful in recording variable conditions in the vadose zone, further research into accounting

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