Predicting the Critical Point of the Soil Water Retention Curve

The transition point between capillary water and adsorbed water is defined as the critical point (including the critical matric potential and the critical water content) of the soil water retention curve. It demarcates the energy and water content region where flow is dominated by capillarity or liquid film flow. Accurate estimation of the critical point is crucial for modeling water movement in the vadose zone.

In a recent article in the Soil Science Society of America Journal, researchers describe a simple method to estimate the critical point of soil water retention curve and analyzed the relationship between the critical point and particle size distribution or specific surface area.

With increasing clay content, the critical matric potential was initially more negative but started to increase at clay contents above ~30%. Increasing the silt content resulted in more negative critical matric potential, whereas soils with higher sand content had less negative critical matric potential. The magnitude of critical water content increased linearly with specific surface area and clay content.

These findings suggest that the critical point estimated from the new method could represent actual situations and help researchers understand the retention and movement status of water in soil at different matric potential as well as establish the hydraulic conductivity model from saturation to oven dryness.