

Measurement and Modeling of Seasonal Responses of Plant Transpiration to Soil Moisture Deficits

Grace Miner

Department of Horticulture and Landscape Architecture

Abstract. As the primary control interface involved in regulating plant water loss, understanding the relative influence of leaf physiological transpiration factors is critical to the accuracy of large-scale hydrologic cycle predictions as well as small-scale predictions of agricultural crop water use. Determining stomatal responses to environmental variables has proved difficult to understand mechanistically. Common models for modeling stomatal behavior utilize an observed relationship between photosynthesis and stomatal conductance. However, large questions remain regarding the behavior of stomatal conductance under soil moisture deficits, particularly regarding the impact of drought on transpiration rates and the relationship of photosynthesis to stomatal conductance. The overarching goals of this project are to explore and quantify a parameter underlying variation in leaf-level transpiration efficiency (the slope parameter, m) as well as how this trait changes in response to water stress. Methodologies for estimation/collection of the parameter using bottom up and top-down approaches are also discussed.