Measurements of Surface Energy Balance Components in Dryland Wheat/Fallow and Limited-Irrigation Corn

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Abstract. Water evaporation from soil and plant surfaces and plant transpiration comprise land surface/canopy evapotranspiration (ET), which is essential to estimate for land-atmosphere interaction and crop water use. There are no direct measurements of ET, and the most direct methods (e.g., weighing lysimeters) are expensive and difficult to implement. Alternatively, latent heat flux can be estimated as a residual component of the surface energy balance. We will review practical issues of instrumentation, along with theoretical concepts of estimating sensible heat flux, ground heat flux, and net radiation. Two field installations in Colorado will be discussed: 1) experimental plots (10 m wide) of full and deficit-irrigated corn (maize) at the Limited Irrigation Research Farm near Greeley during the growing season, and 2) alternating strips (~120 m wide) of winter wheat and fallow (wheat stubble) at the Drake Farm near Severance year-round. Implications of variable sampling areas, flux planes and lateral advection of energy between treatment areas are recognized. Although an individual plot may not be fully representative of a large field under the same irrigation treatment, sensors measure the actual plot conditions. Thus, estimated ET differences reflect actual conditions of the experiment. Differences in estimated fluxes between plots will be illustrated for the irrigated corn, while seasonal changes will be highlighted in the dryland wheat-fallow field. These preliminary measurements, energy balances and resulting ET estimates in dryland and irrigated sites will support on-going systems research to address agricultural management effects on crop production with limited water.

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