



COMPARISON OF ROOT WATER UPTAKE AND SOIL MOISTURE DYNAMICS UNDER CONTRASTING LAND USES IN THE CANADIAN PRAIRIES

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ABSTRACT

In Canadian prairies, land use changes have affected hydrological processes, particularly groundwater recharge, as many of the grasslands have been converted to croplands. The objective of this research is to study the effect of the land cover changes on hydrological processes, in particular, evapotranspiration phenology, soil moisture dynamics, and energy balance partitioning by means of field observation and modelling based approach. Three study sites is located near Calgary including one grassland site and two cropland sites. The sites were monitored during 2009 and 2012 by meteorological stations and hydrological devices to measure air temperature, relative humidity, wind speed, long and shortwave radiation, precipitation, sensible and latent heat of vaporization, soil temperature and soil moisture content. These observations enabled us to investigate differences in evapotranspiration, energy balance, and soil moisture content between grassland and cropland during the growing season (April-October). Versatile Soil Moisture Budget (VSMB) model was used in this study to simulate the hydrological fluxes for the selected sites. The parameters controlling evaporation in VSMB were fitted to match model outputs with field observations of evapotranspiration and soil moisture dynamics. The results indicates the effect of plant phenology on root water uptake, energy balance, and soil water dynamics under dry (2009) and normal (2012) conditions. Findings of this research have important implications on the influence of land use and climate variability on groundwater recharge and hence, groundwater management in the Canadian Prairies.