Geophysical Research Abstracts
Vol. 17, EGU2015-12953-1, 2015
EGU General Assembly 2015

Response of sap flow to environmental factors in the headwater catchment of Miyun Reservoir in subhumid North China

Qiang Tie, Hongchang Hu, Fuqiang Tian, Yaping Liu, and Ran Xu
Department of Hydraulic Engineering, Tsinghua University, Beijing 100084, China (tieqiangiron@gmail.com)

Since the headwater catchment of Miyun Reservoir is the main drinking water conservation area of Beijing, its water cycle is of importance for the regional water resource. Transpiration is an important component of water cycle, which can be estimated by sap flow. In this study, the dynamics of sap flow and its response to environmental factors and relationship with leaf area index (LAI) were analyzed. The field study was conducted in the Xitaizi Experimental Catchment, located in the headwater catchment of Miyun Reservoir in subhumid North China. The Aspen (Populus davidiana) and Epinette (Larix gmelinii) are the two dominant tree species. Sap flow in 15 Aspen (Populus davidiana) trees was monitored using thermal dissipation probes (TDP) during the growing season of 2013 and 2014, and sap flow in another 3 Epinette (Larix gmelinii) trees was also monitored during September and October in 2014 for comparative analysis. Physiological and biometric parameters of the selected trees and the environmental factors, including meteorological variables, soil moisture content and groundwater table depth were measured. Vapor pressure deficit (VPD), variable of transpiration (VT) and reference crop evapotranspiration (ET0) were calculated using the measured environmental factors. The LAI, which is used to characterize phenophase, was calculated using the Moderate Resolution Imaging Spectroradiometer (MODIS) LAI product (MCD15A3). Correlation analysis for daily sap flow and air temperature, relative humidity, precipitation, wind speed, solar radiation, VPD, VT and ET0 under different soil moisture and groundwater table depth conditions was performed. Diurnal course and hysteresis of sap flow were analyzed as a function of air temperature, solar radiation, VPD and VT on the typical sunny, cloudy and rainy days under different soil moisture conditions. Correlation analysis between daily sap flow and LAI showed that LAI and phenophase significantly influence sap flow and restrict the maximum value of sap flow. The sap flow and its response to environmental factors were compared between Aspen and Epinette. The result could make contributions to improve empirical transpiration modeling for efficient water resource management in the headwater catchment of subhumid region.