On Delineating Ecohydrologic Process Networks in Gwangneung Decidious Forest

Juyeol Yun[1], Joon Kim[1*], Hyojung Kwon[2], and Jeong Hwa Cheon[3]
[1]Complex Systems Science Lab, Department of Landscape Architecture and Rural Systems Engineering, Seoul National University, Seoul 151-921, Korea
[2] National Center for AgroMeteorology, Seoul National University, Seoul 151-921, Korea
[3] Division of Forest Ecology, Korea Forest Research Institute, Seoul 130-712, Korea

A process network is defined as a network of feedback loops and the associated time scales, which describes the magnitude and direction of flow of matter, energy and information between the different variables. In this study, we adopted a process network method using information flow statistics to delineate the monthly state of the ecohydrologic systems in Gwangneung deciduous forest. We analyzed the time series data of 15 key variables of ecohydrologic systems in Gwangneung deciduous forest in 2008, which are atmospheric pressure, precipitation, net radiation, latent heat flux, sensible heat flux, CO_2 flux, gross primary productivity, ecosystem respiration, air temperature, canopy temperature, vapor pressure deficit, soil temperature, soil water content, wind speed, and wind direction. We computed both mutual information and transfer entropy using the time series data of the above-mentioned variables, produced matrixes for information statistics, and then assembled process network for each month in 2008. In this presentation, we attempted to define the state of ecohydrologic systems by monthly process networks and demonstrate how they adapted to changing environment.

*Corresponding Author: Joon@snu.ac.kr (Joon Kim)