Geophysical Research Abstracts
Vol. 20, EGU2018-5616-2, 2018
EGU General Assembly 2018

Disentangling the relative influence of canopy structure on stemflow: insights from a large-scale rainfall simulator and Bayesian statistics

Delphis Levia (1), Shin'ichi Iida (2), Kazuki Nanko (2), Xinchao Sun (3), Yoshinori Shinohara (4), and Naoki Sakai (5)

(1) University of Delaware, Departments of Geography and Plant and Soil Sciences, Newark, DE, United States (dlevia@udel.edu), (2) Department of Disaster Prevention, Meteorology and Hydrology, Forestry and Forest Products Research Institute, Tsukuba, Ibaraki 305-8687, Japan, (3) Institute of Surface-Earth System Science, Tianjin University, Nankai District, Tianjin, 300072, P.R. China, (4) Department of Forest and Environmental Sciences, University of Miyazaki, Miyazaki 889-2192, Japan, (5) Storm, Flood and Landslide Research Division, National Research Institute for Earth Science and Disaster Resilience, Tsukuba, Ibaraki 305-006, Japan

Despite recent advances in stemflow research, gaps still exist in our knowledge of stemflow generation. We utilized the large-scale rainfall simulator at the National Research Institute for Earth Science and Disaster Resilience (Tsukuba, Japan) to simulate a range of rainfall intensities under constant conditions to disentangle the effects of canopy structure on stemflow. Cryptomeria japonica D. Don (Japanese cedar), Chamaecyparis obtusa (Siebold & Zucc.) Endl. (Japanese cypress), and Zelkova serrata Thunb. (Japanese zelkova) were the selected test species. Stemflow from the experimental trees were examined at six different rainfall intensities (15, 20, 30, 40, 50, and 100 mm/h) under foliated and defoliated conditions. Both coniferous and deciduous tree species were defoliated to simulate crown dieback (in the case of conifers) and season (for deciduous species) on stemflow generation. Stemflow amounts (and funneling ratios) were examined in a Bayesian framework to examine the relative influence of various canopy structure metrics on stemflow production across all species as a function of canopy state. Our initial results indicate a dynamic and complex response of stemflow production for all species considered as a whole in relation to canopy state. This is to say that particular canopy structure metrics have different levels of importance across tree species under foliated and unfoliated conditions. In other words, branch inclination angle or trunk lean, for example, do not have the same effect on stemflow throughout the year. Variable rankings of certain canopy structural metrics for a given canopy state, as revealed by Bayesian analysis, yields new clues as to how stemflow is influenced by canopy structure. This finding has important implications for elemental cycling and the genesis of hot spots on the forest floor.

Funding note: This research was supported by JSPS Invitation Fellowship for Research in Japan (Grant Award No.: S16088) and JSPS KAKENHI (Grant Award No.: JP15H05626).