[EE] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-HW Hydrology & Water Environment

# [A-HW22]Hydrological Cycle and Water Environment

convener:Seiya Nagao(Institute of Nature and Environmental Technology, Kanazawa University), Isao Machida(Geological Survey of Japan), Shin'ichi Iida(国立研究開発法人森林研究・整備機構森林総合研究所森林研究部門森林防災研究領域水保全研究室, 共同), Takeshi Hayashi(Faculty of Education and Human Studies, Akita University)

Thu. May 24, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

We focus on various issues of water cycle and environment and aim to answer questions of hydrological and earth system sciences including 1) surface, subsurface and evapotranspiration processes of water cycle; 2) natural and anthropogenic hydrothermal systems, 3) environments issues and studies on a watershed or global scale, 4) water-related issues with ecological, environmental, and geochemical aspects, and 5) other issues in hydrological sciences. This session welcomes presentations regarding various kinds of approaches and techniques such as field survey, remote sensing, isotope tracers, numerical simulation, and theoretical analysis.

# [AHW22-P05]Estimating evapotranspiration using diurnal fluctuations in total soil moisture under Japanese forest plantations

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Keywords:Understory Vegetation, Total soil moisture (TSM), Evapotranspiration (ET), Soil water, Stable Isotopes

Investigating the effects of understory vegetation cover in forest ecosystems is crucial for understanding its influence on shallow water table levels and moisture content within the soil profile. In hydrological studies, evapotranspiration (ET) is commonly used to examine the interactions between atmosphere, soil, and vegetation at arid and semi-arid conditions. Nevertheless, few studies were conducted to inspect such interactions in temperate settings where the heterogenous understory vegetation cover exhibits complex physiological characteristics. There are various methods to compute large-scale evapotranspiration within a forest system, which include the use of isotope mass balance equation for evapotranspiration partitioning, complex measurements of soil hydraulic properties or the use of empirical and hydrological models. Although, limited research focused on examining changes in moisture content within the soil column to estimate small-scale variations in ET levels.

Our research project is conducted in a hill slope environment at Karaswayama mountain in Tochigi prefecture. In this study, we inspect diurnal changes in total soil moisture content (TSM) to estimate ET at a plot scale level. We observe fluctuations in water content on daily basis by installing several soil moisture sensors at different depths of 5, 10, 20, 30, and 50 cm. Soil water samples are also collected at 5 to 80 cm depths. We are performing this research on two study sites with a total of six plots. The first site (P1) is covered by Japanese Cypress plantation where strip thinning have been conducted. It consists of four plots two of which are below middle-canopy (MC) condition, and we remove the understory vegetation of one plot. The other two plots are below under-canopy (UC) condition and we also remove

the understory cover of one of the plots. The second site (P3) is covered by Japanese cedar plantation where spot thinning have been performed. This site consists only of two plots one at MC condition and another at UC condition, and we keep the understory vegetation cover of both plots intact. The water table displays daily fluctuations influenced by ET depletion of soil moisture content. To compute ET, we use the night time slope of TSM between 1200h midnight and 0400h to estimate the subsurface flux. Then we calculate evapotranspiration based on a diurnal hydrologic balance. In addition, we perform the isotopic measurements to partition ET within each study plot.

Our primary examination using TSM method indicates consistent results of ET levels. Using past soil moisture data from P1 study site, we calculated ET and compared our results to previous measurements of evapotranspiration performed by Sun et al. 2017, which used lysimeter method. Our analysis demonstrates a positive correlation coefficient ranging from 0.25 to 0.86. Hence, we inspect the applicability of this method in our study sites to determine its suitability in estimating ET without prior information on vegetation type or detailed measurements of soil texture and site hydraulic properties. Nonetheless, the accuracy of the measurements requires for soil moister monitoring to remain continuous and of consistent values.