

SEASONAL VARIATIONS OF WATER AND ENERGY BUDGET OF EVERGREEN BROAD-LEAVED FOREST IN CENTRAL TAIWAN

Wen-Yu Chiou

Graduate Institute of
Hydrological and
Oceanic Sciences
National Central
University, Taiwan

Ming-Hsu Li*

Graduate Institute of
Hydrological and
Oceanic Sciences
National Central
University, Taiwan

Kuan-Yin Chen

Graduate Institute of
Hydrological and
Oceanic Sciences
National Central
University, Taiwan

Pei-Yuan Chen

Graduate Institute of
Hydrological and
Oceanic Sciences
National Central
University, Taiwan

ABSTRACT

Water and energy budget in forest ecosystem are deeply affected by changes in meteorological conditions and surface characteristics, which lead to distinct behaviors in dry and wet seasons. Meteorological and energy fluxes data observed at the Lianhuachi (LHC) Research Center in central Taiwan during 2010 to 2020 were analyzed in this study. Based on rainfall amount, dry (*i.e.*, Oct.~Mar.) and wet (*i.e.*, Apr.~Sept.) seasons were identified to have 6 months in each season. Latent heat flux (LE) and net radiation (Rn) in wet seasons are larger than those in dry seasons, while differences in sensible heat flux (H) between dry and wet seasons are insignificant. Soil moisture, evapotranspiration, and streamflow of wet seasons are also larger than those in dry seasons. In order to understand effects of different dryness and wetness on energy and water budget, the Standardized Precipitation Index (SPI) was applied to further identify dryer (*i.e.*, SPI3 < -1), dry (*i.e.*, -1 < SPI3 < 0), wet (*i.e.*, 0 < SPI3 < 1), and wetter (*i.e.*, SPI3 > 1) seasons in different years based on the median of SPI3 calculated by 3 months accumulated precipitation in each season. The wetter season has larger LE and smaller H than the wet season due to more rainfall and rainy days which lead to small Rn. Although differences in LE between dryer and dry seasons are insignificant, larger H and Rn are observed in the dryer season than those in dry seasons due to less rainfall and rainy days in dryer seasons. The wetter seasons have the largest soil moisture and streamflow, which are the lowest in the dryer seasons, among 4 types of wet/dry seasons. Since the LHC did not suffer extreme drought with long duration during past 10 years, the evergreen broad-leaved forest is still able to sustain functions of evapotranspiration by uptaking deeper soil moisture under moderate drought condition. Long-term and continuous observation of water and energy contributed to understanding the characteristics of seasonal variation, especially the impacts of extreme wet and dry events to the forest ecosystem, and supporting to propose sound strategies of forest management.

Keywords: Standardized precipitation index, Water and energy budget, Evergreen broad-leaved forest, Seasonal variations.