

關刀溪森林集水區蒸發量推估之探討

黃信蒼⁽¹⁾ 游繁結⁽²⁾

摘要

本研究以關刀溪森林集水區為對象，就長期蒐集之氣象資料進行分析，探討森林集水區蒸發量與各氣象因子之關係。其結果得知，本試區林下由於林冠之遮蔽且因植物蒸散作用旺盛，使得林下相對濕度全年皆維持於 90% 以上；林上全年平均相對濕度為 79.3%；林冠上下層間水汽壓差約在 3.3 到 7.9mb。本試區林下之年平均氣溫為 16.9℃，林冠上層之年平均氣溫為 17.9℃，林外空地之年平均氣溫為 19.8℃。本試區林下風速由於鄰近山谷而受地形之效應影響，使得林冠層下方風速高於冠層上方之風速。本試區林下日射量為林外日射量之 48.9%。而林內淨輻射變化之趨勢大致與日射之變化趨勢一致。林內下方蒸發量於夏季採用風速推估較為接近。而在冬季則因林內風速變異甚大，蒸發量推估誤差相對較大，但推估值之變化趨勢仍與實測值之變化趨勢一致。

關鍵詞：蒸發、相對濕度、氣溫、風速、日射

Study on the Estimation for Evaporation in Guandaushi

Forest Watershed

Shin-Tsang Huang

Graduated Student, Department of Soil and Water Conservation, National Chung Hsing University,
Taichung, Taiwan 402, R.O.C.

Fan-Chieh Yu

Professor, Department of Soil and Water Conservation, National Chung Hsing University, Taichung,
Taiwan 402, R.O.C.

ABSTRACT

The Long-term meteorological data in Guandaushi Forest Watershed were used to analyze the relationships among meteorological factors in this study. And analyzed the influence to evaporation in the forest watershed from the variation of the value among meteorological factors. The study results were that, because of the shelter of canopy and the violent transpiration of vegetation, the average of

(1) 中興大學水土保持學系碩士班學生

(2) 中興大學水土保持學系教授

relative humidity above the forest was 79.3%. The relative humidity outside the forest was lower than the relative humidity of the forest. The range of vapor pressure deficit between the air above the forest and the air inside the forest was 3.3-7.9mb. The mean air temperature of year was 16.9°C inside the forest, 17.9°C above the forest and 19.8°C outside the forest. The wind velocity inside the forest was higher because of wind from the valley. Because of the reason, the wind velocity inside the forest was lower than the velocity above the forest. The solar radiation inside the forest was about 48.9% of the outside. The variation tendency of net radiation inside the forest conformed to the tendency of solar radiation. Using the wind velocity to estimate the evaporation inside the forest was fitting in summer. Because of the higher wind velocity, the error of the estimation to the evaporation inside the forest increased in winter. But the variation tendency of the estimation to the evaporation still conformed with the variation tendency of the real evaporation inside the forest.

Keywords: Evaporation, Relative Humidity, Air Temperature, Wind Velocity, Solar Radiation

一、前言

森林之蒸發散作用對於氣候變遷與水文循環具有重大的影響，森林蒸發散之作用對大汽之水汽補充和大氣中水蒸氣之平衡扮演重要的角色。

蒸發散作用中包含了自由水面及土壤表層之蒸發量、森林樹冠層截流量上的蒸發與植物群的蒸發作用。

由於目前對於蒸發散量之直接量測甚為困難，致使對於森林集水區內蒸發散量的推估亦因此缺乏實測值佐證，而不易建立準確之推估式。

由於蒸發與蒸散均屬水汽逸散之大氣現象，因此若能掌握蒸發推估，則此而推論蒸發散量，應是一可行的方式，故本研究以位於中興大學惠蓀林場內之關刀溪集水區為試驗地，先行探討集水區中蒸發量多寡與各因子之關係，以期能了解蒸發量在森林集水區內的變動狀況。

二、研究材料與方法

(一) 試驗區概況

1. 地理位置

本試驗觀測自 1995 年 7 月開始，試驗地位於南投縣國姓鄉國立中興大學惠蓀林場，為台灣中部烏溪流域中之北港溪上游支流關刀溪中上段支流所屬之集水區。集水區全部位於惠蓀實驗林場之中，約北緯 24 度 02 分至 24 度 06 分、東經 121 度至 121 度 03 分之間，範圍包括實驗林場第三～八林班地，地勢為呈南向北開口狀。本研究所分析之試驗集水區包含在此一集水區之內，其面積約為 40.5 公頃，形狀略呈橢圓形，海拔高度在 1100~1700 公尺之間，平均坡