

Prakumkaew Boontum 2007: Determination of Stomatal Conductance Equation Coefficients for Estimating Evapotranspiration of Hill Evergreen Forest Using Penman-Monteith Model at Kog-Ma Watershed, Chiang Mai Province. Master of Science (Watershed and Environmental Management), Major field: Watershed and Environmental Management, Department of Conservation. Thesis Advisor: Mr.Chatchai Tantasirin, MS. 115 pages.

To estimate evapotranspiration (Et) of a hill evergreen forest at Kog Ma watershed, Chiang Mai province, northern Thailand, analyses to derive coefficients of Jarvis' stomatal conductance model were carried out. The objectives of the study are to derive coefficients of Jarvis' model and apply to estimate Et based on Penman-Monteith model and verify it results with Et measured by Eddy Correlation method. The relationship between stomatal conductance of *Cinnamomum porrectum* (A) and *Lithocarpus elegans* (B) and several environmental factors were analyzed. The coefficients were derived using Generalized Reduced Gradient technique. Four different levels of Jarvis' model were compared. The most suitable model was selected to estimate Et during November and December 2005 and January 2006. Modelling accuracy was verified using a parameter called Model Efficiency (EFF) proposed by Nash and Sutcliffe. Estimated Et from the model was calibrated using Generalized Reduced Gradient technique. The results can be summarized as follow.

Generally, photosynthetically active radiation (PAR), temperature and relative humidity have high correlation with stomatal conductance. However, in some day, there is no relationship among these environmental factors. The reason probably because other factors have higher effects on stomatal conductance than those factors. In addition, it was found that soil moisture has very low relationship with stomatal conductance. Therefore, soil moisture can not be applied, only PAR, temperature and relative humidity were applied in Jarvis' model. The accuracy of estimating stomatal conductance from four level equations of species A using EFF is 0.6594, 0.6242, 0.6727 and 0.5041 respectively. While that from species B is 0.6540, 0.5964, 0.6042 and 0.5551 respectively. The third level of Jarvis' model was then applied to Penman-Monteith model since it shows the highest and the most reasonable results on estimating stomatal conductance. The model is $G_{sw} = 0.146 \left[\frac{Q}{Q+96.66} \right] \cdot \left[\left(\frac{T-7.04}{16.33} \right) \cdot \left(\frac{43.00-T}{19.60} \right)^{1.20} \right] \cdot \frac{(1-0.05D)}{(1+0.2D)}$. Estimated monthly Et during November and December 2005 and January 2006 is about 30, 32 and 49 mm. respectively and average daily Et is 1.0, 1.1 and 1.6 mm. respectively. The accuracy comparing with that measured by Eddy-Correlation method using EFF is 0.6018, 0.6240 and 0.5386 respectively.

Student's signature

Thesis Advisor's signature