8th International Conference on Fog, Fog Collection and Dew
Taipei, Taiwan, 14–19 July 2019
IFDA2019-101

The surface heat fluxes-atmosphere relations in Chi-Lan montane cloud forest in Taiwan

Rong-Yu Gu (1), Min-Hui Lo (1), Chi-Ya Liao (2), Jehn-Yih Juang (3), Choy Huang (3), Shih-Chieh Chang (4), Cheng-I Hsieh (5), Ming-Hsu Li (6), Yi-Ying Chen (7), and Housen Chu (8)

(1) Department of Atmospheric Sciences, National Taiwan University, Taipei, Taiwan (r07229016@ntu.edu.tw; minhuilo@ntu.edu.tw), (2) Central Weather Bureau, Taipei, Taiwan, (3) Department of Geography, National Taiwan University, Taipei, Taiwan, (4) Department of Natural Resources and Environmental Studies, National Dong Hwa University, Hualien, Taiwan, (5) Department of Bioenvironmental Systems Engineering, National Taiwan University, Taipei, Taiwan, (6) Graduate Institute of Hydrological and Oceanic Sciences, National Central University, Taoyuan, Taiwan, (7) Research Center for Environmental Changes, Academia Sinica, Taipei, Taiwan, (8) Lawrence Berkeley National Laboratory, University of California, California, USA

Variations in surface fluxes can alter the development of the planetary boundary layer, thus potentially affecting the convective initiation through land-atmosphere interactions. Chi-Lan montane cloud forest, located at 1650 m above mean sea level at northeastern Taiwan, possesses low latent heat flux compared with other forests around the world. Both frequent afternoon fog water and more than 3000 mm annual precipitation serve as plentiful water sources to Chi-Lan's ecosystem, horizontally and vertically, respectively. In addition, tropical montane cloud forests may suffer from vegetation mortality or species invasion due to the uplift cloud base height resulting from local and regional hydroclimatological changes. However, the interactions between surface fluxes and atmosphere in such wet montane cloud forests remain unclear. In this study, flux tower observations and Community Land Model (CLM) simulations are utilized to explore the role of fog in Chi-Lan. An asymmetric diurnal latent heat flux was found in observations: an early peak of the diurnal latent heat fluxes. However, this characteristic is not shown in Lien-Hua-Chih in central Taiwan. The high canopy evaporation in early morning is found to potentially result in the increased latent heat flux through CLM simulations. We also found that the intercepted fog water and dew at night reform canopy water, contributing to evaporation after the next sunrise, modifying the diurnal water cycle in Chi-Lan. The surface fluxes response to the atmosphere may change under global warming, and thus, to understand the change in Chi-Lan montane cloud forest in the future climate is necessary.