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# Assessment of observed fog/low-cloud trends in central Taiwan

Yen-Jen Lai (1) and Po-Hsiung Lin (2)

(1) Experimental Forest, National Taiwan University, JuShan, 55750, Taiwan (alanlai@ntu.edu.tw), (2) Department of Atmospheric Sciences, National Taiwan University , Taipei, 10610, Taiwan

Xitou region, as the epitome of mid-elevation cloud forest ecosystems in Taiwan, it possesses a rich diversity of flora and fauna. It is also a popular forest recreation area. Due to rapid development of the local tourist industry, where tourist numbers increased from 0.3 million/year in 2000 to 2 million/year in 2015, the microclimate has changed continually. Global warming and landscape changes would be also the most likely factors. This study reports findings of monitoring systems including 4 visibility observed sites at different altitude, a self-developed atmospheric profile observation system carried by unmanned aerial vehicle (UAV) and a high temporal cloud base height observation system by a ceilometer. Besides this, the cloud top height of MODIS cloud product is evaluated as well.

The results indicated the foggy day ratio in 2015 was 24% lower than that in 2005 around the district of the nursery. The foggy day ratio raised along with the increase of altitude and the sharpest increasing range happened in the summer time. The UAV-observed results showed the top heights of the nighttime atmospheric boundary layer (ABL) usually happened under 1300m a.s.l. (250m above ground) and the top heights of daytime ABL rose to 1500m - 2100m a.s.l. Unfortunately, it was difficult to observe the inversion layer/ABL in summer due to the fly height limitation of UAV. The ceilometer-observed results indicated the highest foggy ratio happened around 17:00 (local standard time). The daytime cloudy based height ratio was higher than nighttime and the cloud based height was usually located during 1150m - 1750m a.s.l. which was under the top heights of ABL. In addition, the higher cloud-based-heights-happened ratios were found at 1200m - 1250m a.s.l. and 1350m - 1400m a.s.l.. These results indicated the cloud based height uplifted from ground to at least 150m above ground-level causing the foggy ratio decrease. The MODIS cloud product showed the top height of low cloud uplifted or even became clear sky along with the increase of Xitou tourist numbers. Both ceilometer and MODIS data suggested the low cloud was uplifting. In order to clarify the seasonal characters of cloud thickness, the validation of MODIS cloud top height by atmospheric profiles are on-going. Furthermore, an adapted land-atmospheric model (WRF model is now under testing) will be implemented in order to discover the major factors causing the decrease of foggy ratio and assess the impacts on cloud forest.