インドネシア西スマトラの沿岸地における可降水量の日変化

Diurnal Variation of Precipitable Water at Tabing, a Coastal Area in Western Sumatra

伍培明¹・佐々木太一¹・山中大学^{1,2}・木村富士男³・Tien Sribimawati⁴

(1. 地球観測フロンティア研究システム, 2. 神戸大学自然科学, 3. 筑波大学, 4. インドネシア BPPT)

In our previous study, diurnal variations in atmospheric water vapor at Koto Tabang, a mountainous area of Sumatra Island, Indonesia, were studied. We observed that precipitable water (PW) increases during daytime, reaching its maximum in the late afternoon at about 1700 LST (Wu et al., 2003). In the present study, diurnal variations in atmospheric water vapor at Tabing, a coastal area of Sumatra Island, Indonesia, are studied by analyzing the GPS-derived precipitable water, radiosonde data, and surface meteorological observation data. A GPS receiving station was established at Tabing (0 ° 53′ 3″ S, 100 ° 21′ 11″ E) in April of 2002. Radiosonde soundings were carried out at 6⁻h intervals in the period from 27 July to 5 August 2002.

A distinct diurnal variation in water vapor is observed. The precipitable water increases during daytime, reaching its maximum at about 2000 LST in the evening at Tabing (Fig. 1). This is 3-4 h later the time observed in the mountainous area at Koto Tabang. The specific humidity near the surface increases only from the morning until about 1300 LST. The results of radiosonde observations indicate that a remarkable increase in water vapor occurs at an altitude of about 2.4 km at 1900 LST (Fig. 2). The diurnal cycle of water vapor is affected by the intensity of incident solar radiation and the upper wind. The diurnal range of the precipitable water on days of upper easterly wind was larger than that on days of westerly wind. The daily maximum appears about 2 h earlier on days of upper easterly wind. It is suggested that water vapor is transported by

the thermally induced local circulation. In the daytime, convergence by the upslope wind led to an enhancement of moisture over the mountainous area. Then, the water vapor is transported to the coastal area in the upper air in the afternoon and evening.



Fig. 1. The mean diurnal variations of GPS-sensed PW, specific humidity observed at a level of 1.5 m, and rain frequency observed at Tabing in the period from 1 May to 23 Aug 2002.



Fig. 2. Variation in the vertical profiles of specific humidity observed at Tabing (left) on 3 Aug 2002 and (right) 4 Aug 2004.

References

Wu, P. M., J. Hamada, S. Mori, I. T. Yudi, M. D.
Yamanaka and F. Kimura (2003): Diurnal variation of precipitable water over a mountainous area of Sumatra Island. J. Appl Meteor., 42, 1107-1115.

— 34 —