

# **Studies on the turbulence characteristics and flux data quality control at Tak Flux Measurement Station in Thailand**

**Wonsik Kim <sup>(1)</sup>, Jaecil Cho <sup>(2)</sup>, Shin Miyazaki <sup>(2)</sup>**

**Shinjiro Kanae <sup>(3)</sup> and Taikan Oki <sup>(2)</sup>**

**<sup>(1)</sup> Seoul National University. e-mail: wonsik@snu.ac.kr, <sup>(2)</sup> IIS, University of Tokyo**

**<sup>(3)</sup> Research Institute for Humanity and Nature, and University of Tokyo**

## **Abstract**

Using the data for 2003, the basic studies for long-term flux measurement are carried out at Tak flux measurement station (TFMS) in Thailand. The experimental site is located in Chao Praya River Basin which is one of the starting points of Asian Monsoon. The vegetation around TFMS consists of a large area of tropical deciduous forest and several kind of crop field. While the land surface heterogeneity, the characteristics of wind flow and turbulence are available for flux measurement because:

1. The west wind via vegetated tropical deciduous forest is dominated during the rainy season but the daily variation observed during the dry season.
2. The integrated turbulence characteristics based on Monin-Obukhov similarity are well matched to micrometeorological theory.
3. The coordinate rotation and Webb correction are applied to rotate the main streamline and to correct density fluctuation.
4. Considering the land cover and micrometeorological characteristics at TFMS, the strategy of data quality control for standard micrometeorological measurements of TFMS are constructed.

*Keyword: Data quality control, Eddy covariance technique, Tak Flux Measurement Station, Turbulence characteristics.*

## 1. Introduction

About 150 flux measurement towers are constructed over the world to monitor energy, water and carbon dioxide fluxes. The data from those towers have improved our knowledge about water and carbon cycle upon the land surface. However the most sites are located in North America and Europe, only a few sites are available in Asia. Especially, the sites for long-term and precise flux measurement in Indochina peninsular are rare though it is important region to the meteorological, hydrological and ecological aspect. Consequently, the aims of this study are to continually measure the energy, water and carbon dioxide fluxes at least during ten years using eddy covariance technique, and to extract the flux data by its quality control for standard micrometeorological measurements considering the land cover and micrometeorological characteristics at TFMS.

## 2. Experimental site and instrumentation

The TFMS site (latitude: 16°56'N, longitude: 99°25'E) is located about 20 km east of Tak and 50 km west of Sukhothai in the northwest part of Thailand. There is essentially a flat area of about 100 km<sup>2</sup> and 130 m higher than sea level. The fetch is more than 10 km with gently undulating hills with about 20 m differences in height. The climate of the experimental area is divided into wet and dry seasons as a part of the Southeast Asia monsoon region. The onsets of the wet and dry seasons are in May and October, and the mean temperatures of each season are about 27°C and 32°C, respectively. The total annual precipitation is about 1200 mm. The vegetation consists of 70% 10-15 m tall deciduous trees with 3-5 leaf area index, and 30% agricultural area cultivating rice, corn and tobacco. The eddy covariance technique to measure the fluxes is used at the TFMS site. In applying the technique, two sets of the prototype instrument consisting of three dimensional sonic anemometers and an open path CO<sub>2</sub>/H<sub>2</sub>O gas analyzer. The detail description refers to Kim et al. (2003).

## 3. Result

Figure 1 shows the characteristics of wind flow at TFMS on February and August in 2003. The wind flow during the rainy season comes from only west, while the daily variation of wind flows are clearly appeared during the dry season. (i.e. the north-east and south-west wind blow in the daytime and nighttime, respectively).

Figure 2 shows various turbulence characteristics based on Monin-Obukhov similarity at experimental site. The characteristics will be presented and discussed in this meeting.

## Reference

Wonsik Kim *et al.* (2003) Real time monitoring and simulation system (RTMASS) for Tak flux measurement site, Thailand. *Korean Journal of Agricultural and Forest Meteorology* **5**, 116-127.

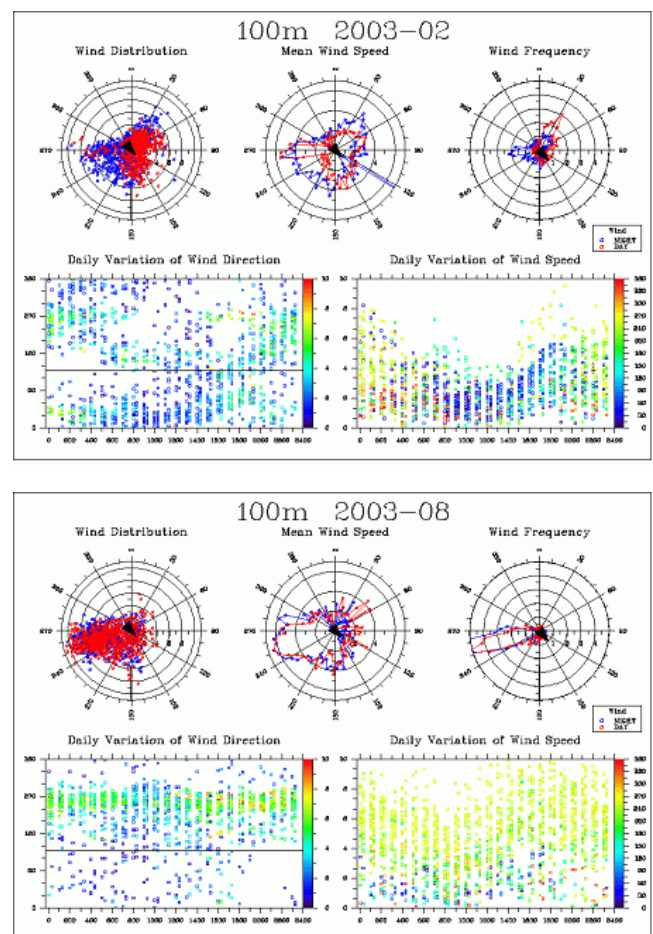


Figure 1. The characteristics of wind flow at Tak flux measurement station on February and August in 2003.

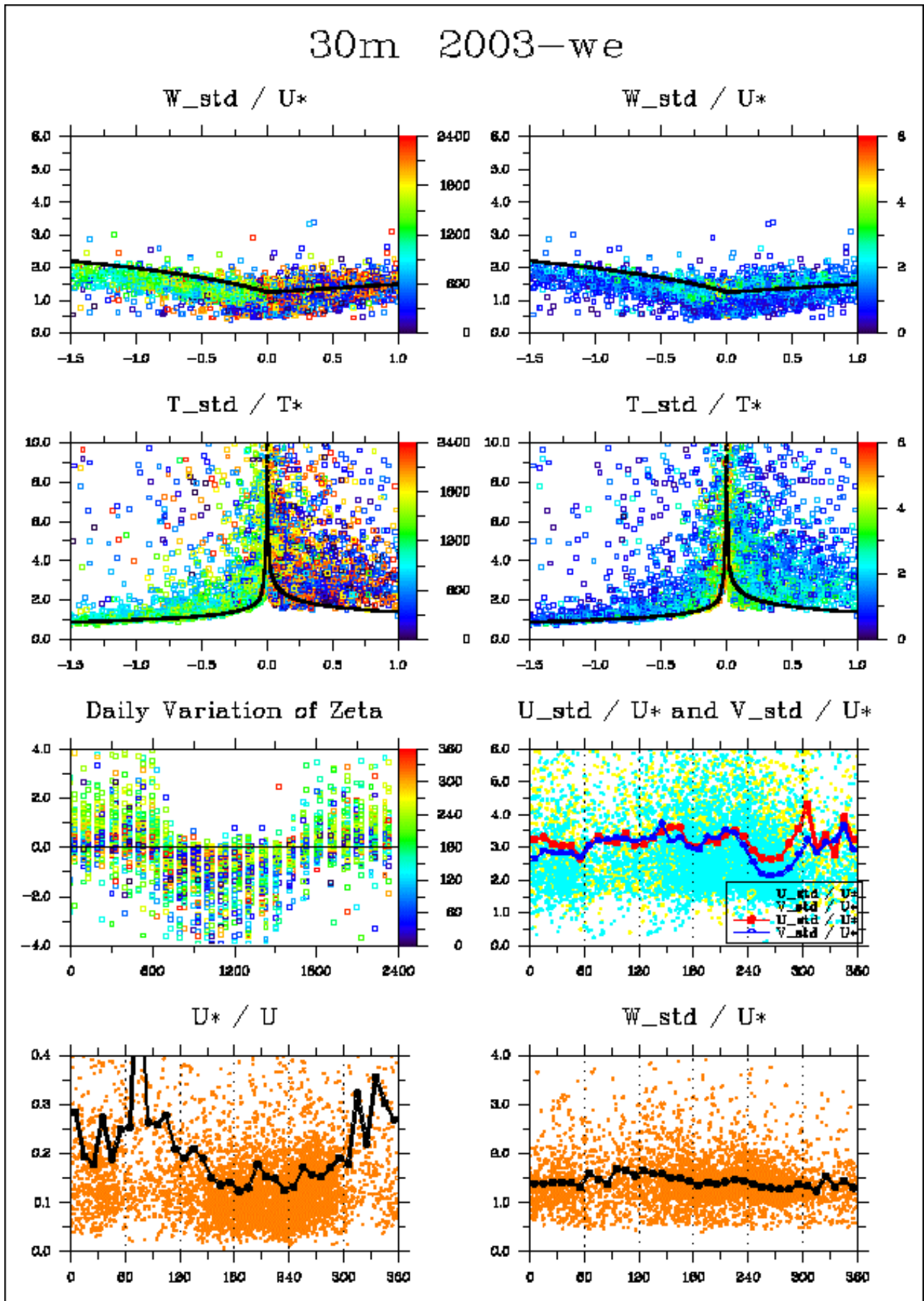


Figure 2. The analyzed turbulence characteristics during the wet season.