

CHAPTER 1

INTRODUCTION

1.1 Objectives

The present research was conducted with two objectives. One is to investigate the Atmospheric Boundary Layer (ABL) structure in monsoon area by using lidar. The other is to develop the observation system at the Observatory for Atmospheric Radiation Research at Sri Samrong, with particular emphasis on lidar system.

1.2 Scope of Study

The Observatory was built in 1997 in cooperation between Thai and Japanese scientists for observation of atmospheric radiation. The Observatory accommodates, sensors, computer controlled equipments, data transfer system and support facilities. All of the data stored in the Observatory are transferred to servers at Chulalongkorn University and Center of Climate System Research of University of Tokyo. The research was initiated in order to obtain continuous and reliable data. Special emphasis was given on lidar system because this system was used for study ABL structures of the second objective.

The ABL is the lowest atmospheric layer that is closest to the surface and has highest influence for human being. Since ABL has high temporal and spatial variation, understanding of ABL requires good observational data of the dynamical process. Earlier scientists used balloon to study ABL behavior. However, balloon measurement can collect ABL data only at synoptic hour and it is very expensive. So the remote sensing instruments such as lidar which can observe ABL variation almost continuously became more popular than balloons.

We used lidar data collected during June 1997 to October 2002. Due to some problem of lidar observation system, we could obtain continuous data only since

October 2001. Therefore we selected data during October 2001 to October 2002 as reference data.

1.3 Data collection and data analysis

Data used in this study are composed of lidar data, meteorological data and radiosonde data. Procedure of Lidar data analysis consists of 2 parts, namely, preliminary analysis and ABL structure analysis. For preliminary analysis, lidar data composed of backscattering intensity and depolarization ratio were used to compare with surface meteorological data provided by Thai Meteorological Department (TMD) site observation at Sukhothai (about 20 km, west of the Observatory). According to the preliminary analysis of all year round, ABL variation was found to be divided into 3 specific types that dominate each period. After that, Fernald's method was applied to evaluate the aerosol extinction coefficient from lidar data to compare with radiosonde data (Table 1.1). However, we could not apply Fernald's method to determine the extinction coefficient in rainy season because surface was frequently covered by lower cloud.

| Season | Date | Interval | Site of Observation |
|---------------|---------------------|---------------|---------------------|
| Wet season | 25 – 27 Oct 2001 | 8 times/day | The Observatory |
| Wet season | 25 – 27 July 2002 | 2-10 time/day | The Observatory |
| Cold season | 25 – 27 Jan 2002 | 4-8 times/day | The Observatory |
| Summer season | 22 Feb – 3 Mar 1999 | 5 times/day | EGAT Tower |

Table 1.1 Radiosonde data that collected around the Observatory during 1997- 2002