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Aerosol Observation by Multi Channel Lidar System at Kosan, Jeju, Korea during ACE-Asia 2001

C.S. Hong[1], Y.J. Kim[1], Y. Iwasaka[2], Y.S. Kim[2]

[1]Department of Environmental Science & Engineering,
Advanced Environmental Monitoring Research Center, Kwangju Institute of Science & Technology,
Kwangju 500-712, Korea
[2]Division of Earth and Environmental Science, Graduate School of Environmental Studies,
Nagoya University,
Nagoya 464-8601, Japan

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1. INTRODUCTION

The analysis of pollutants in the atmosphere is necessary to research the characteristic of air quality. The kinds of pollutants are variable and each pollutant has particular characteristic. So LIDAR need several channels. Besides, transport and dispersion process partially control the concentration of the pollutants. Therefore, we have improved the observation system and researched analytic method. In order to measure atmospheric aerosols effectively, Advanced Environmental Monitoring Research Center (ADEMRC), K-JIST in cooperation with Nagoya University has built a 8-channel LIDAR System at Kosan Super Site, Jeju island, Korea.

2. LOCATION

The Multi channel LIDAR System is installed at the Kosan, Jeju Island (33°17′N, 126°10′E, 50m above sea level). The measurement site is located in the urban area located 45km from the Jeju city.

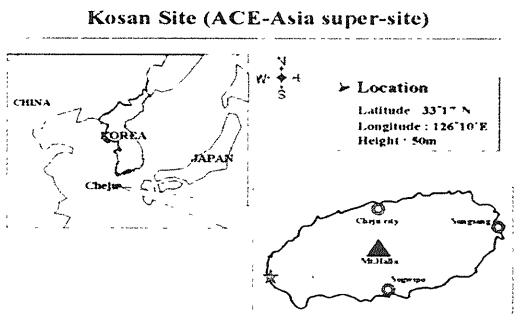


Figure 1. Site Map

Figure 2. Kosan Measurement Site

3. INSTRUMENTATION

Vertical profile of atmospheric aerosol backscattering and the depolarization ratio(particle nonsphericity) were measured with multi channel lidar from 11 March to 4 May, 2001, ACE-Asia intensive measurement period to investigate the characteristic of aerosol optical properties with altitude during yellow sand event. This LIDAR System uses a Nd:YAG laser whose wavelength is 355nm, 532nm, and 1064nm. Pulse duration of laser is not over 10ns at 1064nm, repetition rate is 20Hz, and detection range is below 60km.

Additionally, the detector is PMTs which counts the number of photons. LIDAR consists of three telescopes and receives data of aerosols by eight channels. One of telescopes detects water vapor, N_2 and O_2 by two channels. The channel used to detect N_2, O_2 can calculate the temperature. The others detect aerosols by six channels. Four channels receive the data about aerosols and give us the depolarization ratio. Two channels are used not only to measure aerosols but also to analyze under boundary layer. The six channels which detect aerosols are produced by polarizing 532nm laser and 1064nm laser vertically and horizontally respectively.

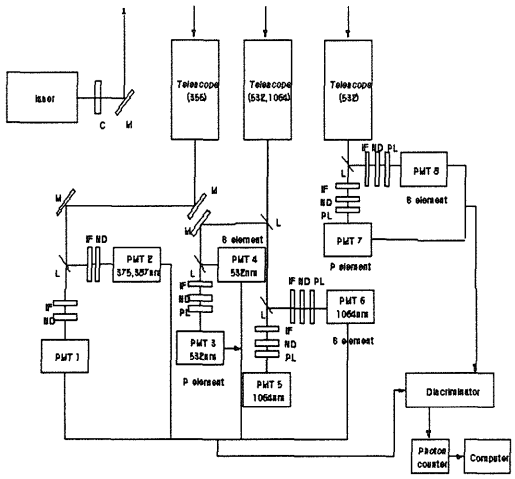


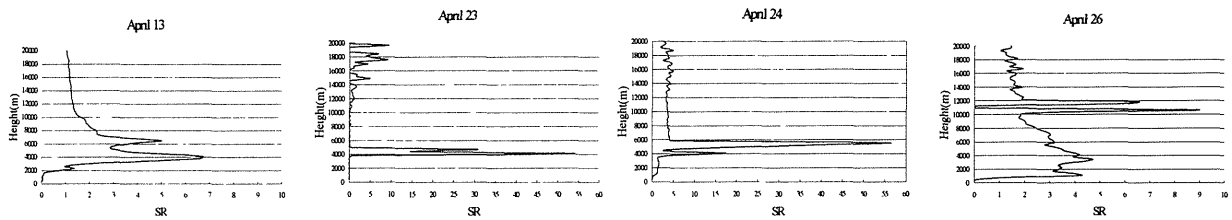
Figure 3. LIDAR Composition

Table 1. LIDAR Specification

Telescope	Channel	Wavelength	Measurement parameter	Remark
Receiving Telescope 1	Channel 1	355nm	Water Vapor	
	Channel 2	Raman Scattering	N_2, O_2	Temperature
Receiving Telescope 1	Channel 3	532nm Horizontal polarization	Aerosol	Depolarization Ratio
	Channel 4	532nm Vertical polarization		
	Channel 5	532nm Vertical polarization		
	Channel 6	532nm Horizontal polarization		
Receiving Telescope 1	Channel 7	1064nm Vertical polarization		Boundary Layer
	Channel 8	1064nm Horizontal polarization		

4. REUSLT

Vertical profile of scattering ration at a wavelength of 532nm on April 13, 23, 24, and 26, 2001 are shown in Figure 4. During April 13, yellow sand layers existed at 6km and 4km, respectively. The upper layer had a scattering ratio of 6.7. Much more lower layers appeared at about 2km to be mixed with background aerosol and scattering ratio of 1.4. At April 23, yellow sand layers existed at 4-5km, and the maximum scattering ration of 54.1 was recorded. Also, April 24, yellow sand layers existed at 5.5km and 4km. The upper layers had a scattering ratio of 55.1, and the lower layer had a scattering ratio of 17.6. At April 26, yellow sand layers separated low and high altitude between 3-5km and 10-11km, respectively. At the lower altitude, yellow sand layers existed at 3-5km with maximum scattering ratio of 4.7. However, at high altitude, yellow sand layers existed at 10-11km, and the maximum scattering ratio of 9.0 was observed.



(a) April 13 (b) April 23 (c) April 24 (d) April 26

Figure 4. Vertical Profile of Scattering Ratio

5. ACKNOWLEDGEMENTS

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