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Some Aerosol Events in Asia Observed by LITE

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1. Introduction

Economic expansion of many countries in Asia will unavoidably be accompanied by increases in sulfate and soot particle concentrations downwind in the atmosphere. Dust from the desert in Mongolia and the northwest of China alters the amount of aerosol deposited into the Pacific Ocean. The aerosol characteristics in Asia will be the subject of ACE-Asia project.

Lidar In-Space Technology Experiment (LITE) was launched on board the space shuttle Discovery in the period of about 10 days in September 1994. The high-resolution aerosol data, both vertically and horizontal, were obtained in global scale. It provided us an opportunity to investigate the aerosol properties over some different types of regions such as the ocean, desert, land, and coast. The map of LITE orbits in Asia is shown in Fig. 1. Eight night orbits flew from the continent of Asia to West Pacific Ocean. Daytime orbit No.27 flew along the east coast of China.

The purpose of this work is to study the aerosol characteristics in different types of atmosphere. Some aerosol events are selected from the LITE data, and analzyed.

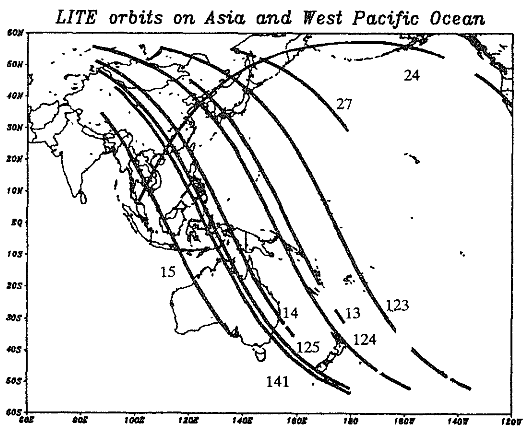

Fig. 1 The coverage map of LITE in Asia

2. Data Processing of LITE

On orbit 124, LITE flew over Ulan Bator, passed through Chifeng to Dalian city, then went through over the ocean not far from Seoul, and passed over Kwangju to Kagoshima. In this orbit a thick layer of aerosol is observed over the sea on west of Seoul and southeast Kagoshima. The optical depths are analyzed for the latter two regions, which represent the atmospheric aerosol over coast and the ocean, respectively. The layers near Seoul and Kwangju are considered to be composed of sea salt aerosol and urban plume. The aerosol over desert obtained from the data on the orbit of 125 over the Gobi desert, which is one of the principal sources of Asian dust.

The aerosol optical depth and the backscattering ratio are retrieved from the lidar data by the algorithm of Fernald[1]. LITE data at the wavelength of 532 nm are chosen for the analysis for its relatively greater sensitivity to aerosol. The ratio of aerosol extinction to backscattering is assumed to be 30 sr in the troposphere and 45 sr in the stratosphere [2]. The 2-second average data with horizontal resolution of 15 km are used for calculation.

3. Results

The optical depth estimated for the desert, coast and ocean regions are shown in Figs. 2(a), 3(a) and 4(a), respectively. The backscattering ratios (total backscattering/molecu-lar backscattering) are also shown in Figs. 2(b), 3(b) and 4(b), representing the three different types. Aerosol optical depth over desert is not very large, but the aerosol layer is expanded up to higher than 10 km. Thick layers in many signals are considered to be the dust blown up by wind in that season. It is interesting that the aerosol optical depth near

Seoul coast becomes as large as 4; this might be the composite effect of sea salt and urban plume; most aerosols concentrated below 4 km as shown in the Fig.2 (b). Aerosol over the ocean near Kagoshima is relatively stable with the mixing layer of about 2 km.

4. Summary

Aerosol optical depths and backscattering ratios are obtained over desert, coast and ocean areas. Simultaneously analysis with more detailed information will provide.

Acknowledgments

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References

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2. H. Jager, T. Deshler, and D.J. Hofmann, “Midlatitude lidar backcatter conversions based on balloonborne aerosol measurements”, Geophys. Res. Lett., 22, 1729-1732(1995).

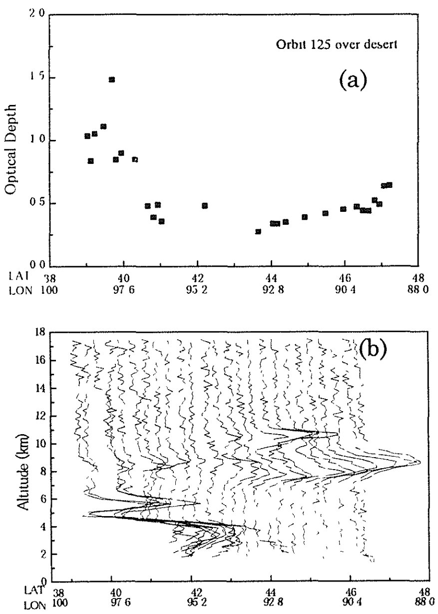

Fig.2. (a) optical depth and (b) the backscattering ratio over Gobi desert.

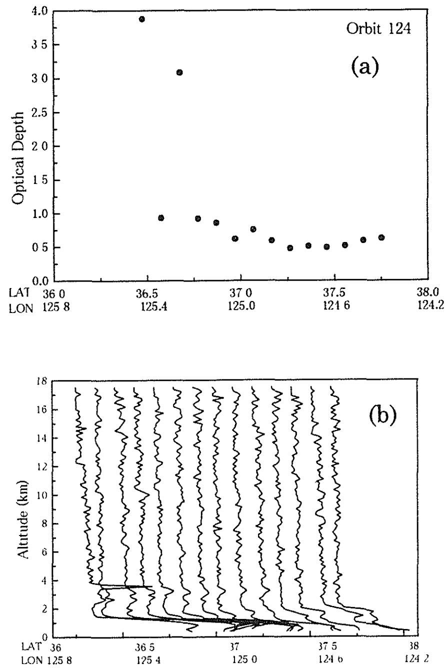

Fig.3. (a) optical depth and (b) the backscattering ratio over Seoul coast.

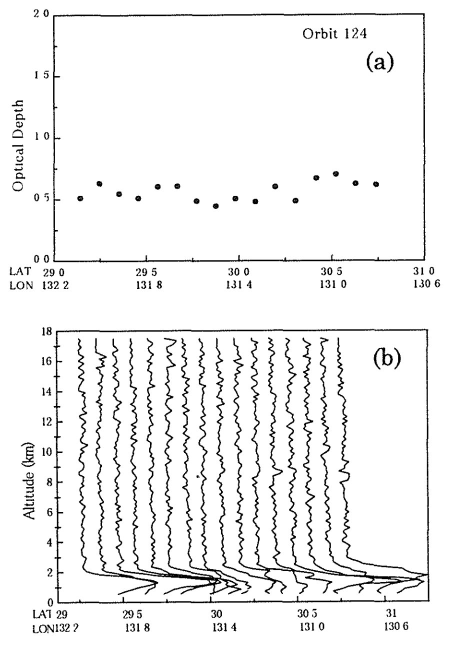

Fig.4. (a) optical depth and (b) the backscattering ratio over the ocean near Kagoshima.