

THE PRIMARY STUDY ON DISTRIBUTION CHARACTERISTICS OF AEROSOLS AND CCN UNDER CLEAR SKY WEATHER CONDITION IN SUMMER USING AIRCRAFT DETECTION OVER THE BOHAI SEA GULF AREA ,CHINA

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1. INTRODUCTION

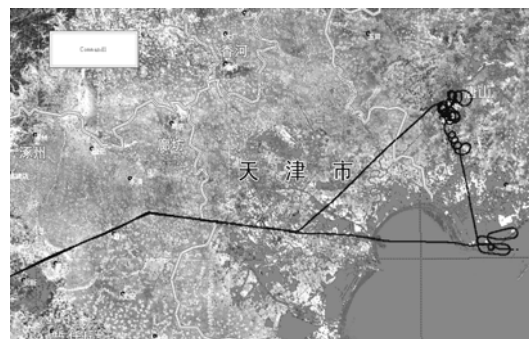
Since 2005 year, in order to study the distribution characteristics of aerosol and CCN in atmosphere over the Bohai sea gulf area of north China, aircraft observations were carried out using PMS (Particle measuring Systems) and the CCN counter. In this paper, based on the summer data over the Bohai sea gulf area of north China on 21 June 2005, which obtained by PMS PCASP-100X probe (Passive Cavity Aerosol Spectrometer Probe) and CCN counter, the distribution characteristics of aerosol and CCN were primarily analyzed.

2. INSTRUMENT, FLYING DESINE AND WEATHER

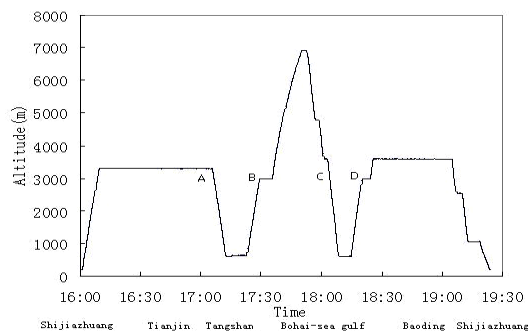
On 21 June 2005, weather was dominated by northwestern flow at upper air level over North China and the sky mostly was clear with surface temperature was more than 35°C all the area at LST 1400. The detected area was clear during aircraft observation but shower occurred after observation in the evening.

A Cheyenne IIIA aircraft with airborne PMS and other instruments was use for the observation. Measurements were made by aerosol probe PCASP-100X (size range 0.1-3.0 μm), cloud droplet probe FSSP-100ER (1-95 μm), OAP 2D-GA2

(25-1550 μm) , OAP 2D-GB2 (150-9300 μm), thermometer, King LWC meter, M300 dada system, GPS and a CCN counter. The aircraft took off at 16:00 and landed at 19:26 at



(a) Flight path



(b) Flight pattern

Fig.1 Flight path and pattern

Shijiazhuang Airport. Flight path was Shijiazhuang, Tianjin, Tangshan, Bohai sea gulf, Tianjin and Shijiazhuang. The flight altitude was from 600-7000 m. The flight path, altitude and position are shown in Fig.1.

3. PRIMARY ANALYSIS ON DISTRIBUTION

CHARACTERISTICS OF AEROSOLS AND CCN

3.1 The distribution of aerosols

The number concentration, average diameter, volume concentration, and aerosol particle

rapid with height increasing at 1600-3500 m, and the average number concentration is $130\text{--}940\text{ cm}^{-3}$. Average diameter is approximately $0.12\mu\text{m}$, average volume concentration is $4.2\text{--}5.5\mu\text{m}^3\text{ cm}^{-3}$ in boundary layer, which decreased with height increasing.

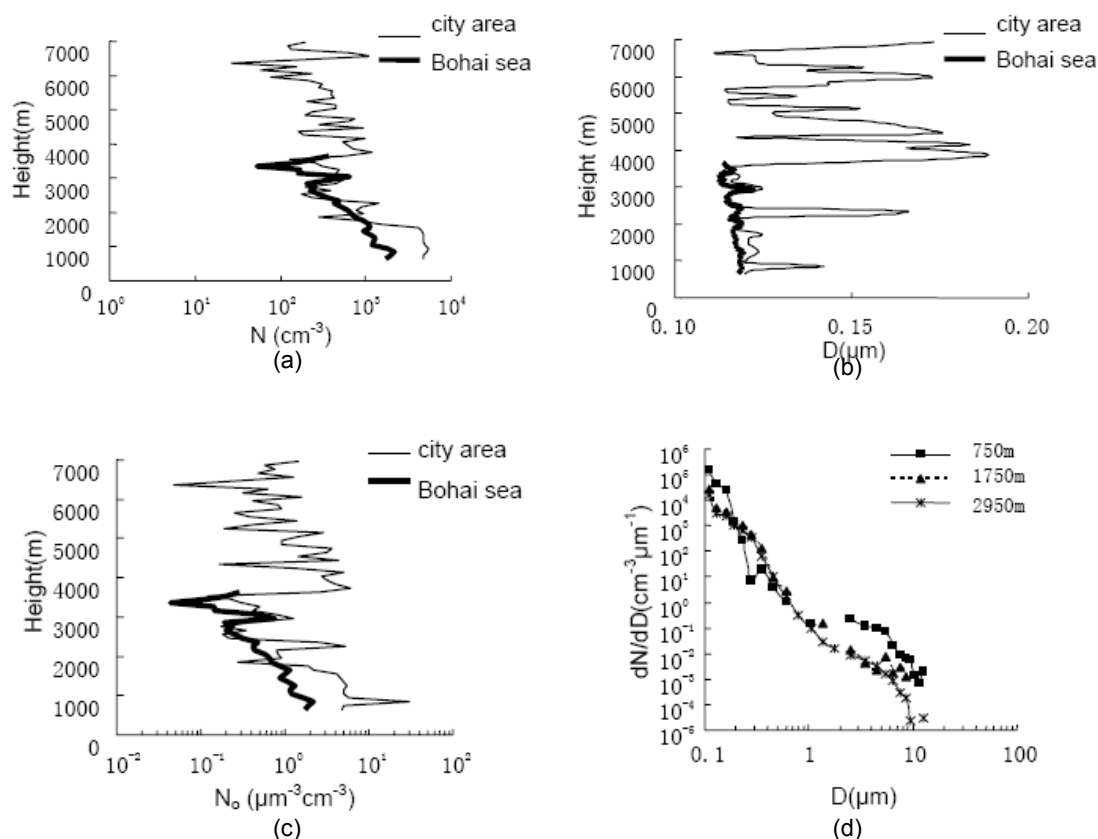


Fig.2 Vertical distribution of (a) aerosol concentration, (b) average diameter, (c) volume concentration and (d) spectra.

size spectrum distribution with height over Tangshan city and Bohai sea gulf are given in Fig.2. The results show that aerosol average number concentration range is $4200\text{--}5500\text{ cm}^{-3}$ at 1600 m level over the city. Below 1600m, the value changed little with height increasing. It indicates turbulence mixing is symmetrical in boundary layer. Average aerosol number concentration decreased very

From 600 to 3500 m over Bohai sea gulf area, average concentration is $1700\text{--}2200\text{ cm}^{-3}$. From 3000 to 3600 m, average aerosol concentration decreased from 150 to 370 cm^{-3} . Compared with Tangshan, average aerosol concentration over Tangshan city is two to five times than that over Bohai sea gulf. Average diameter over Bohai sea gulf is less than that over Tangshan from 600 to 3500 m. The

volume concentration decreased with height increasing. Average volume concentration over Tangshan is two to five times than that over Bohai sea gulf (see Fig.2(a),(b) and (c)). Aerosol particle size spectrum distribution at different level over Tangshan city is given in Fig.2(d). It can be seen that size spectrum range is $1.05\ \mu\text{m}$, $1.35\ \mu\text{m}$ and $1.75\ \mu\text{m}$ at 750 m, 1750 m and 2950 m, respectively. Comparatively, size spectrum distribution character is basal consistent over different area.

3.2 The distribution of CCN

The distribution of CCN concentration with

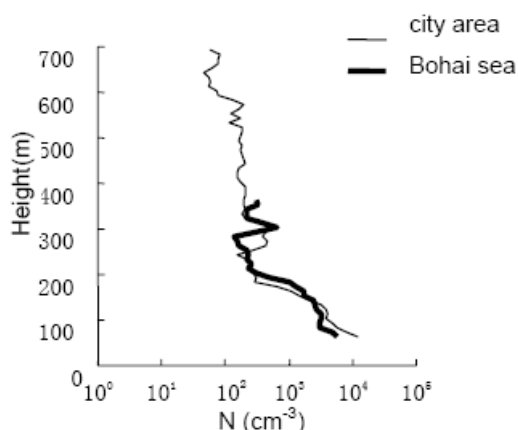


Fig.3. Vertical distribution of CCN concentration

height is shown in Fig.3, which the supersaturation was set at 0.3%. The result shows that CCN concentration reduced with height increasing over Tang Shan city and also Bohai sea gulf. From 600 to 2500 m in boundary layer, CCN concentration decreased rapidly. At 600 m level over Tangshan city, CCN concentration was $11770\ \text{cm}^{-3}$, at same level of Bohai sea gulf, CCN concentration was $5790\ \text{cm}^{-3}$, the latter is less than one half than that over city area. At 2000m, CCN concentration reduced to about one tenth, it was about $300\ \text{cm}^{-3}$. From the measurements, it can be seen that the variety trend of CCN concentration is consistent with

that of aerosol concentration with height increasing.

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