



TRANSPORT OF OZONE IN DOWNWIND AREA FROM SEOUL METROPOLITAN AREA IN KOREA

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ABSTRACT

Recently, high ozone episode occurred frequently in Korea. Moreover ozone episode frequently occurred not only in the city but also in background area where local anthropogenic sources are not important. It analyzed frequency exceeding 100ppb ozone at monitoring stations in Seoul and background area during 2001-2004. Mean of occurrence frequencies for 29 Seoul station and for 12 background stations during 2001-2004 were 7.2, 13.3 respectively. So, it should be noted that ozone concentration in the background area are higher than that of in the city.

Key Words : ozone, transport, background concentration

1. INTRODUCTION

Ozone pollution in urban areas has important implications for health and environmental management. Recently, ozone concentration greatly increases in Korea(fig. 1). As metropolitan area in Korea, the population of Seoul and its surrounding cities is about 20 million people. However ozone episode frequently occurred not only in the city but also in background area where local anthropogenic sources are not important. In the present study, the aspects of high ozone episode in selected background stations were analyzed.

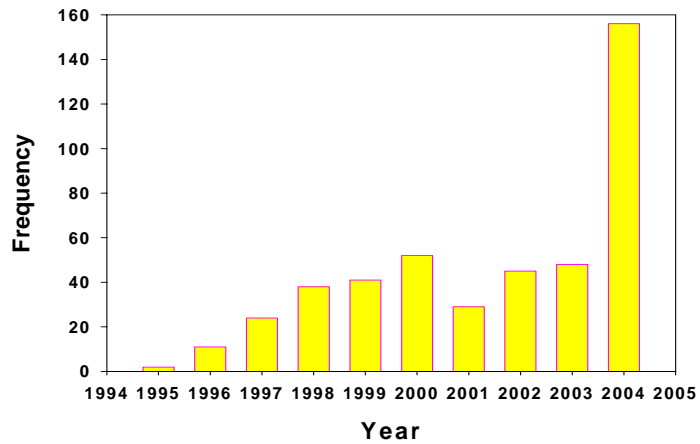


Figure 1. Total frequency of ozone warning (over 120ppb) in Korea(1994-2004)

2. DATA AND ANALYSIS

According to direction of wind in metropolitan region, it becomes the downward region of metropolitan area. The monitoring stations in background of the Seoul Metropolitan are presented in fig. 2. Inside Seoul city, there are 29 monitoring stations. We selected the ozone episode cases, i.e., daily maximum ozone concentration exceeded 100ppb during 4 years(2001-2004).

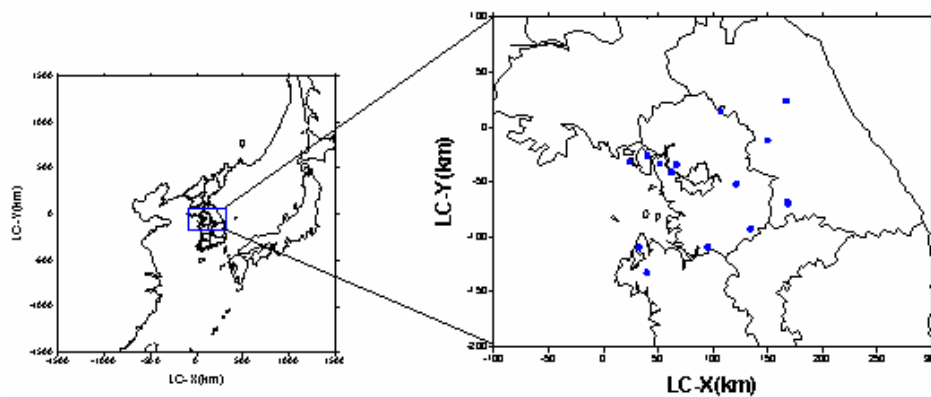


Figure 2. The monitoring sites(●) of O₃ in the study area.

3. RESULTS

3.1 Characteristic of high ozone occurrence in background stations

Table 1 shows frequency of high ozone exceeded 100ppb. In particular, high concentration ozone much occurred in station number 6(132113), 7(632121) and 9(131441) at late afternoon (after 17 LST).

Fig. 3 shows exceeding frequency 100ppb ozone at monitoring stations in Seoul and background area during 2001-2004. Mean of occurrence frequencies for 29 Seoul station and for 12 background stations during 2001-2004 were 7.2, 13.3 respectively. So, it should be noted that ozone concentration in the background area are higher than that of in the city.

Chuncheon is a small city located in northeast region of Seoul Metropolitan area and population is about 250 thousand people. When wind condition was southwesterly, daily maximum ozone concentration occurs at late afternoon (after 17 LST) in Chuncheon. When high concentration happened in Chuncheon after 17 LST, ozone concentration in Seoul were much lower than in Chuncheon.

Table 1. Frequency of high concentration ozone (100ppb over) in the study area.
(unit : day)

station no.	total freq. over 100 ppb	2001	2002	2003	2004	before 16(LST)	After 17(LST)
1 831481	36	12	9	15	0	19	17
2 823691	13	4	1	6	2	10	3
3 131473	12	0	7	0	5	10	2
4 131451	13	-	10	3	0	6	7
5 132401	3		3	0	0	0	3
6 132113	18	8	8	2	0	3	15
7 632121	14	4	5	4	1	3	11
8 632122	13	0	1	6	6	7	6
9 131441	15	1	1	13	0	3	12
10 131341	23	3	9	5	6	14	9
11 534421	12	-	5	4	3	9	3
12 534422	12	-	2	8	2	4	8

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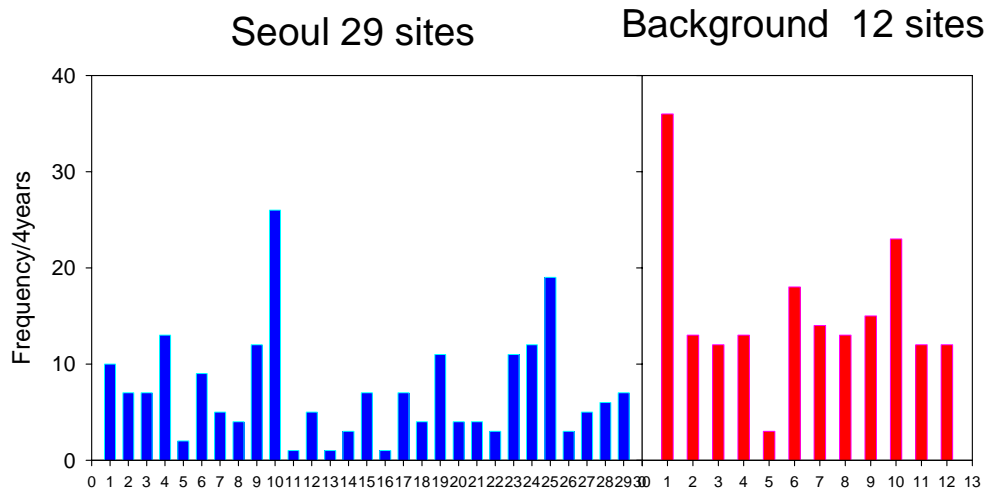


Figure 3. Frequency of exceeding 100ppb ozone at air pollution monitoring stations in Seoul(left) and background stations (right) during 2001-2004.

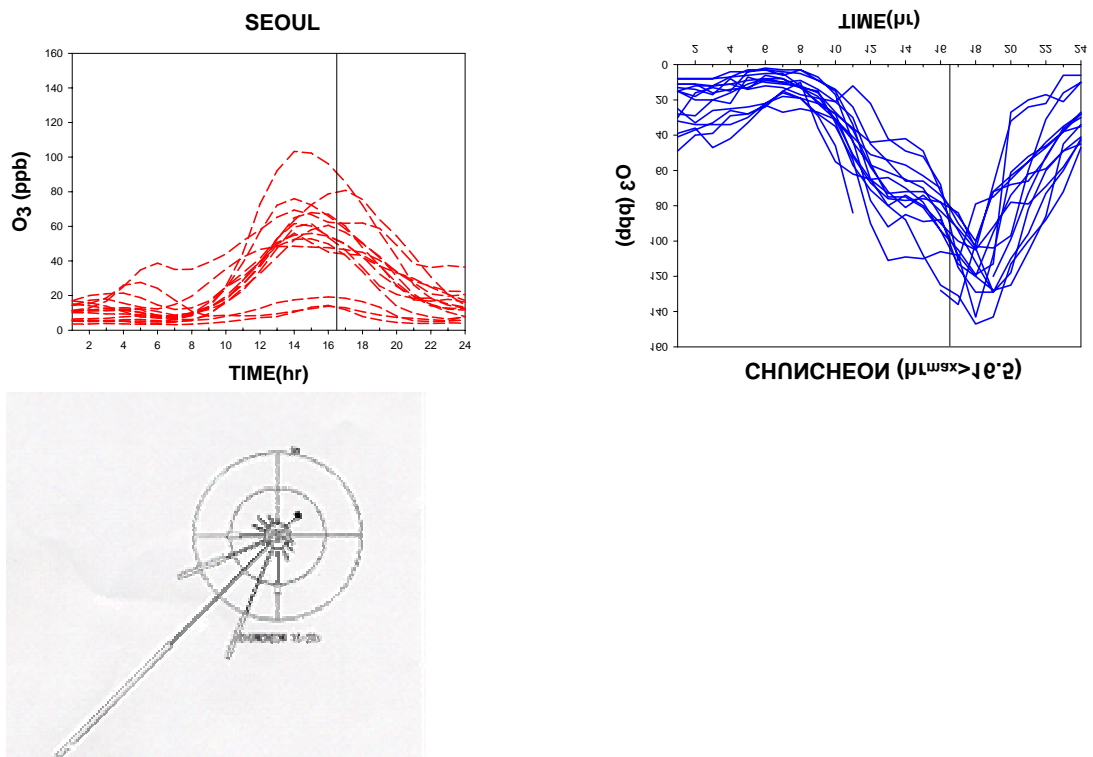


Figure 4. Diurnal variations of ozone concentration in Seoul (left of upper) and Chuncheon(right of upper) for days daily maximum ozone concentration exceed 100ppb in Chuncheon. The wind rose(down) in Chuncheon at daytime(13-20 LST) shows southwesterly wind.

3.2 Occurrence time delay of high ozone concentration

Fig. 5. show variations of average ozone concentration in 5 cities(A:Incheon, B:Bucheon, C:Seoul, D:Guri, E:Chuncheon) for 18 days when daily maximum ozone concentration exceeds 100ppb in Chuncheon. As monitoring station moves from A to E, the daily maximum ozone concentration increases gradually and occurrence time of daily maximum ozone concentration delayed gradually.

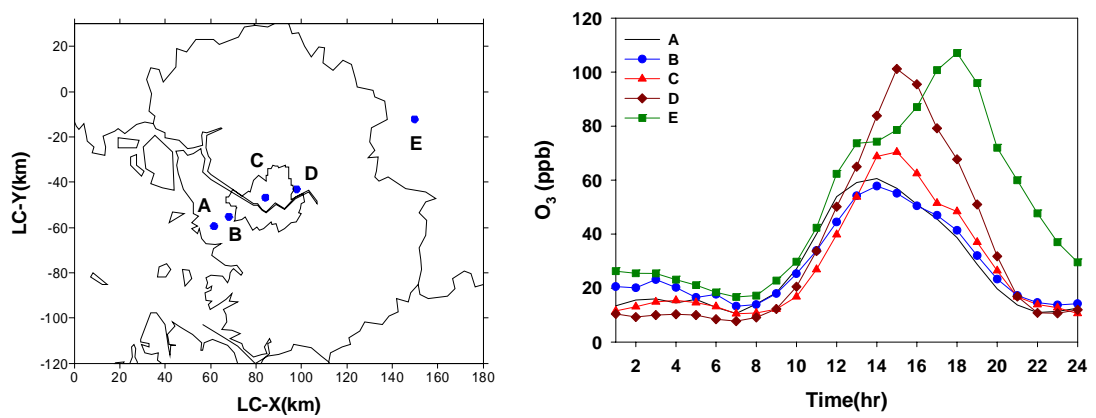


Fig. 5. Variations of ozone concentration in 5 cities averaged for 18 days when daily maximum ozone concentrations were exceeded 100ppb in Chuncheon during 2001-2004.