PB15) 서해연안 도시의 대기질 특성연구: 해안도시와 내륙도시와의 비교연구

Comparative Analysis of Ambient Air Quality in West Coastal City and Inland City of Korea

Kim, Deug-Soo · Ma Hui
Department of Environmental Engineering, Kunsan National University

1. Introduction

It seems that air quality in urban area has not been improved enough, even though there were many efforts for controlling and regulating major gaseous pollutants such as O_3, CO, NO_2, SO_2 and VOCs(volatile organic compounds). Increase of these pollutants, also including fine particles and other secondary pollutants, are known to be injurious to human health, plants and ecosystem. Using the available air quality data over long term, the assessment of air quality in urban atmosphere will be helpful for planning pollution control strategies to keep the pollutant levels under ambient air quality standards. Air quality data over long-term is necessary to understand their trends in depth, and will lead to more realistic findings and conclusions(Riga-Karandinos and Saitanis, 2005). Although many studies of the air pollution for mega cities in Korea, such as Seoul and Busan have been conducted(Lee et al., 2007; Kim et al., 2003), there is insufficient or lack of information about the air pollutants in small or medium cities, specifically located in coastal area in which has significantly different geographical characteristics from inland mega cities.

The main purpose of this study was to investigate the air pollution characteristics of an industrialized midsize west-coastal city by comparative assessment of the air quality in two cities (one is a coastal city, Kunsan and the other is a large typical inland city, Jeonju), Jeon-Buk province. The air pollution levels in these cities will be explored with long-term measurement air pollutants data of O_3, NO_2, SO_2, CO and PM_{10}.

2. Methods

The data used in the present study were provided from the Jellabukdo Institute of Health & Environmental Research. The available data of the hourly averages data measured from continuous air quality monitoring sites in Jeonju and Gunsan were used for this comparative analysis. The data set covers the period from 2004 to 2006.

3. Results and discussion

In order to assess the air quality in the two different cities, measured concentration values of the pollutants have been analyzed and compared with the annual mean concentration as shown in Table 1. The annual average concentrations of the air pollutants in two cities are generally higher in Gunsan, but except NO_2. It showed that annual average NO_2 concentrations in Jeonju were consistently higher than those in Gunsan over the data period. This could be resulted from heavy automobile emission from Jeonju.

For the protection of human health, the ozone sets a threshold value of 0.06ppm as a rolling 8-h average. Inhabitants of both cities in our study are not exposed to O_3 levels above the limit.

Table 1. The annual mean concentration comparision between Jeonju and Gunsan in 2004-2006.

	O_3 (ppm)		NO_2 (ppm)		SO_2 (ppm)		CO (ppm)		PM_{10} ($\mu g/m^3$)	
	Jeonju	Gunsan	Jeonju	Gunsan	Jeonju	Gunsan	Jeonju	Gunsan	Jeonju	Gunsan
2004	0.015	0.023	0.017 (0.05)	0.013 (0.05)	0.003 (0.02)	0.005 (0.02)	0.671	0.679	48.585 (70)	49.686 (70)
2005	0.018	0.018	0.022 (0.05)	0.013 (0.05)	0.004 (0.02)	0.005 (0.02)	0.687	0.646	48.994 (70)	47.077 (70)
2006	0.022	0.023	0.017 (0.05)	0.013 (0.05)	0.004 (0.02)	0.005 (0.02)	0.672	0.679	54.462 (70)	49.686 (70)

※( ) The annual mean concentration limits value.

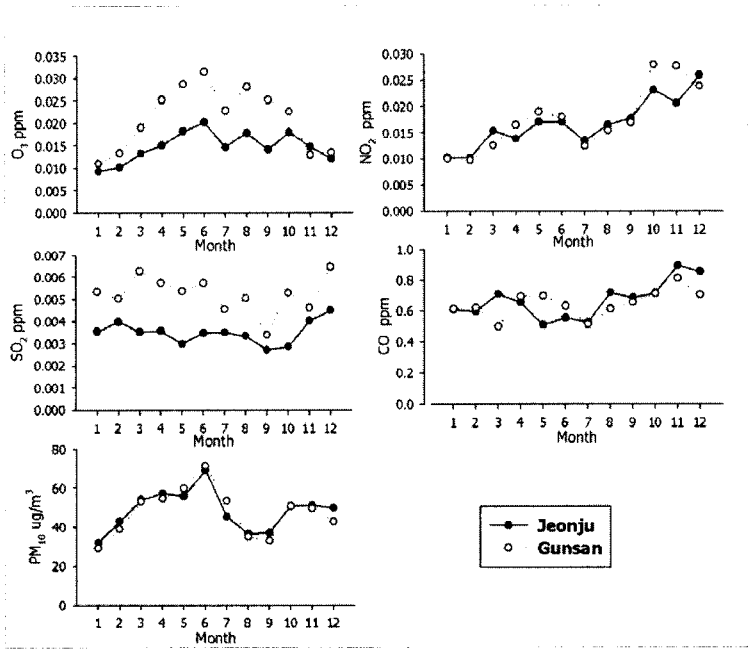

Fig. 1. The plots of the average monthly patterns of air pollutants in Jeonju and Gunsan in 2004-2006.

The O_3 and SO_2 levels in Gunsan were in general higher than those in Jeonju(Fig. 1). However, no exceedance concerning the protection of human health occurred in Jeonju and Gunsan. The monthly pattern of O_3 concentration were very similar for two cities, which mostly showed higher levels during month of April through September for a year.

A good way of unraveling the dynamics of ozone and of the other air pollutants is to examine their diurnal pattern. Fig. 2 showed that the composite average diurnal patterns of the O_3, NO_2, SO_2, CO and PM_{10} levels for each city over the measurement years. The diurnal patterns of the pollutants were very similar for two cities, however the levels of the pollutants were significant different. Diurnal pattern of O_3 mixing ratios in both cities showed a typical diurnal variation, which shows lower level during morning and night time, and the maximum in mid-afternoon. NO_2 diurnal variation in Fig. 2 were also typical in urban city, which have bimodal trend(peaks at traffic hours

during morning and evening). It implies O_3 accumulation could be attribute to local formation by photochemistry rather than transportation.

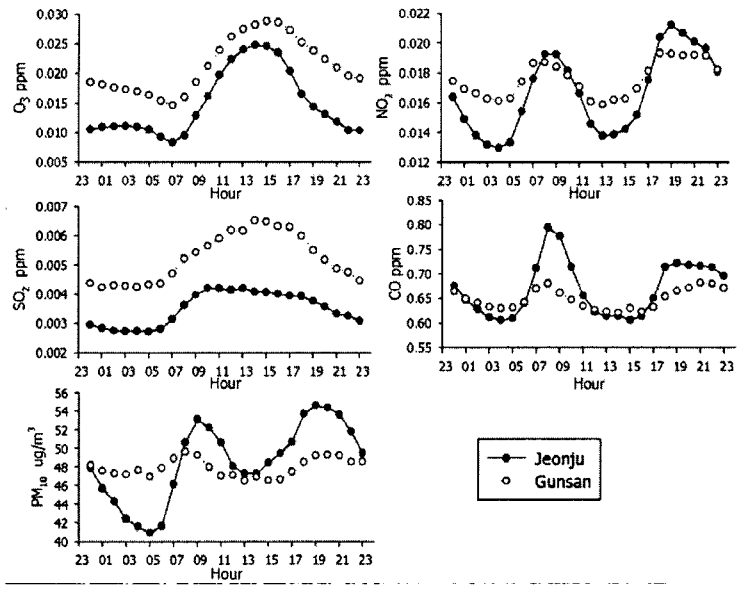

Fig. 2. The plots of the average diurnal patterns of air pollutants in Jeonju and Gunsan in 2004-2006.

Synoptically, the primary pollutants O_3 and SO_2 occurred at higher levels in Gunsan than in Jeonju. No significant difference was found for CO and PM_{10} levels between the two cities. Concerning the exceedances of O_3 and CO, for human health in Jeonju and Gunsan, there is not any exceedance in those two cities. For the protection of ecosystems, there are not exceedances of SO_2 levels in any of the two cities. The data of this study would be useful for future planning of the air quality management for the cities.

Acknowledgement

This work was supported by the Korea Research Foundation Grant funded by the Korean Government(MOEHRD) (KRF-2007-521-C00296).

References

Antonia-Nelly Riga-Karandinos and Constantine Saitanis (2004) Comparative assessment of ambient air quality in two typical Mediterranean coastal cities in Greece. Chemosphere, 59(2005) 1125-1136.

Kim, Y.K., I.B. Oh, and M.K. Hwang (2003) Numerical simulation of O_3 using UAM-V on summer episode in the coastal urban area, Busan, J. KOSAE, 19(1), 1-11.

Lee, J.H., J.S. Han, H.K. Yun, and S.Y. Cho (2007) Evaluation of incremental reactivity and O_3 production contribution of VOCs Using the PAMS Data in Seoul metropolitan area, J. KOSAE, 23(3), 286-296.

Oh, I.-B, Y.-K. Kim, and M.-K. Hwang (2004) Effects of Late Sea-breeze on Ozone Distributions in the Coastal Urban Arer, J. KOSAE, 20(3), 345-360.