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EAST ASIAN OZONE POLLUTION: EVALUATION FROM OBSERVATION AND REGIONAL MODEL IN CHINA

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ABSTRACT

The increases in anthropogenic emissions of air pollutants in China, resulted from the rapid industrialization and economic growth, potentially have impact on both domestic and hemispherical scale. Since many studies have predicted the upward trend of these emissions in the near future, it is likely that China will dominate the regional and global emissions in the earlier decades of the 21st century.

One of the important concerns on air pollution problem for East Asia is the increase of regional ozone pollution, its trans-boundary transport, and the environmental impact. In order to elucidate these problems, key research approaches considered necessary must include both atmospheric measurements and simulation by model. In this work, we have recently established ozone and carbon monoxide observatory at three regional sites in China. All of them are regional mountain sites: Taishan (Mt. Tai, 36N 117E 1520m asl) in Shandong Province, Huashan (Mt. Hua, 34N 110E 2060m asl) in Shaanxi province, and Huangshan (Mt. Huang, 30N 118E 1840m asl) in Anhui province as shown in Figure 1.

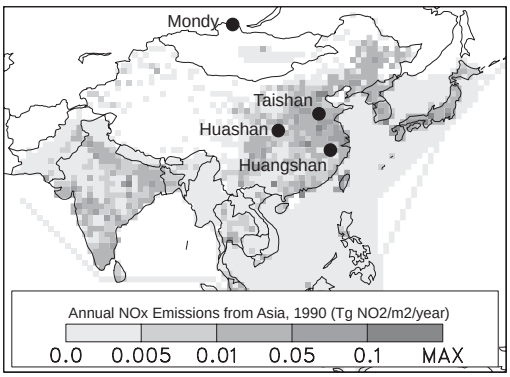

Figure 1. Locations of the three mountain sites in China, shown together with the annual NOx emissions for 1990

The results obtained from these site are analyzed and compared with the background and carbon monoxide data at Mondy (51N 100E 2006m asl) in eastern Siberia、and with the results from regional-scale model simulation.

From the observations, high levels of ozone and carbon monoxide have been found in China, especially in springtime. The ozone mixing ratios at our sites are well-correlated and clearly higher than those observed at other remote mountain sites in northeast Asia and Siberia. The good correlation among different monitoring sites indicates that the high ozone mixing ratio events are regional-scale pollution. While trajectory analysis confirms that the seasonal variation of ozone in China are primarily due to East Asian monsoon regime, many pollution episodes found at the three observatories indicate the enhanced effect of regional anthropogenic sources, mega-cities, and regional transport within China. These high ozone episodes would likely have an impact on air quality in China and east Asia. For example, considering that the ambient air quality standard for China (environmental level) is 60 ppb, about 65% of Taishan data in spring 2004 shows mixing ratios that exceed the ambient standard.

The results from RAMS/CMAQ simulation having domain over East Asia have been made and compared with the results from observation. As shown in Figure 2, RAMS/CMAQ model reproduces the ozone mixing ratios and its variation observed at Taishan very well. Good agreements between model and observation, though with lower correlation, are also found at Hunagshan and Huashan. The good correlation between observation and model verifies the regional-scale representatives of our observatories and makes it possible to clarify the characteristics of ozone pollution in China. Details on these results and discussion will be presented in the conference.

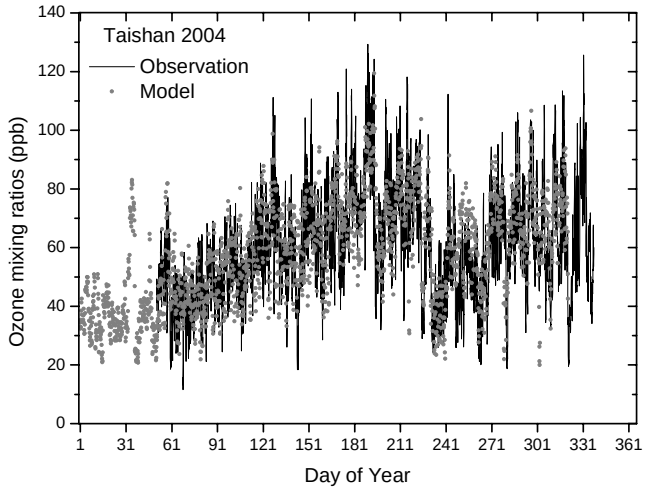

Figure 2 Ozone variations at Taishan in 2004 from observation and regional model.

Keywords: air pollution, long-range transport, ozone observation, regional source.