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PE1) 한반도 배경대기중 온실기체 농도변동 특성

The Distribution Characteristics of Greenhouse Gases on the Korean Peninsula

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1. Introduction

The characteristics of atmospheric CO_2 acquired through the ground based measurements over the Korean Peninsula were analyzed from the viewpoint of an annual trend, a seasonal variation, a daily variation, and a comparison with one another including Mauna Loa Observatory (NOAA/CMDL), respectively. Finally, the current background atmosphere in the Korean Peninsula was not only diagnosed throughout the comparison with CO_2 concentration from 9 worldwide GAW (Global Atmosphere Watch) observatories but a future aspect of that was also discussed by using the linear regression method.

2. Research approach

At KGAWO, the measurement is in situ made every an hour while at Gosan supersite flask samples are taken every a week (48 samples per year) and they are sent to NOAA's Climate Monitoring and Diagnostics Laboratory (CMDL) where samples are analyzed by NDIR method. The data of CO_2 concentration from January 1999 to December 2002 at KGAWO and from August 1990 to June 2002 at Gosan supersite were used in this research. Additionally, the CO_2 data observed in Mauna Loa (Hawaii, U.S.A) for the period 1976-2002 were plotted for a comparison with an annual trend and a seasonality of atmospheric CO_2 concentration.

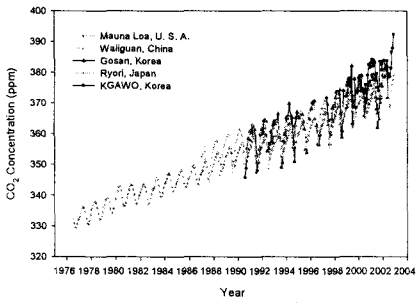

Fig. 1. The trend of atmospheric CO_2 concentration at Mauna Loa, Waliguan, Gosan, Ryori, and KGAWO, respectively.

3. Results and discussion

In the year 2002, annual mean concentration of atmospheric CO_2 at Gosan supersite corresponds to 375.56 ppm which is comparable to global mean 374 ppm. However, at KGAWO it corresponds to 383.26 ppm (Figure 1). Also, the annual increasing rate at Gosan supersite has 1.17-2.02 ppm for the period 1990-2002 while that of KGAWO has 2.30-4.07 ppm for the period 1999-2002. The daily

cycle affected from the metabolic activity of terrestrial vegetation is clearly shown in the atmospheric CO_2 concentration at KGAWO, but the amplitude of this cycle has decreased year by year (Figure 2). Furthermore, KGAWO shows notable deviations in the monthly mean CO_2 concentration higher than those of 8 GAWs. From these two phenomena, we have concluded that non-mixed CO_2, especially emitted from anthropogenic sources, has affected to KGAWO (Figure 3). On the other hand, CH_4 and N_2O are slightly increased during this period: about 50 ppb for CH_4 and up to 5 ppb for N_2O. CFCs show a decreasing trend: CFC-11 has been decreased as much as 15 and CFC-12 is decreased 2-4 ppt for the same period.

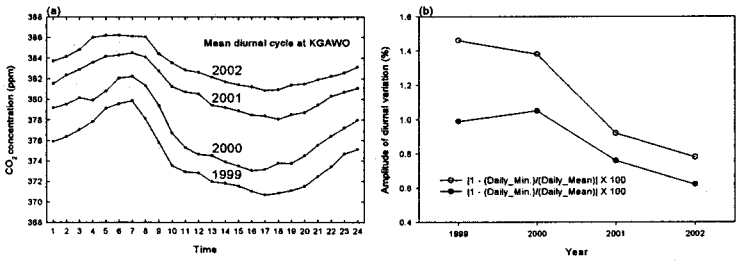

Fig. 2. (a) the mean daily cycle in atmospheric CO_2 concentration at KGAWO; (b) the amplitude change of the mean daily cycle for 1999-2002 at KGAWO.

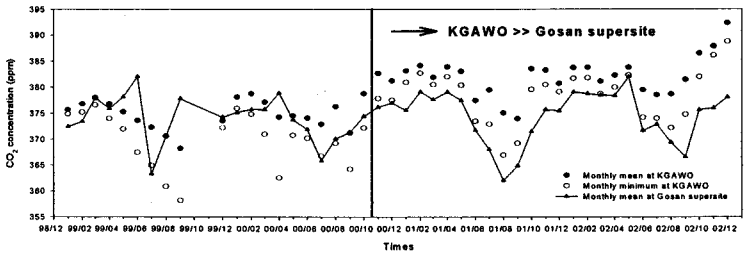

Fig. 3. Comparison of monthly means and monthly minimums in the mean daily variation of atmospheric CO_2 concentration at KGAWO with monthly means of atmospheric CO_2 concentration at Gosan supersite (black cycles correspond to the monthly mean concentrations of atmospheric CO_2 in each month while white cycle means the minimum in mean daily cycle calculated by each month).

Acknowledgment

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Reference

Cho, C. *et al.* (2005) The distribution characteristics of atmospheric CO2 in the Korean Peninsula and the expectation on its annual growth trend by the year 2010, J. of the Korean Meteorological Society, Vol. 41(3), 371-385.