PF7) Annual Variation of CO_2 and CH_4 Concentration in the Background Area of the Korean Peninsula

Jae-Cheon Choi, Byoung-Cheol Choi, Ki-Jun Park, and Hyo-Sang Chung[1]

Korea Global Atmosphere Watch Observatory, Meteorological Research Institute, KMA, [1]Meteorological Research Institute, KMA

1. Introduction

Human activities have become a major factor that significantly changes the global environment. Mankind has increasingly used land, water, minerals and other natural resources since the beginning of industrialization, and future growth in the population and economy is thought to further enhance the impact upon the Earth. The global climate, biogeochemical process and natural ecosystems are closely linked with one another, and changes in any one of these systems may effect the others, which could result in consequences detrimental to humans and other living organisms on the Earth. gases particle matters produced by man and emitted into the atmosphere have modified the energy balance in the atmosphere and thus affect interactions among the atmosphere, hydrosphere and biosphere. Nevertheless, mankind still does not sufficiently understand the chemical process of the atmosphere and its relationship with the hydrosphere and biosphere. Most of the uncertainties in the chemical processes of the atmosphere and the oceans arise from the lack of observation data(WMO, 2003).

The effect of global warming due to greenhouse gas increases is especially large and sensitive to the radiation budget structure over land area. The amount of carbon dioxide (CO_2) in the atmosphere has increased by more than 25% in the past century. Several other greenhouse gases also have been observed to be increasing in the atmosphere due to human activities. These gases include methane, nitrous oxide, chlorofluorocarbons (CFCs) and tropospheric ozone, and they tend to reinforce the changes in the radiative forcing effect caused by increased carbon dioxide levels (IPCC, 2001).

In KGAWO, to co-ordinate and assess atmospheric chemistry measurements and associated physical parameters in relation to climate change(greenhouse gases). Carbon Dioxide (CO_2) is one of the most common and important trace gases in the earth-ocean-atmosphere system. Because of CO_2's role as one of the more important greenhouse gases, scientists have attempted to understand its potential impact on climate and global change.

2. Experiment

CO_2 is a significant greenhouse gas that is the largest contributor to global warming. Before the 18th century(pre-industrial times), the concentration of carbon dioxide in the atmosphere was about 280 ppm based on ice core studies, while in 1999 the concentration was about 368 ppm at Mauna Loa. More than half of the direct radiative forcing from the increase in long-lived greenhouse gases is attributed to that of carbon dioxide(IPCC, 2001).

In KGAWO, background atmospheric CO_2 measurements are made with Non-Dispersive Infra-Red(NDIR, Ultramat 6E, Simens, Germany). NDIR instruments are based on the same principle that makes CO_2 a greenhouse gas: its ability to absorb IR radiation. NDIRs measure the intensity of IR radiation passing through a "sample" cell relative to radiation passing through a reference cell gas. Sample air, pumped from inlets mounted well-away from the measurement building, and standard gas flow alternately through the sample cell. A difference in CO_2 concentration between sample and reference gases (or standard and reference gases) contained in two cells results in a voltage that is recorded by the data acquisition system.

CH_4 is a strong greenhouse gas, and it plays important roles in determining the oxidizing capacity of the troposphere and in stratospheric ozone depletion. measurements of CH_4 used in background monitoring are made by gas chromatography(GC, HP5890 II, USA) with flame ionization detection(FID).

Calibration of the continuous greenhouse gases data have been performed strictly in collaboration with the NOAA Climate Monitoring and Diagnostics Laboratory (CMDL) primary standards.

Data obtained by greenhouse gases monitoring system are used to define aspects of the global greenhouse gases budget such as atmospheric burden, total annual source, and, in combination with models of atmospheric chemistry and transport, distributions of sources and sinks.

3. Result and Discussion

The results of this study is expected to be an essential information for the prediction of climate change in Korean peninsula, and to establish a tool for prediction of climate change by learning the advanced application technology of climate data in participating the round robin. The measurement of greenhouse gases which is used in this study will be operated systematically based on the standard of WMO, so that it will be used as a basic information to work out a counter measure for the united nations framework convention on climate change.

This study also will be applied as an important information for the establishment of national policy on the reduction of environmental pollution, as well as in a research on the climate change and other various fields.

Reference

IPCC, 2001: Climate change 2001, The Science basis, *Cambridge Univ. press*, UK, 944pp.
WNO/WDCGG, 2003: WMO WDCGG Data summary, GAW Data Volume IV- Greenhouse Gases and Other Atmospheric Gases. *WDCGG* No.27, 92pp.
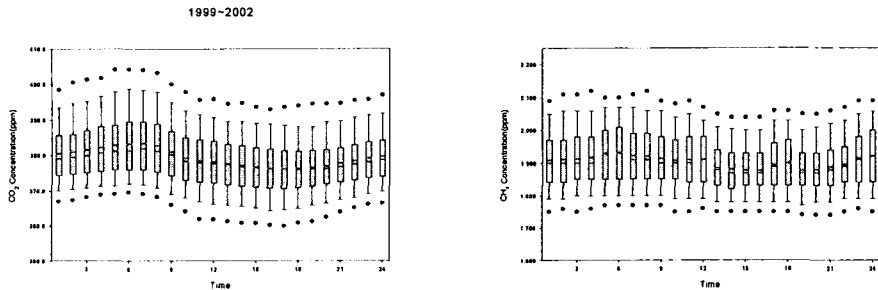
1999~2002

Fig. 1. Variation of diurnal mean CO_2 and CH_4 concentration at Anmyeon-do from 1999 to 2002.
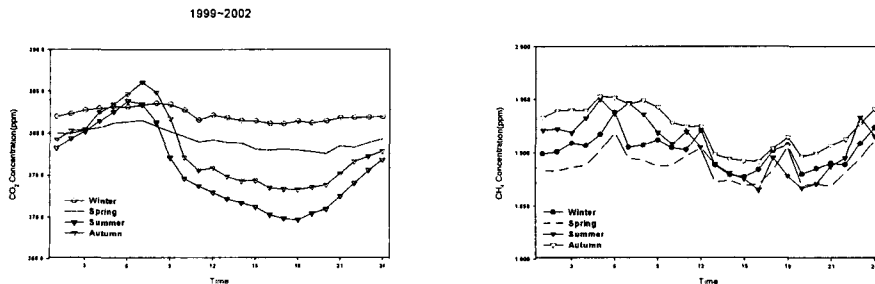
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Fig. 2. Variations of season mean CO_2 and CH_4 concentration at Anmyeon-do from 1999 to 2002.