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Distribution of GHG over West Siberia: airborne and tower network observations.

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In spite of high confidence level in understanding of greenhouse effect on climate change there is a lack of measurement data over significant part of the Northern Hemisphere. Taking into account the importance of the global climate changes and international cooperation in this field, NIES (National Institute for Environmental Studies) and IAO (Institute of Atmospheric Optics) combined their efforts in the framework of Joint Japanese-Russian Project on GHG monitoring to fill up this gap at least over West Siberia, which occupies a significant part of Northern Eurasia. This monitoring consists of airborne and tower network observations.
Airborne study of vertical distribution of greenhouse gases nearby Novosibirsk (between 54°05'N-81°50'E and 54°35'N-82°40'E) has been started on July 1997. Monthly flight observation have been conducted at an altitude from 500 to 7000 km. The 11-year airborne study nearby Novosibirsk has revealed a positive trend in CO2 mixing ratio (>15 ppm) and the absence of a definite trend for CH4. Minimum of CO2 concentration is typically observed at the end of July. Highest annual amplitudes of CO2 mixing ratio (up to 40 ppm) are observed in the atmospheric boundary layer.
During recent years a tower network (8 towers) for carbon dioxide and methane monitoring was established in West Siberia. This network covers several climatic zones from steppes in the south to northern taiga in the north (51°N to 63°N and 62°E to 82°E). In this paper we present the first results of the diurnal, seasonal, and annual behavior of these greenhouse gases in the surface atmospheric layer over West Siberia
Diurnal behavior of CO2 mixing ratio showed its maximum amplitude in July and its minimum amplitude in January. Concentration gradient between northern and southern regions remains during the whole year. Carbon dioxide mixing ratio has a pronounced annual behavior with a maximum in December and a minimum in July-August. It starts to decrease on March, and this process becomes more intensive from May until July. Since the beginning of September and until December intensity of CO2 sink is smaller than the rate of its emission.
Diurnal behavior of the CH4 mixing ratio is mainly neutral during the year except for the late spring and beginning of the summer when a significant one is observed. There is a CH4 concentration gradient directed from south to north with a difference in concentration from 100 to 340 ppb. In the annual behavior of CH4 concentration two maxima and two minima are observed in the center of the region under study (maxima: July and December-January; minima: April-May and October). At northern sites the main maximum is also observed in winter with one-month lag with respect to central regions. Summer maximum over southern regions is not so intensive and observed in August. Amplitude of annual behavior at northern sites is 200 ppb, and 100-120 ppb at southern. The most interannual variability is 150 ppb and observed during main and secondary maxima.