



Modeling of transport of trans-boundary carbon dioxide and other admixtures over Siberia within the AEROSIB-YAK project

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In the frames of this work, an analysis of meteorological situations in Siberia was made for different periods of aircraft measurements. Since a clearly pronounced zonal airflow is not observed over the whole territory of Russia in the troposphere at any level and in any season, in accordance with the plan of the AEROSIB-YAK project, possible zones of the west-eastern transport of air masses along 60 N were determined for different seasons.

The criteria of favorable and unfavorable conditions for the aircraft measurements of component concentrations were developed.

The most informative meteorological elements were determined and then monitored during the first flight campaign from 11 to 14 April 2006. The most probable lines of air masses (lines of flows) were determined for the region of aircraft measurements.

A technology of providing starting meteorological data was developed, and a preliminary modeling of pollution transport with the aid of the developed system of predicting changes in meteorological parameters was performed with the use of a special version of the MM5 model.

During the work at the AEROSIB-YAK project, the data of the NCEP / NCAR and NCEP / DOE reanalyses were used to create the archives (bases) of meteorological data. The system of predicting changes in meteorological parameters was tested during an active phase of the flight campaign over Novosibirsk-Yakutsk in the frames of the YAK-AEROSIB project; the aircraft measurements were taken from 11 to 14 April

2006.

Using the meteorological data-provision system during these measurements, about 900 fields of prediction of selected meteorological elements were calculated for the period April 7-14, 2006, for the areas under study (10 W - 140 E and 45-75 N) with the aid of the hydrodynamic model MM5 adapted to the project objective.

Different mechanisms that influence distribution of minor species in the free troposphere over the above-mentioned regions are under analysis. These mechanisms are the following: a vertical transport of polluted air from the lower troposphere caused by local pollution sources, subsiding of sub-stratospheric air during cold-air intrusions, vertical exchange in frontal areas, etc. Individual contributions into the observed overall balance of minor gases over the Northern Eurasia will be estimated due to long-range transport and local atmospheric emissions of pollutants.

In the future, proceeding with this work, we are planning to estimate the volume of air transport from Europe to the Northern Pacific region and Japan, in particular, and to estimate the contributions made by both natural and man-made sources, including forest and peat bog fires.

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