



Urban Pollution in Russia on Base of TROICA Data

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Train based experiment TROICA (TRAnscontinental Observations Into the Chemistry of Atmosphere) acts since 1995 to provide continent scale measurements of numerous atmospheric species and characteristics across Russia. TROICA data contributed a lot to our knowledge about spatial and temporal variations of small gases and aerosols in the Northern Eurasia. Till present 8 campaigns (16 runs in both directions) have been performed along TransSiberian railway, 1 campaign has covered railroad Murmansk-Kislovodsk and last campaign occurred in October, 2006, included 3 circle runs around Moscow.

During TROICA campaigns numerous Russian cities and towns have been crossed many times, so large database of measurements in urban areas has been accumulated. Results obtained from that database using statistical analyses are presented here. Among all cities which have been studied during TROICA campaigns there were selected

- large regions centers (megapolises with population more than 1,000,000 people) which are both administrative and industrial centers (Perm', Ekaterinburg, Omsk, Novosibirsk);
- large centers of powerful industrial zones with population from 600,000 to 1,000,000 people (Krasnoyarsk, Irkutsk);
- region centers with moderately developed industrial zones and low density of enterprises (Tyumen', Chita);
- towns along railroad with population less than 70,000 people and with 1-2 main industrial enterprises or are large transport nodal points (Kotel'nich, Mariinsk, Tulun,

Skovorodino, Belogorsk).

Each urban settlement has been divided into railway station area, urban zone and city (or town) surroundings. Concentrations of main polluting gases (NO, NO₂, CO, SO₂, NMHC, O₃) have been averaged for each settlement as well as for each group of urban settlements for day and night, and for winter and summer. Thus, rough structure of pollution has been obtained. In addition ratios NO/NO₂ and O₃/NO₂ have been studied. Pollution distribution within settlements has been related to wind direction as well. Average concentration of submicron and soot (black carbon) aerosol has been considered too.

It was found that concentration of CO, NO, NO₂ in megapolises in winter time is about two times higher than in summer due to heating. Ozone concentration in urban areas for large cities in winter is 10-15 ppb less than in surrounding areas. Difference between surface ozone ratio in urban area and surroundings for megapolises do not vary much depending on season.

High carbon oxide concentrations were found mostly in winter time at large railway stations where source is stove heating of passenger carriages, and in small towns of Eastern Siberia where source is stove heating of private houses. Sulfur dioxide concentrations over daily maximum permissible concentration level were observed mainly in middle towns of East Russia where heating systems and power electric stations use coal as fuel.

Data comparison for all big cities revealed evident effect of local relief and wind on pollutants' distribution and accumulation.

The work was supported by International Scientific and Technology Center (ISTC Projects # 2770 and 2773).