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TROICA campaigns: spatial distribution of key tropospheric species across Russia

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Spatial distribution of key gaseous species in the surface air over Russian territory was analyzed. O3, NO, NO2, CO, CO2, CH4, SO2 and some VOC surface concentrations measurements along Trans-Siberian and North-South railways have been performed using mobile railway laboratory in TROICA experiments. Campaigns have been carried out in 1995-2005 period during different seasons. Due to high frequency of measurements spatial inhomogeneities varying from continental scale to local one (few hundreds meters) were studied. Industrial regions with heavy pollution, moderately-polluted rural areas and remote areas with background level of concentrations were defined during analyses. For background conditions longitudinal gradient of O3, CO and CO2 content is found. Concentrations of these species increases eastward during warm season on the whole and especially during summertime. In winter months spatial distribution of these species is homogeneous. Nitrogen oxides and other species of anthropogenic origin have lowest concentrations in the Eastern Siberia. Longitudinal gradient was also revealed for some VOC, but it exists in Western part of Russia and has opposite sign. Apparently it is caused by distant transfer of those constituents from Central Europe inside Eurasia. For methane distribution region of higher values is defined in Western Siberia. Biogenic CH4 and CO2 emissions from ground were estimated using data of surface 222Rn measurements. Using these estimations it is possible to explain large-scale particularities of CH4 and CO2 distributions both in longitudinal and meridianal directions. Multiple crossings of settlements allowed us to determine typical variations of species concentrations within cities and towns depending on their dimension. Typical extensions of polluted urban air plumes as well as changes of ratios between different chemical compounds along those plumes are

also obtained. Stable local extremums of ozone related to biomass burning and emissions from some industrial plants are defined and systematized. Causes of many local enlargements of CH4 and other species are found. The work has been done under financial support of ISTC (Project N 2773)