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Inter-annual variations and trends of CO total column amount over Russia

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Carbon monoxide is an important atmospheric trace gas, its atmospheric concentrations are variable and depend on many factors (urban and industrial pollution, biomass burning, remote transport, local meteorology, OH concentrations, etc.). This report presents results of a long-term series of CO total column measurements in Russia. Two identical spectrometers of medium resolution measure spectra of solar radiation at two sites. One of this sites is Zvenigorod Research Station of the Obukhov Institute of Atmospheric Physics, located in 53.4 km to the West from the Moscow center. Another one is inside Moscow, being 1 570 m to the South from the Red Square. The measurements started in 1970 (Zvenigorod) and in 1974 (Moscow); both spectrometers were modernized and are still operational. These data sets represent background and urban CO total column amounts and were published many times (Yurganov et al., 2002, and references therein). Background CO was increasing between 1970 and 1985; after that and until 1996 no significant long-term trend was observed. Inter-annual variations of CO during this period were explained mostly by major volcanic eruptions that changed photochemically active UV radiation. After 1996 strong inter-annual variations, masking any trend, were connected with biomass burning in Siberia (forest fires of 1996, 1998, 2002 and 2003). These data were compared with measurements in other areas of the Globe. It was concluded that Siberian fires influenced the mid-latitudes of the Northern Hemisphere as a whole. Regional forest and peat fires around Moscow resulted in a record high CO column amounts both in Zvenigorod and Moscow in August and September, 2002. Increased CO columns were detected over this area from Terra satellite as well (Edwards et al., 2004).

Insignificant long-term trend of the background CO between 1985 and 1995 contra-

dicts to recent CTM modeling studies (e.g., Duncan and Bey, 2004) based on available inventories that predict a decline in CO total column. The urban part of CO total column (i. e., total column above Moscow minus total column above Zvenigorod), measured in Moscow may be considered as a measure of the anthropogenic CO emission in Russia: the human population of Moscow is almost 9 x 10^6 and makes up more than 6% of Russian population. On the contrary to 6-fold growth of car population in the city, CO total amount is stable or even decreasing. The CO stability may be explained by dramatic improvements of car engins resulted in lower CO concentration in the exhaust gases.

References.

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