



Some validation results of orbital and ground based CO and CH₄ total content measurements in background and industrial regions

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The results of ground-based spectroscopic measurements of CO and CH₄ total content (TC) in Moscow, Zvenigorod (53 km toward West from the Moscow center), ZOTTO station (Central Siberia) and Beijing (China) during 2010-2014 years for conditions of typical and anomalous emission rates are presented and compared with satellite TC data (the latest versions of MOPITT, AIRS, IASI products). The empiric coefficients and relationships between data of ground-based and satellite CO and CH₄ total contents (TC) are discussed. The comparison demonstrated a good agreement ($R^2 \sim 0.6-0.9$) of satellite and ground-based CO TC data in low pollution conditions and systematic underestimation of satellite CO TC (150-300 %) in condition of intense surface emissions (events of wild fires in Siberia in 2011-2012 and strong atmospheric pollutions in Beijing). The best correlation ($R^2 \sim 0.4$) for polluted conditions of Beijing was obtained in summer time-period for averaged AIRS v.6 CO TC data for $1^\circ \times 1^\circ$ grid, but $K=U_{grb}/U_{stl} = 2.5$, where U_{grb} and U_{stl} are ground based and satellite diurnal TC values relatively. Under excluding of the days with low ABL heights ($H_{ABL} \geq 1000\text{m}$ selection) the correlation between satellite and ground based CO TC diurnal data increases ($R^2 \sim 0.7$, $K=1.5$). Orbital AIRS CH₄ total columns good enough correlate with ground-based data ($R^2 \sim 0.4-0.7$). IASI CH₄TC diurnal data have no correlation with AIRS and ground-based TC.