Comparison results of MOPITT, AIRS and IASI data with ground-based spectroscopic measurements of CO and CH4 total contents

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A comparative analysis of satellite and ground-based spectroscopic measurements of CO and CH4 total content (CO TC) in the atmosphere in the background and polluted conditions (stations of OIAP RAS and NDACC) for the 2010-2015 time-period.

The significant correlation between satellite and ground-based CO TC data for all satellite sensors in background conditions was obtained. Also the empirical private transient relationships between satellite CO MOPITT v6 Joint, AIRS v6, IASI MeTop-A products and the data of solar-tracking ground-based spectrometers are analyzed.

Significant correlation between satellite and ground-based data of CO TC was obtained for all satellite sensors if measurements were carried out over unpolluted areas (2010–2014). It was shown that for polluted areas IASI MetOp-A and AIRSv6 data underestimate the actual value of CO TC by the factor of $1.5 \div 2.8$. The average correlation between satellite and ground-based data increased significantly for the case if the measurement days, when the height of the planetary boundary layer (PBL) was less than 400–500 meters, were excluded from the comparison. This result was obtained for all of the selected sensors and observational sites. To improve the representativeness of the satellite CO TC data for polluted areas it could be recommended to exclude the days with low height of the PBL from the analysis of spatio-temporal variations and subsequent data assimilation (as example for the CO emissions estimating from powerful surface sources).

Best correlation ($R2 \geq 0.5$) in diurnal CH4 TC with ground-based data was found for AIRS v6.