Analysis of CO2 content near Russian cities from OCO-2 satellite measurements

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We performed comparisons of the OCO-2 satellite measurements data that vary from high a quality flag (index «0») to average quality flag (index «1»). These ensembles differ for all investigated cities in the number of measurement days, the total number of CO_2 measurements, and the spatial and temporal coverage. For example, a high-quality ensemble covers ~ 90% of the spring and summer months, i.e. provides an opportunity to study CO_2 variations in the warm season. The ensemble of measurements with average accuracy more evenly covers the entire year. The OCO-2 satellite data give the column-averaged dry-air mole fraction of CO_2, called (XCO_2). XCO_2 satellite data have been analyzed in some cities. We prepared and comprised: days and number of measurements, minimal and maximal values, amplitudes of variations, etc. for XCO_2. (Table 1). The analysis of OCO-2 data with average a quality flag (index «1») for St. Petesburg and Moscow were published [1,2]

Table 1. Comparison of the OCO-2 satellite measurements data that vary from a quality flag (index «0») to average a quality flag (index «1»)

Town	Days 0/1	Number of Measurements, 0/1	Minimum, ppm 0/1	Maximum, ppm 0/1	Amplitudes % 0/1
Chita	52/106	3240/21036	389.5/351	413.8/419.4	6/17
Norilsk	36/110	4060/15431	388.4/326.6	410.1/427.3	5/25
Magnitogorsk	32/85	2072/9643	391.6/355.6	409.9/414.8	5/15
Mednogorsk	43/85	4840/15531	367.4/340.9	412.6/418.4	11/19
Novocherkas	22/75	1790/9019	391.5/331.4	409.4/418.8	4/22
Cherepovec	17/69	799/9310	391.4/347.5	412.1/420.4	5/18
Omsk	34/79	4486/12410	389.5/354.5	411.8/417.7	6/16

Anyone can see a big difference between a quality flag «0» and a quality flag «1» OCO-2 data for investigated cities caused, at least, the different measurement season periods.

Main conclusion: Comparisons of the OCO-2 satellite data with different quality flags (index «1» and index «0») in some Russian cities show:

1. According analysis XCO_2 dataset with high a quality flag «0» has relative homogeneous content of CO_2. The spatial-temporal amplitudes of XCO2 variations amount to 5-6%, but maximum spatial variations - approximately 2-4%. Whereas XCO_2 values with average a quality flag (index «1») have amplitudes of variations ~ 16-22% and maximum spatial variations ~ 14%
2. Significant XCO_2 measurement errors are possible causes of the differences between ensembles. So, when we has calculated root mean square XCO_2 variations, we obtained the following results: for dataset with high a quality flag «0» they amounted 0.1-0.3 ppm, but for dataset with average a quality flag «1» – about 1.0-1.5 ppm. But just high values of the XCO2 measurement error do not completely explain the significant amplitudes of variations and root mean square XCO_2 in the quality index «1» ensemble, and in the future studies are needed for the cities under consideration.

References

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