OMI-AO Progress Report

ID: **2926**

Title of the Proposal:
Validation of OMI ozone and NO_2 vertical column data with ground-based spectroscopic measurements in Russia and NIS

Type: 3rd Progress Report

Date: 29. Jan. 2006

Status: We continued validation of AURA OMI nadir level 2 data by means of comparisons with correlative ground-based measurements over Russia/NIS in 2004-2006. Our studies were focused on the investigation of OMI ozone and NO_2 nadir products - OMTO3, OMDOAS and OMNO2.

Problems: We plan to compare OMNO2 tropospheric product with our UV-VIS ground-based measurements in the polluted are of St.Petersburg, Russia. For that we will have to develop a procedure to retrieve tropospheric NO_2 content from the daytime zenith-sky ground-based observations. Another problem was that known MJD error in old AVDC overpass files, which we have also noticed and solved properly.

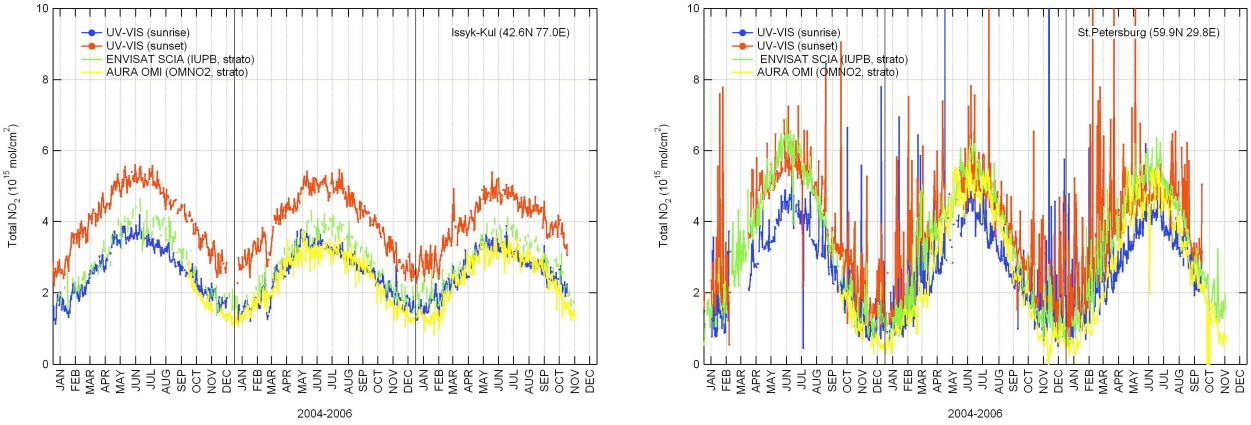
Achievements: Compared to the previous Progress Report, we have updated our results with an analysis of the new ground-based data, acquired in 2006. According to the results of comparison with the measurements of 14 Russian UV filter ozonometers (M-124) in 2004-2006, TOMS-like OMI total ozone (OMTO3) agree with ground-based data within -0.4±5.7%, which is better than similar estimate for the comparisons of M-124 with TOMS V8 (-3.3±6.2%) and GOME GDP4 (-2.0±9.4%). DOAS-type OMI total ozone (OMDOAS) is systematically higher than OMTO3 (especially in winter), and agree with correlative ground-based measurements within +1.0±7.3%.

Besides, OMI NO_2 column data (OMNO2) was compared to ground-based UV-visible twilight observations at Issyk-Kul (Kyrgyzstan, 43N/77E) and St.Petersburg (Russia, 60N/30E) in 2004-2006. Overall, adjusted to the time of sunrise, OMI NO_2 data agree with UV-VIS ground-based data within -6.0±12.6% (-0.1±0.3 10^{15} mol/cm^2) over remote station at Issyk-Kul, and worse – over polluted area of St.Petersburg, -7.0±38.4% (-0.2±1.4 10^{15} mol/cm^2).

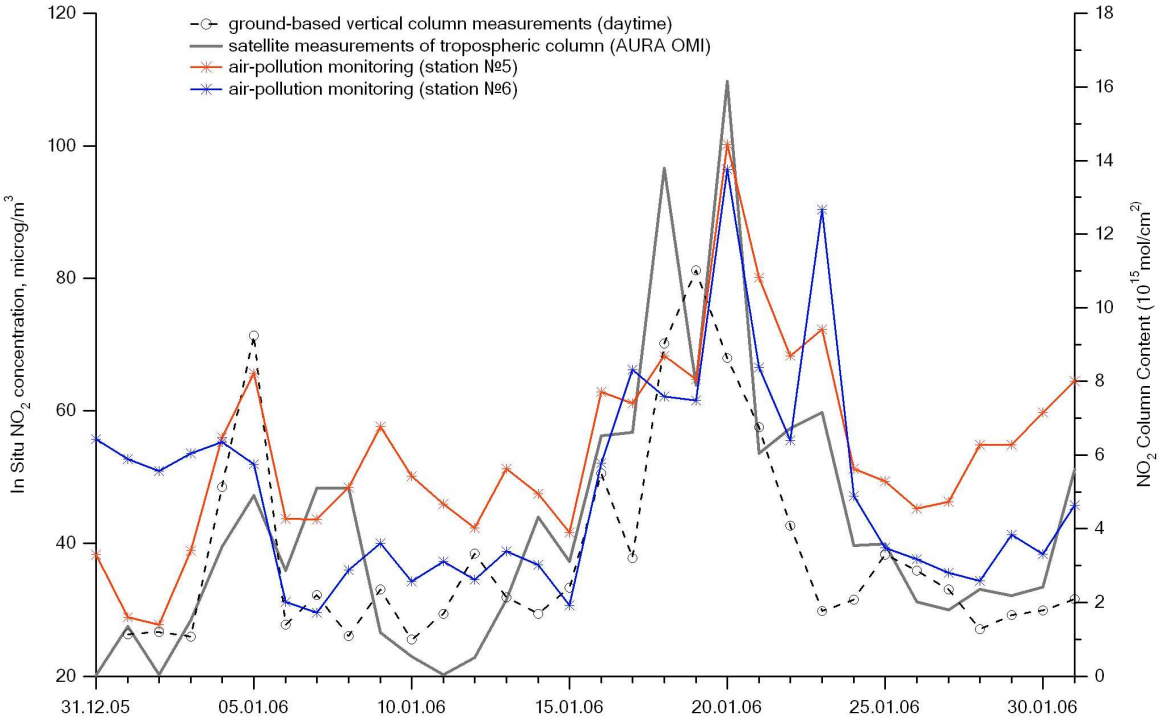
Finally, we have executed a preliminary comparison of OMI tropospheric NO_2 ("NO2Trop" product) over St.Petersburg with correlative ground-based UV-VIS measurements, and *in situ* surface NO_2 observations. Thus, extreme NO_2 surface concentrations have been registered by the system of air-pollution monitoring over the city of St.Petersburg in January 2006, with a maximum on 20/01/06. It was also observed in the data of ground-based NO_2 vertical column measurements and AURA OMI data of tropospheric NO_2. Similar comparison was performed for the period of one year, from December 2004 to December 2005 (however, temporal correlation between high NO_2 values in the data of *in situ*, ground-based and satellite measurements is not always observed).

STATION	TOMS V8			GOME GDP4			OMI OMTO3			OMI OMDOAS		
	Δ	σ	R	Δ	σ	R	Δ	σ	R	Δ	σ	R
St.Petersburg	-1.18	5.86	0.94	+2.60	7.82	0.90	+1.78	5.96	0.95	+4.32	7.78	0.92
Irkutsk	-2.51	6.80	0.88	-0.03	3.76	0.86	+0.83	6.40	0.91	+1.69	6.80	0.90
Y.-Sahalinsk	-1.91	6.06	0.93	-0.02	4.95	0.84	+0.28	5.72	0.93	+1.34	6.35	0.92
Samara	-6.23	9.17	0.91	-3.23	6.78	0.88	-3.83	5.29	0.92	-1.82	5.98	0.91
Murmansk	-3.01	6.19	0.96	+2.21	7.62	0.94	-0.15	6.94	0.96	+0.47	9.85	0.90
Magadan	-1.18	4.39	0.96	-0.32	5.68	0.80	+0.52	4.98	0.96	+2.12	6.68	0.93
Yakutsk	-4.04	4.54	0.97	+0.20	5.81	0.82	-0.55	4.88	0.96	+0.15	7.11	0.93
Pechora	-6.32	4.98	0.97	-2.74	6.30	0.95	-2.89	4.39	0.98	-2.21	7.40	0.93
Petropavlovsk	-4.32	8.19	0.86	-14.91	15.42	0.28	-4.80	6.25	0.90	-3.03	7.10	0.89
Krasnoyarsk	-2.64	6.40	0.92	+5.74	4.92	0.76	+2.16	6.40	0.92	+3.93	5.92	0.94
Vitim	-2.06	4.56	0.96	+2.58	4.15	0.91	+0.37	4.53	0.96	+1.35	7.41	0.93
Voronezh	-4.91	4.18	0.96	-2.37	5.46	0.92	-1.01	4.44	0.94	+1.02	5.47	0.92
Arhangelsk	-3.31	4.70	0.96	+0.29	5.34	0.95	+0.80	5.02	0.96	+2.42	7.13	0.91
Nikolaevsk	-2.34	4.46	0.96	-1.71	4.98	0.78	-0.05	3.36	0.98	+1.65	4.04	0.98
OVERALL:	-3.27	6.18	0.94	-2.01	9.45	0.79	-0.43	5.74	0.95	+0.99	7.27	0.92

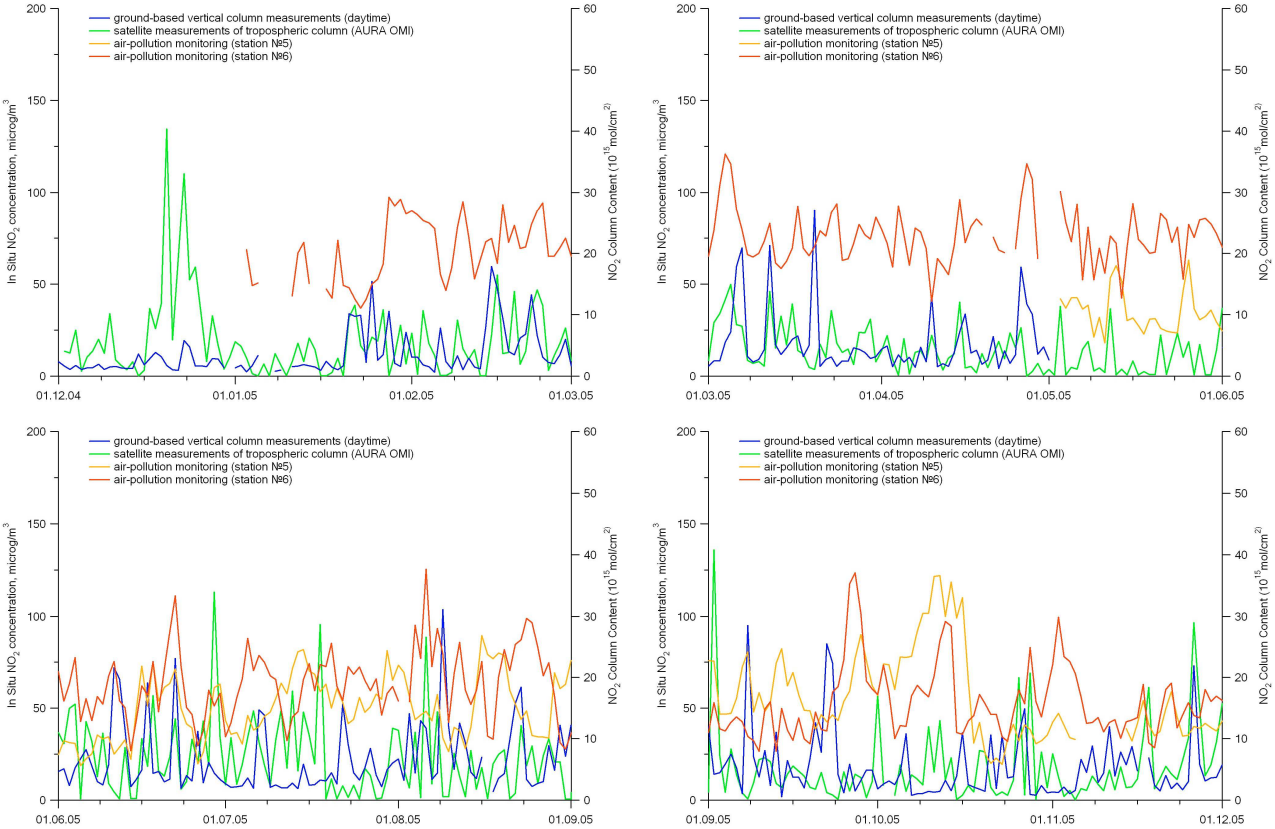
Absolute average and r.m.s. difference (Δ, σ), and correlation (*R*) between M-124 and satellite data in 2004-2006



Comparison of ground-based total NO_2 measurements at Issyk-Kul and St.Petersburg with operational ERS-2 GOME, scientific ENVISAT SCIAMACHY and AURA OMI data in 2004-2006



Comparison of ground-based column NO_2 observations at St.Petersburg with *in situ* NO_2 measurements and AURA OMI tropospheric NO_2 in January 2006



Comparison of ground-based column NO_2 observations at St.Petersburg with *in situ* NO_2 measurements and AURA OMI tropospheric NO_2 in 2004-2005