Observations of atmospheric gases near St.Petersburg

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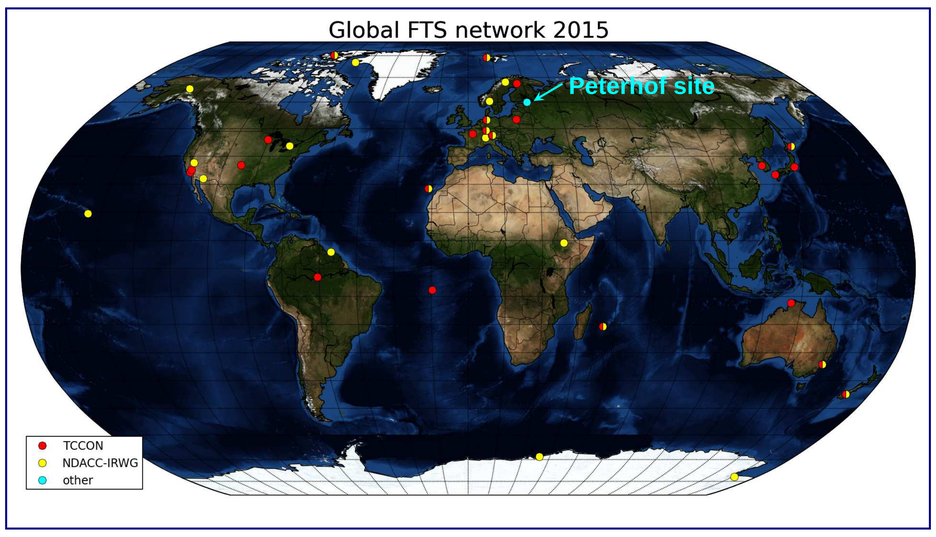
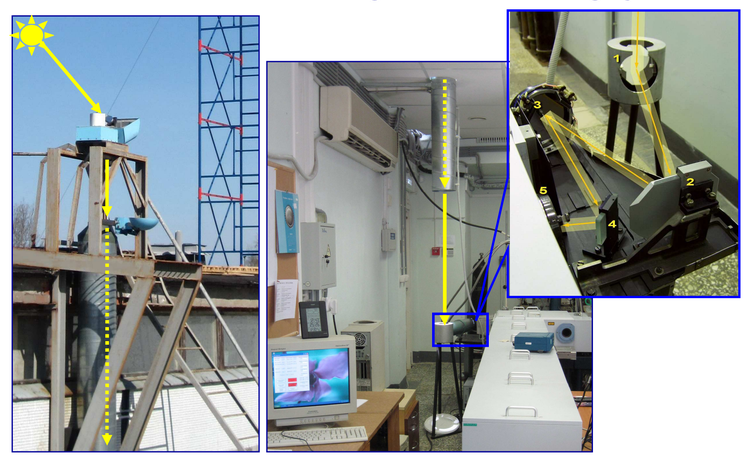
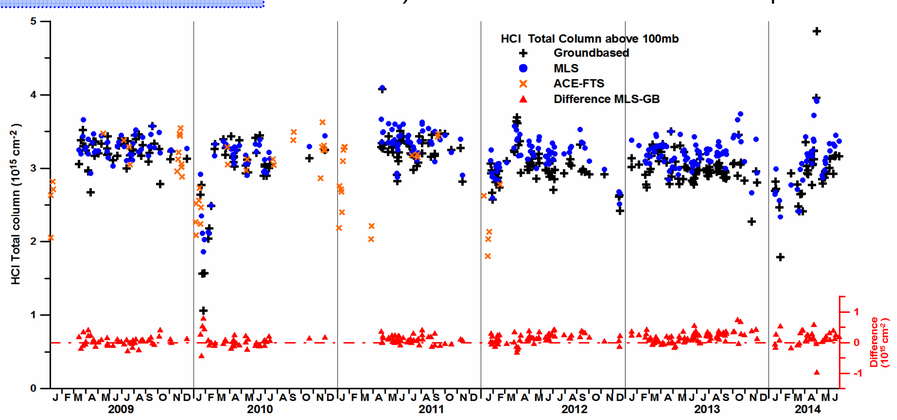


Bruker IFS 125HR + self-designed solar tracking system



HCl, HF

Comparison of ground-based and satellite (MLS, ACE-FTS) HCl measurements in the stratosphere



The mean difference 4.2%, standard deviation of the difference is 5.9%, correlation coefficient between ground-based and satellite data is 0.84.

Ratio HCl TC/ HF TC vs. potential vorticity (at 475K potential temperature level)

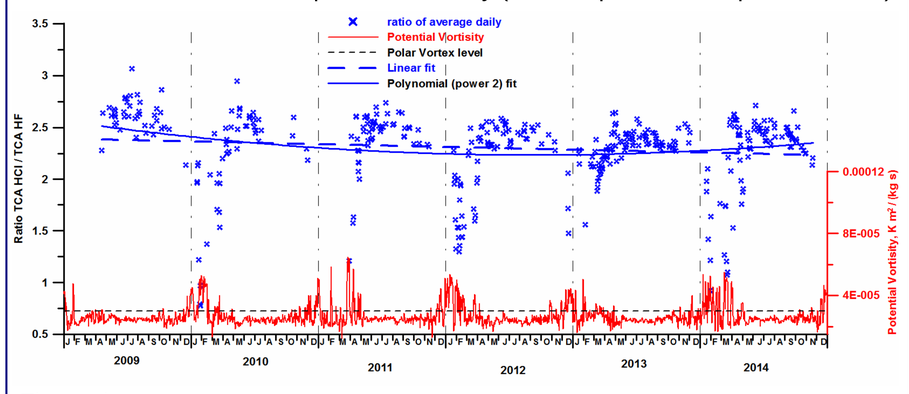


Figure demonstrates:
- Low values of the HCl/HF ratio coincide with polar stratospheric vortex passages over Peterhof site;
- HCl/HF ratio has slowly decreased during 2009-2014 period (please, see fits);
-Extraordinary long period of low HCl/HF ratio was observed in 2014.

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O_3

We present FTIR measurements of ozone total columns (OTC) near Saint Petersburg for the period between April 2009 and November 2014. We compare them with satellite measurements (IASI and OMI) and ground-based measurements of ozone site in Voeykovo (filter ozonometer M124 and Dobson photometer), 50 km NE from Peterhof.

We use daily averaged ground-based measurements, averaged IASI measurements in 1 degree area from Peterhof station (LISA retrieval algorithm) and averaged OMI measurements in 200 km area from St. Petersburg (overpass data).

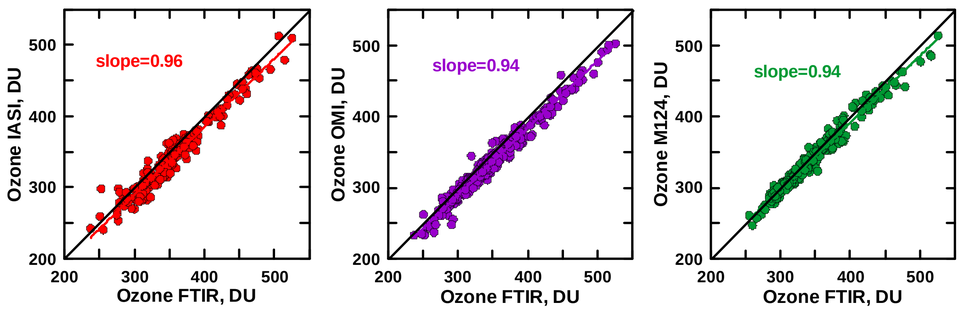
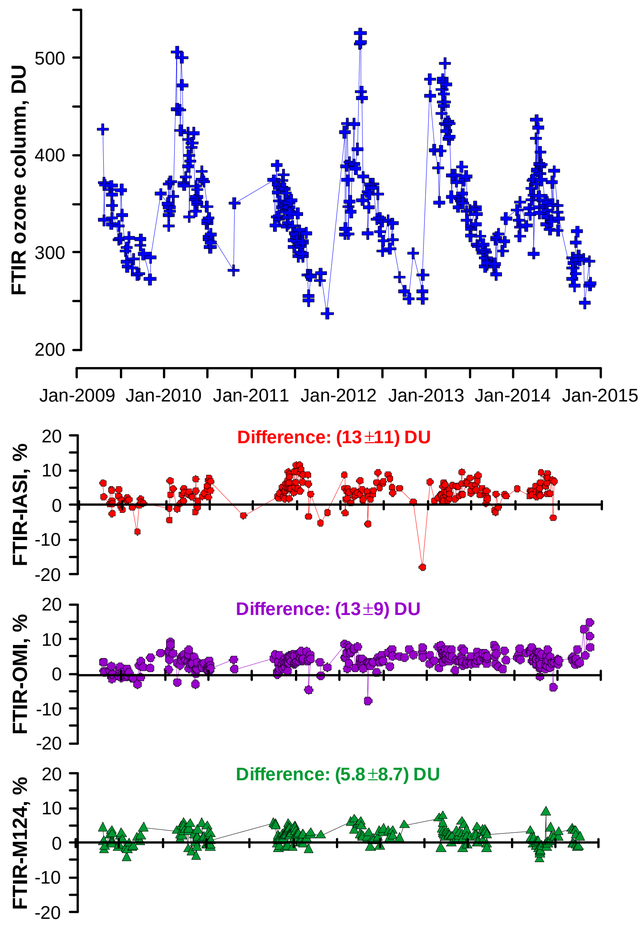


Table. Statistical characteristics of the comparison: FTIR vs. other devices.

Device	Number of days	Bias	Correlations
IASI	212	3.6±3.2%	0.975±0.003
OMI	318	3.8±2.6%	0.986±0.002
M124	230	1.6±2.5%	0.985±0.002
Dobson	130	1.7±2.5%	0.983±0.003

Conclusion:
FTIR overestimates independent ground-based measurements (1.6-1.7%) and satellite measurements (3.6-3.8%). Standard variations from means in pairs' comparison are smaller than total errors of individual measurements.



References

Virolainen, Ya.A., Yu.M. Timofeev, A.V. Poberovskii, M. Eremenko, and G. Dufour. 2015. Evaluation of ozone content in different atmospheric layers using ground-based Fourier transform spectrometry. *Izvestiya, Atmospheric and Oceanic Physics,* 51 (2): 167–176. doi: 10.1134/S0001433815020127

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http://avdc.gsfc.nasa.gov/index.php?site=1593048672&id=28

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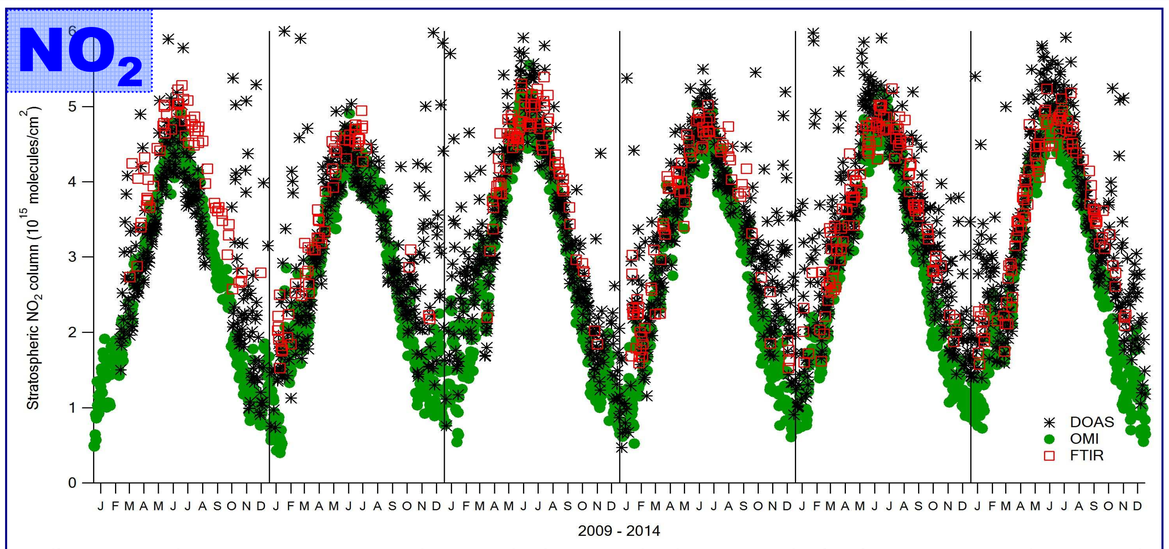
NO_2



Daily averaged FTIR measurements (~3.4 μm) of stratospheric NO_2 vertical column, compared to ground-based zenith-sky DOAS and satellite Aura OMI measurements. Daily averaged FTIR measurements (~3.4 μm) of stratospheric NO2 vertical column, compared to ground-based zenith-sky DOAS and satellite Aura OMI measurements (FTIR-DOAS: 4±15%, FTIR-OMI: 12±11%).

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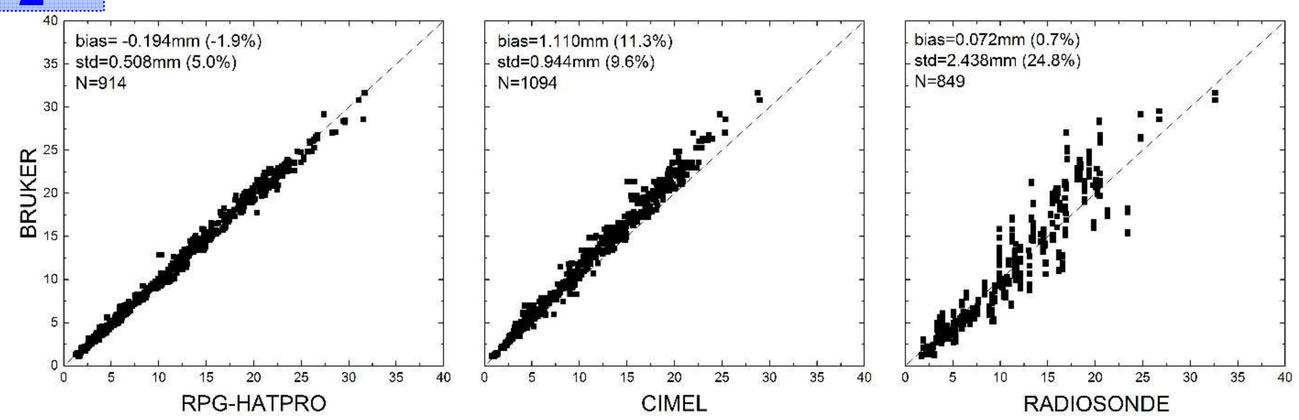
H_2O

Comparison of Bruker IFS-125HR Integrated Water Vapour with Microwave Radiometer (RPG-HATPRO), CIMEL (CE 318N-EDPS9) and Radiosonde Measurements



We analyse simultaneous measurements of integrated water vapour (IWV) performed by FTIR Bruker 125HR, CIMEL (CE 318N-EDPS9) photometer and MW radiometer RPG-HATPRO at Peterhof station. Additionally, we compare these datasets with radiosonde measurements at the Voeykovo station, 50 km northeast from Peterhof for the period between March 2013 and May 2014. Overall error of IWV FTIR retrieval totals (3.6±0.6)%, with (1.2±0.2)% and (3.3±0.6)% for random and systematic impact, respectively. In general, all datasets agree reasonably well, the most significant differences of the data are mainly due to the spatial inhomogeneity of the humidity fields in the atmosphere. At the same time, CIMEL photometer calibrated by the manufacturer significantly underestimates the IWV obtained by other devices.

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CO

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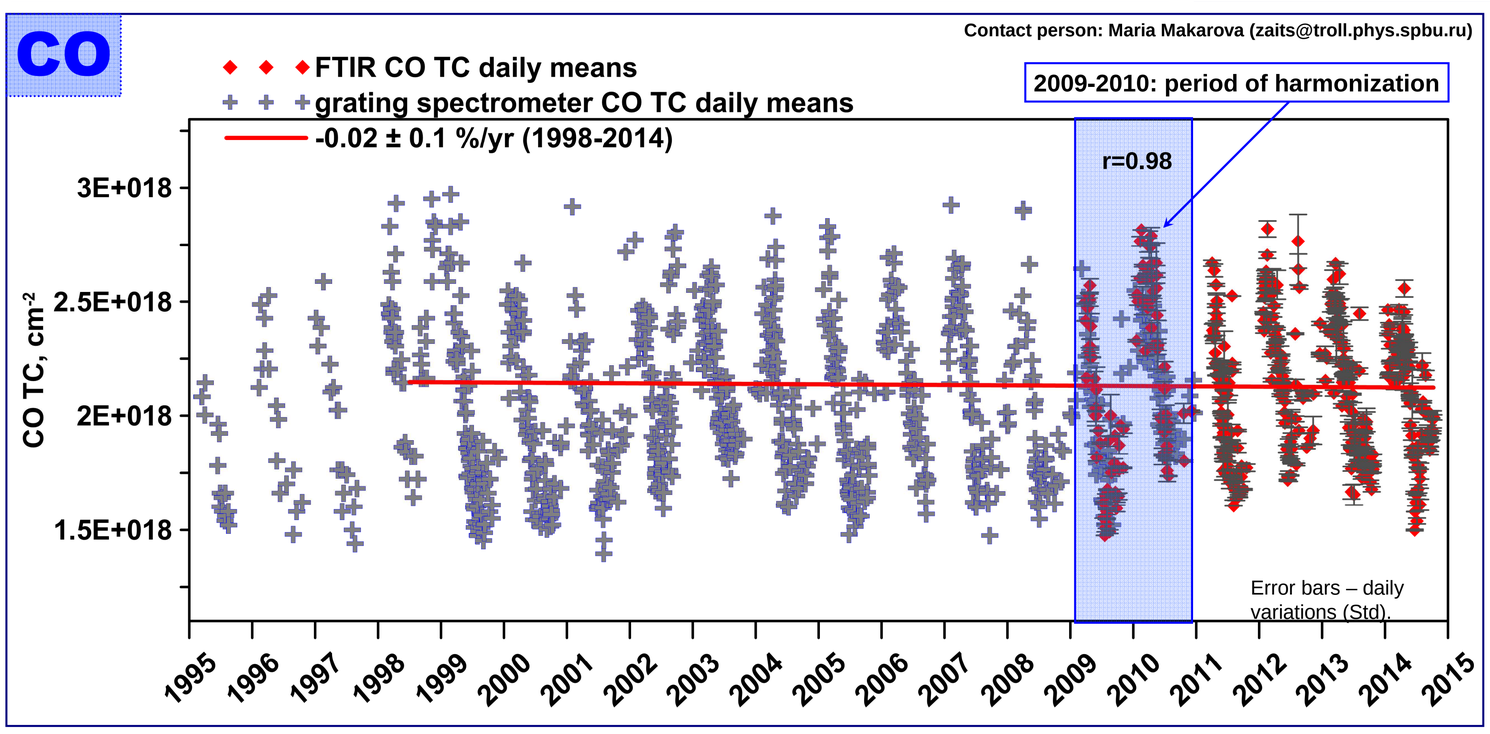

CH_4

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