Russian ROSHYDROMET
Ozone / Nitrogen Dioxide monitoring UV-Vis network associated to NDACC

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OUTLINE

1. Why new UV-Vis spectrometer network ?
   With which instruments ?

2. SAOZ Uv-Vis Spectrometer

3. Newly developped Mini-SAOZ

4. First steps of deployment

5. Future plans

Why new UV-Vis spectrometer network

Existing Ozone monitoring instruments in Russia

- 33 M-124 UV ozone filter instruments still operating in the Russian Federation and Kazakstan
- 3 Brewer UV spectro-photometer in Kislodovsk, Tomsk and Obninsk

BUT all direct sun measurements requiring clear sky and solar elevation < 75°-80°

NO DATA AT HIGH LATITUDE DURING THE ARCTIC OZONE DEPLETION SEASON IN DEC-FEB

ALTERNATIVE FOR HIGH LATITUDE IN THE WINTER

Zenith Sky UV-Visible spectrometers able to perform throughout the year at all latitudes up to the polar circle and in all weather conditions

SAOZ (Système d'Analyse par Observation Zénithale)

- built by CNRS in 1987
- first deployed in the Arctic and the Antarctic in 1988 for studying polar ozone depletion.
- Measuring also NO2 and Polar Stratospheric Clouds

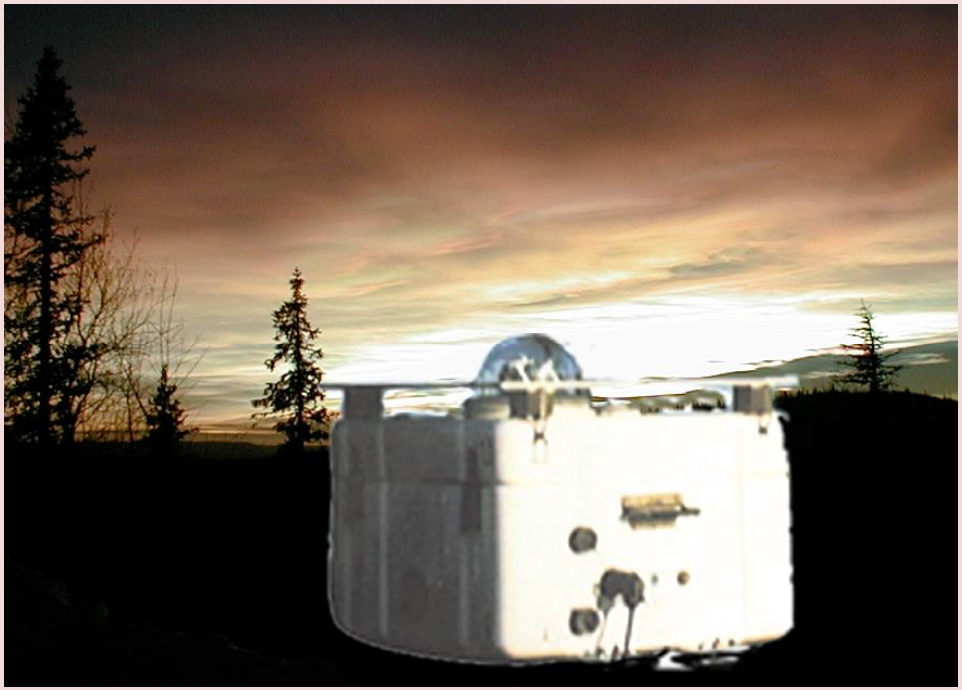
BUT progressive replacement of SAOZ instruments required

(Instrument aging, components no more available, more efficient new detectors..)

SAOZ Uv-Vis spectrometer

Flat field spectrometer, 1024 pixels diode array detector
Differential Optical Absorption Spectroscopy (DOAS)
Looking at zenith. Placed at the ouside.

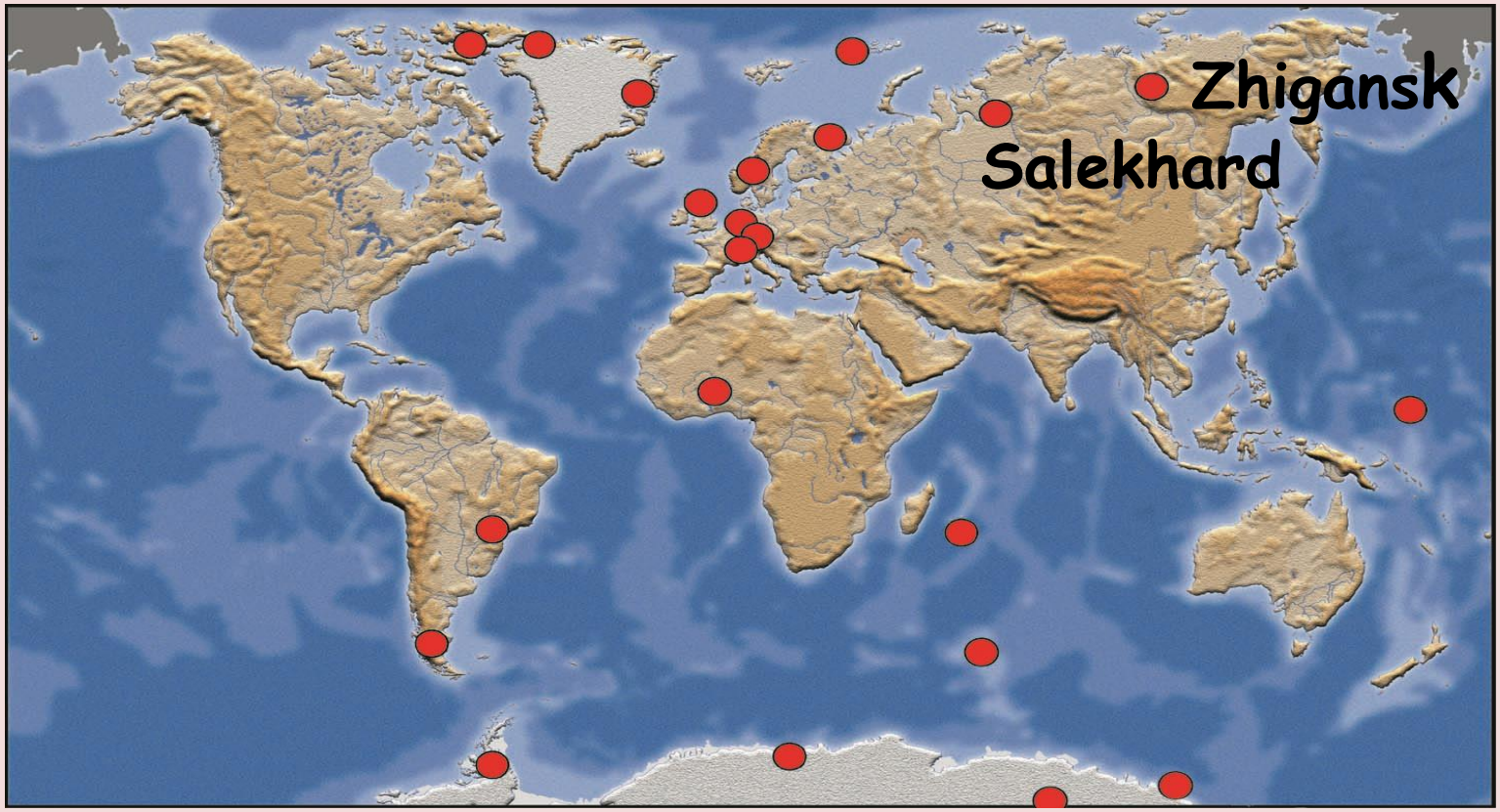
Total ozone and NO2 columns at sunrise and sunset (between 86°-91° SZA)



SAOZ NETWORK

- Qualified for NDACC
- Selected by ESA and NASA for satellite validation
- More than 20 years data available

NDACC SAOZ RUSSIAN STATIONS



Two SAOZ operated in collaboration with CENTRAL AEROLOGICAL OBSERVATORY (V. Dorokhov) at Zhigansk (66° N) in E. Siberia since 1992 and at Salekhard 67°N, W. Siberia, since 2002

Unique long series of data at the polar circle

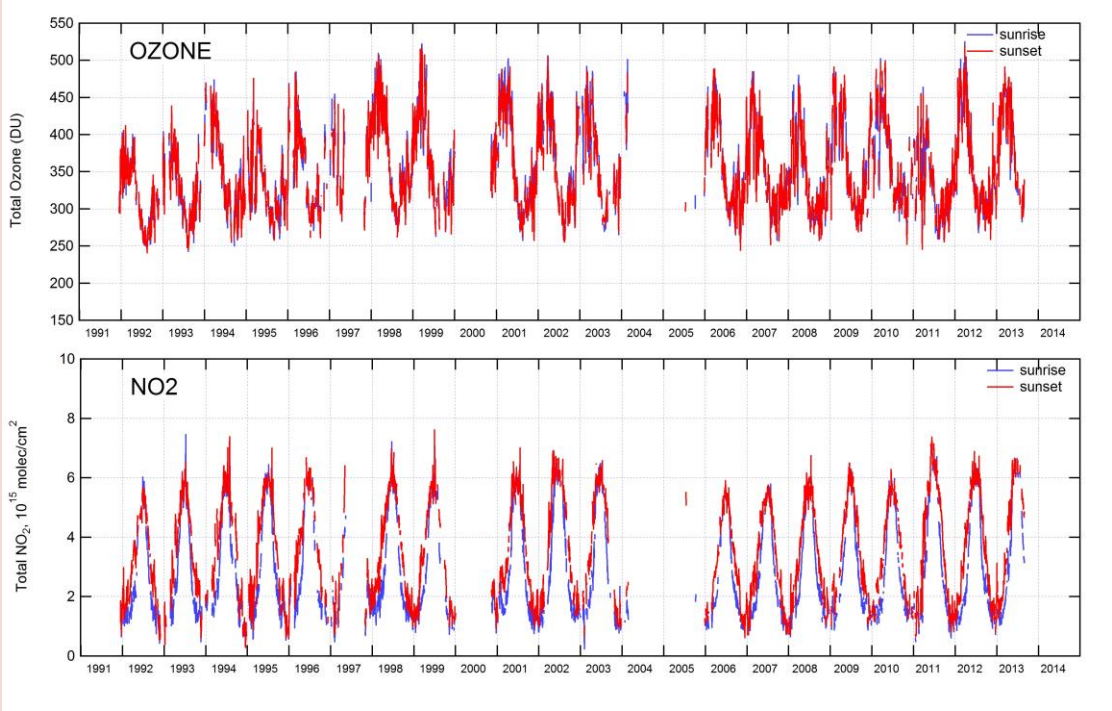
But will not continue (instruments failure, lack of personnel)

Replaced by MINI-SAOZ in 2013-2014

Zhigansk

Zhigansk: 23 years of SAOZ data

Smaller O3 and NO2 columns in 1992-93 and 2006-07 after volcanic eruptions
Aerosols are converting Nox into nitric acid and
ozone, at lower altitude, is partly masked by the aerosols

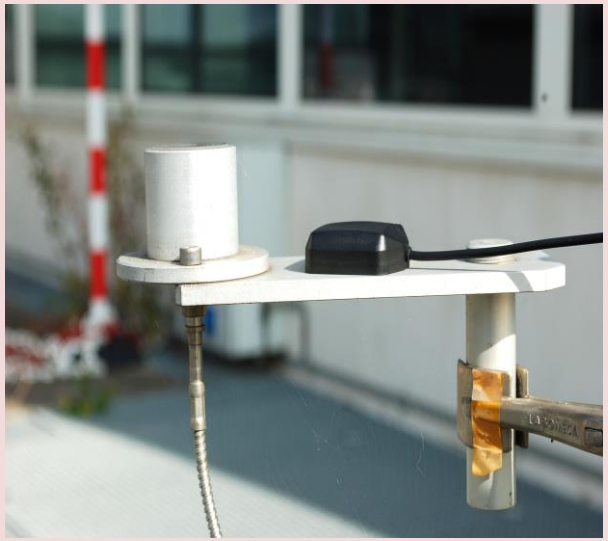


Measurements interruptions in 2000 and 2004-05 dut to handling errors in the station

Newly developped Mini-SAOZ

Czerny-Turner flat field grating spectrometer
CCD detector 2048 x 16 pixels

Instrument Indoor
Optical head Outdoor looking at zenith,
linked to spectrometer by optical fibre



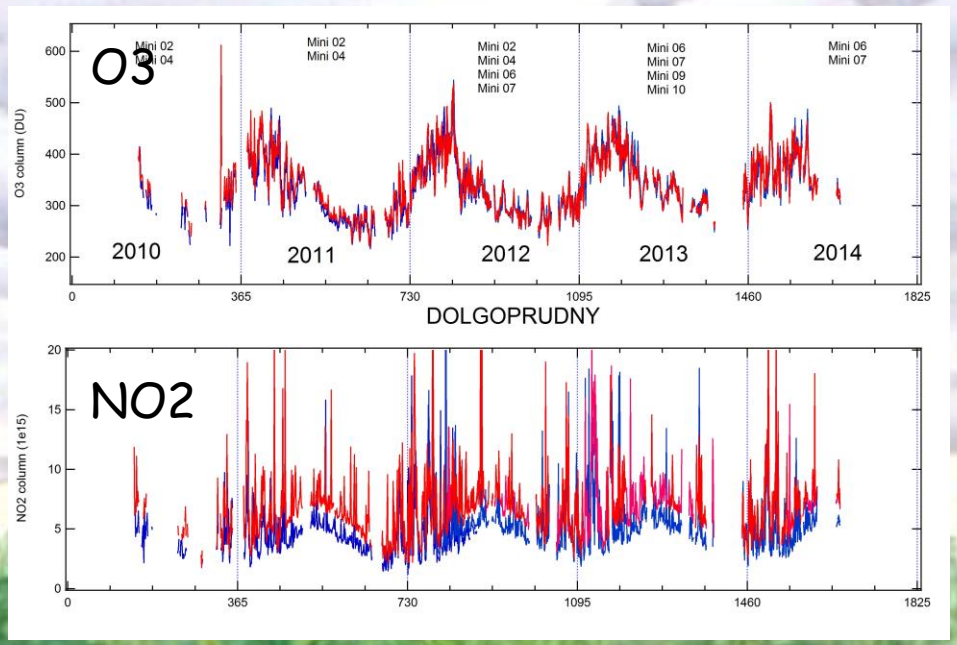
Mini- SAOZ deployment

2010 Tests and qualification at Dolgoprudny 2011 Anadyr

2012 Murmansk and Zhigansk 2013 Irkutsk and Salekhard

Next: Petropavlosk Kamchatsky, Crimea, Arkangelsk

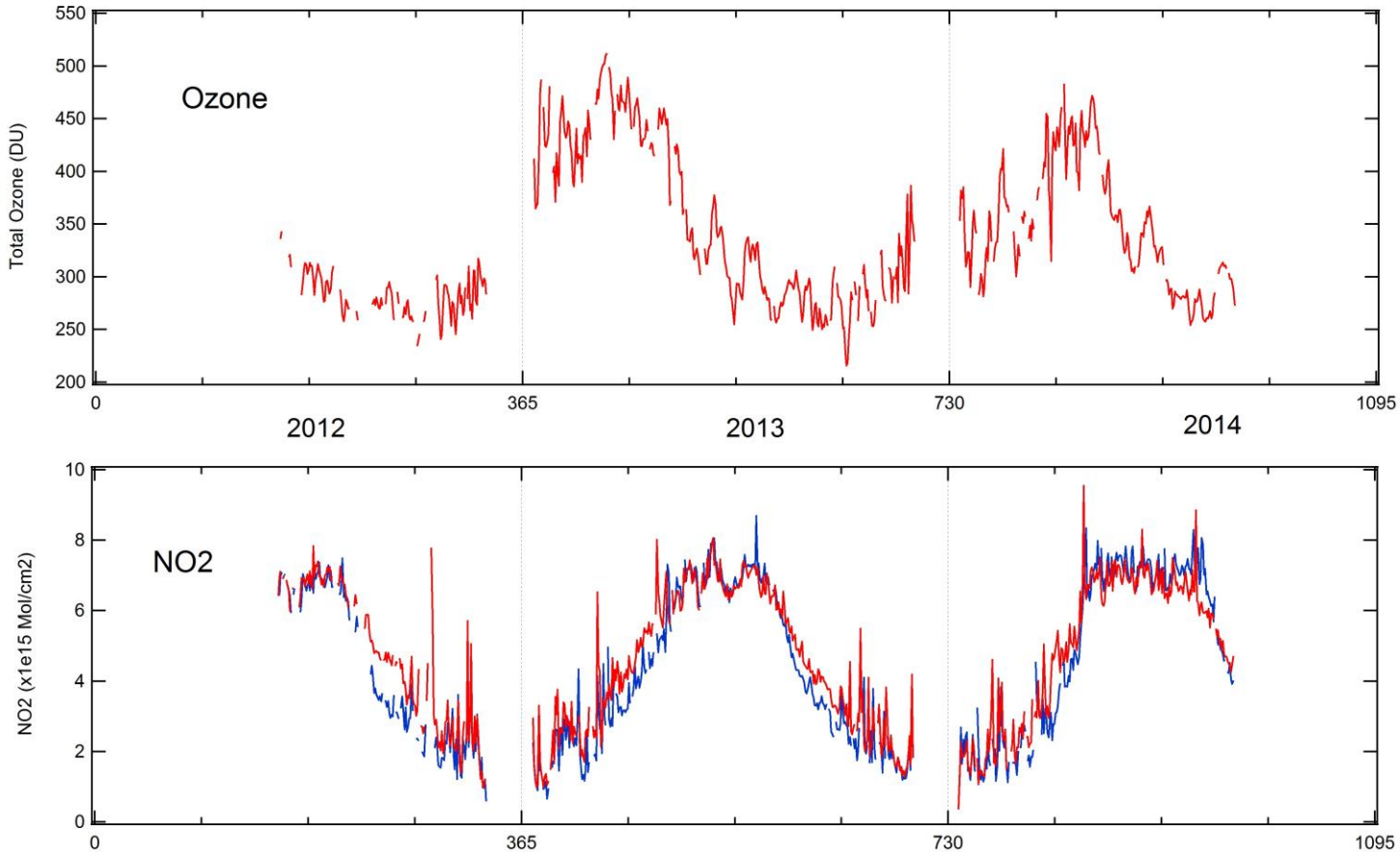
Mini-SAOZ 02, 04, 06, 07, 09 and 10 testing and qualification since 2010 at Dolgoprudny



High pollution in Moscow area
Several instrument stops due to power failure

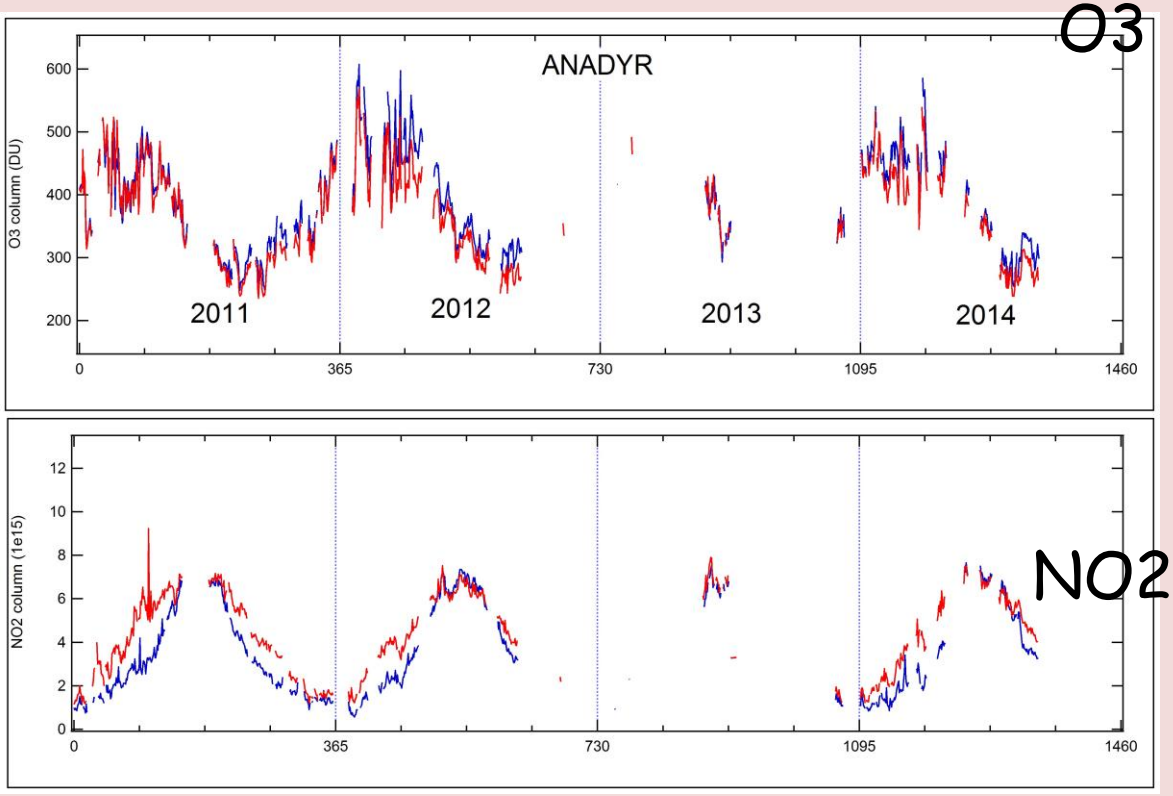
Murmansk 68°N since Sept 2012

Continuous measurements since then
(absence of ozone data in the winter when SZA > 91° at noon,
will check if extention to 92° reliable)



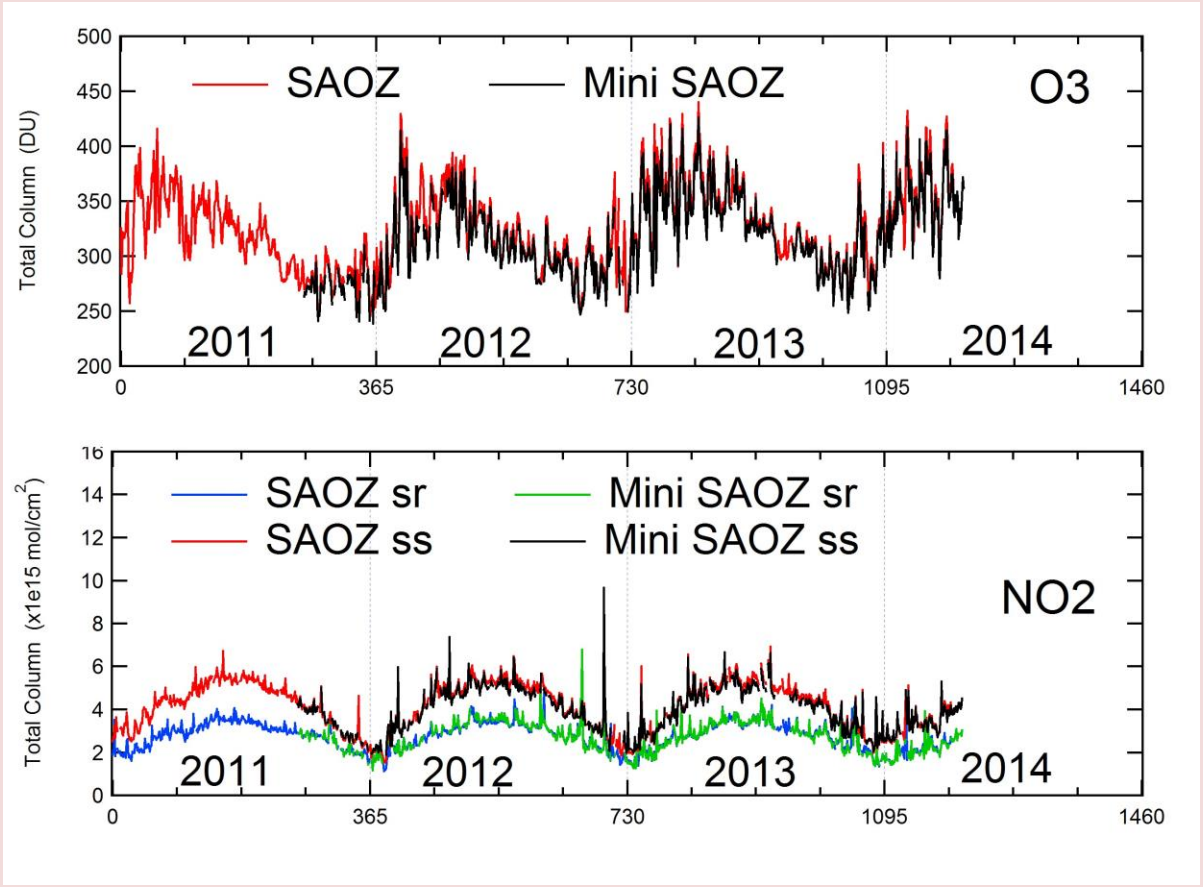
Mini-SAOZ at Anadyr

Some stops due to power failure
Stopped in from autumn 2012 until end 2013 due to lack of local support
Small difference between SR and SS due to loss of GPS time setting

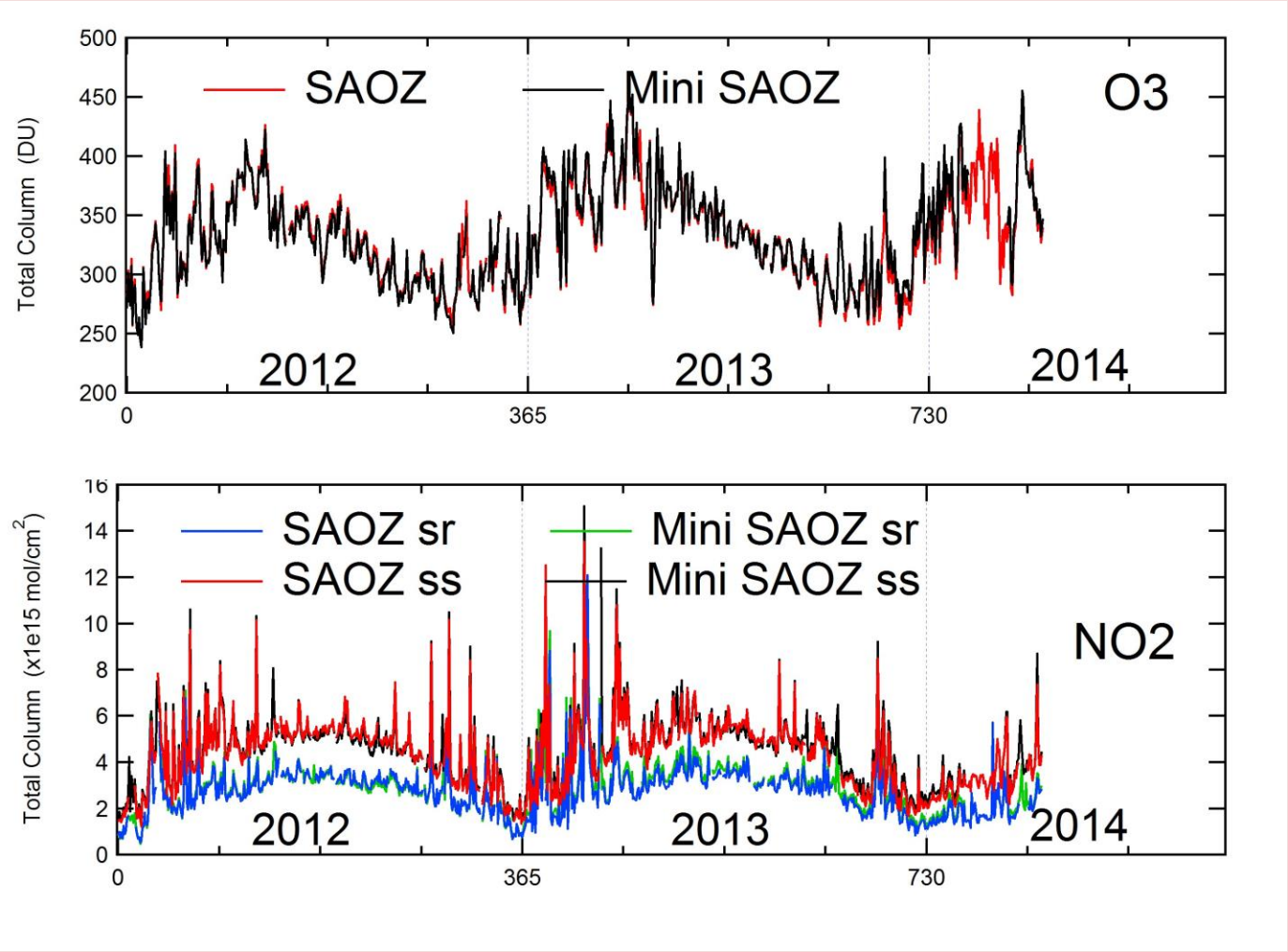


Mini-SAOZ / SAOZ comparison at OHP

DO3 < 3 %, DNO2 < 5% , Corr 0.97
Reason of small difference under investigation



Same in highly polluted Guyancourt urban area



FURTHER WORK PLAN

- Mini-SAOZ Operations Handbook (CNRS) Oct 2014
- Investigation of origin of GPS and power failures origins (CNRS / CAO)
- Report on Mini-SAOZ / SAOZ comparisons at OHP, Guyancourt, Zhigansk and Salekhard Dec 2014 (CNRS)
- Candidature for ROSHTDROMET reconnaissance (CAO)
- Candidature to NDACC UV-vis working group CAO / CNRS Spring 2015