Validation Results of the OMI Calibration and Validation Announcement of Opportunity

Mark Kroon – KNMI
On behalf of ALL the OMI AO PI's

Aura Science Team Meeting
14 August 2006

Chronology

- External OMI project review early 2003
- Recommends AO for calibration & validation
- Call opened 24 May / closed 24 September 2004
- Synchronized with Aura validation NRA
- 21 proposal received / accepted

Partners

- NIVR – funding OMI project
- ESA – logistics support
- KNMI – housing OMI project
- AVDC – OMI data distribution

Framework

- No funding involved from OMI side
- National funding only, letters of support
- OMI data access following proof of funding
- OMI data distribution by AVDC (protocol)

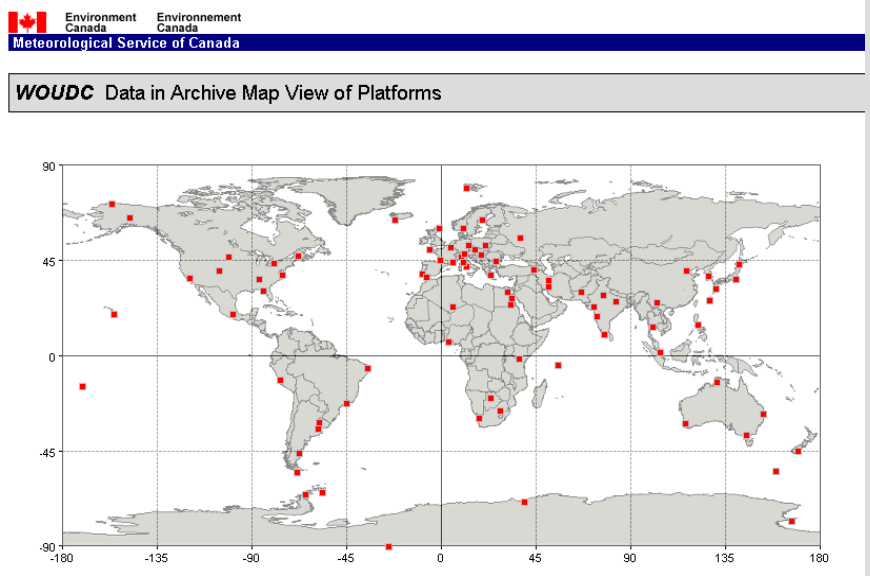
ESA KNMI NIVR AO

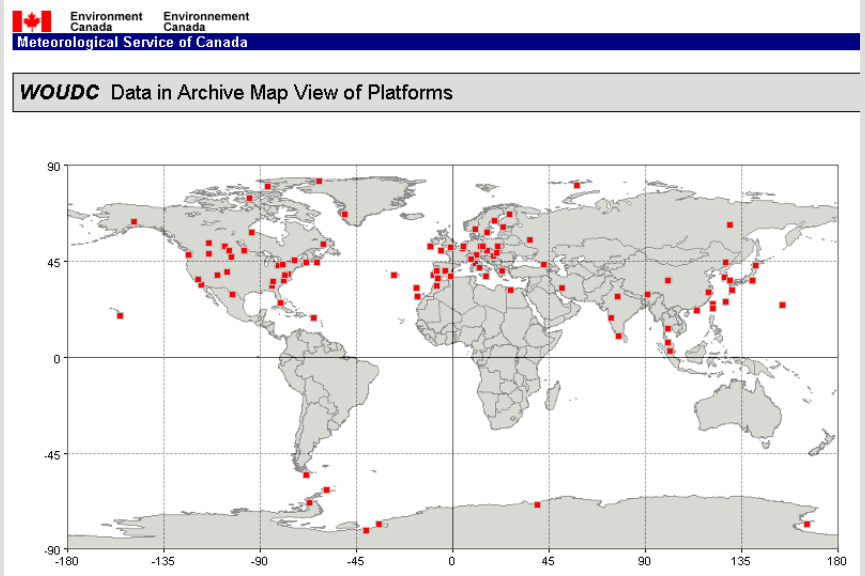
- First ESA AO on Non-ESA instrument
- ESA provided website logistics
- 21 proposals (20 Europe + 1 US)
- Recognized European scientists
- Strong participation former East block
- International review (11 KNMI, 22 US)
- All proposals accepted!
- AVDC Access after Proof of Funding

People Involved

Claus Zehner, Yves Louis Desnos, Rita Malosti, Francesco Pallazo, Mark Kroon, Ellen Brinksma, Pieternel Levelt, Ernie Hilsenrath, Gilbert Leppelmeier, Joost Carpay, Bojan Bojkov, Mike Kurylo

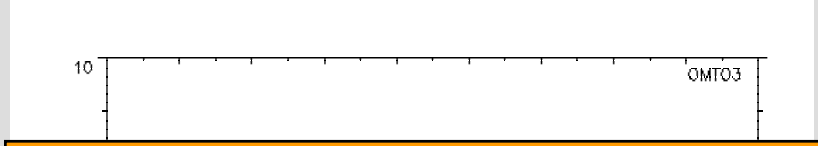
Ozone – Ground Based Validation

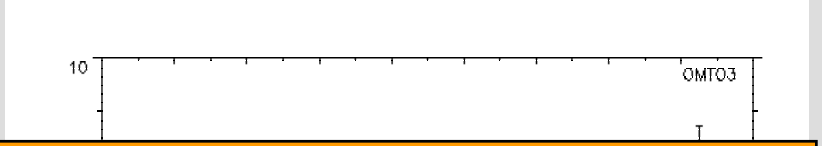




2925 - Validation of OMI total ozone using ground-based Brewer observations. Dr. Dimitris Balis, Aristotle University of Thessaloniki - Laboratory of Atmospheric Physics, Greece

Ozone – Ground Based Validation

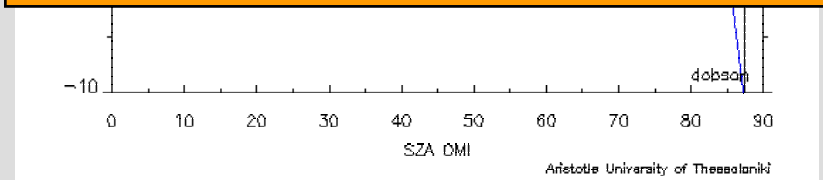


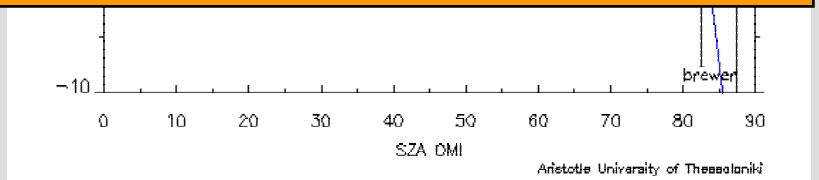


The average difference between OMI-DOAS and Brewer observations is 1.03% while the corresponding difference between OMI-TOMS and Brewer observations is -0.12% (valid mainly for 30° N - 60° N).

The average difference between OMI-DOAS and Dobson observations is about 2.7%, showing however better agreement over 30° S - 40° S. The average difference between OMI-TOMS and Dobson observations is about 1%, with higher values for the tropics.

The OMI-DOAS comparisons reveal a dependence on SZA.





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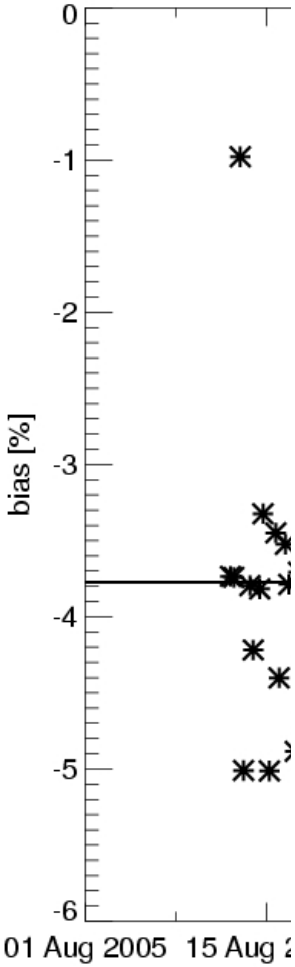
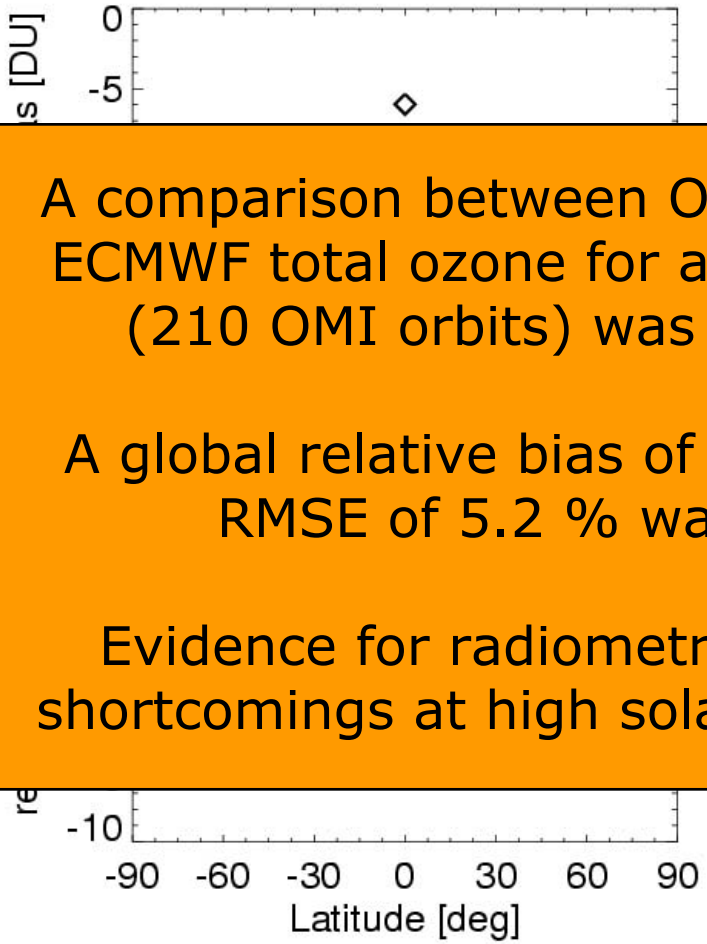
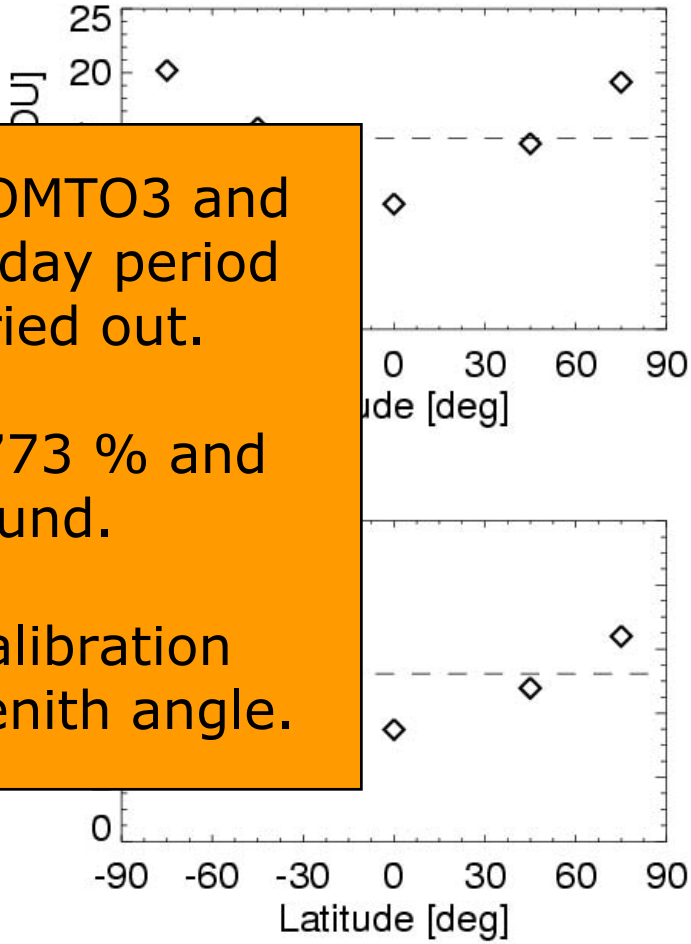
Ozone – Model Comparison

Latitudinal Analysis







A comparison between OMI OMTO3 and ECMWF total ozone for a 70 day period (210 OMI orbits) was carried out.

A global relative bias of -3.773 % and RMSE of 5.2 % was found.

Evidence for radiometric calibration shortcomings at high solar zenith angle.

Dr. Stefano Migliorini, Data Assimilation Research Center, University of Reading, United Kingdom

NO2 – Ground Based Validation

Systeme d'Analyse par Observations Zenithales (SAOZ)

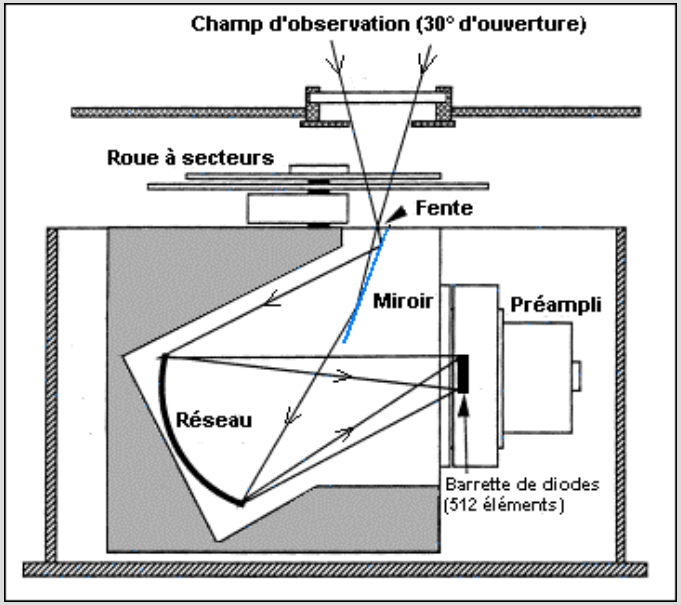
Zenith sky measurements at twilight (86°<SZA<91°)

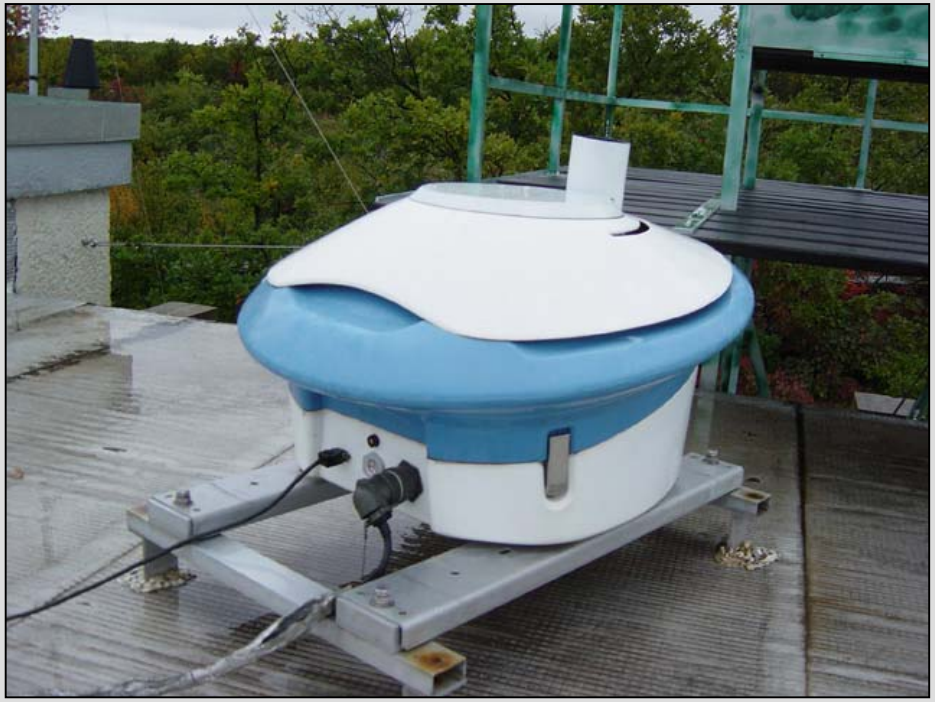
Differential Optical Absorption Spectroscopy (DOAS)

Ozone: 450-590 nm Chappuis Band, temperature independent

NO2: 400-550 nm

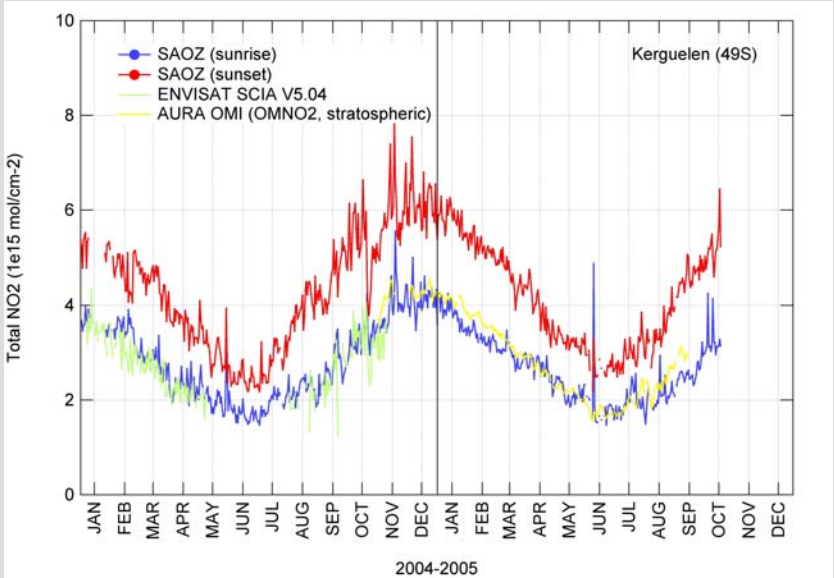
NDSC qualified

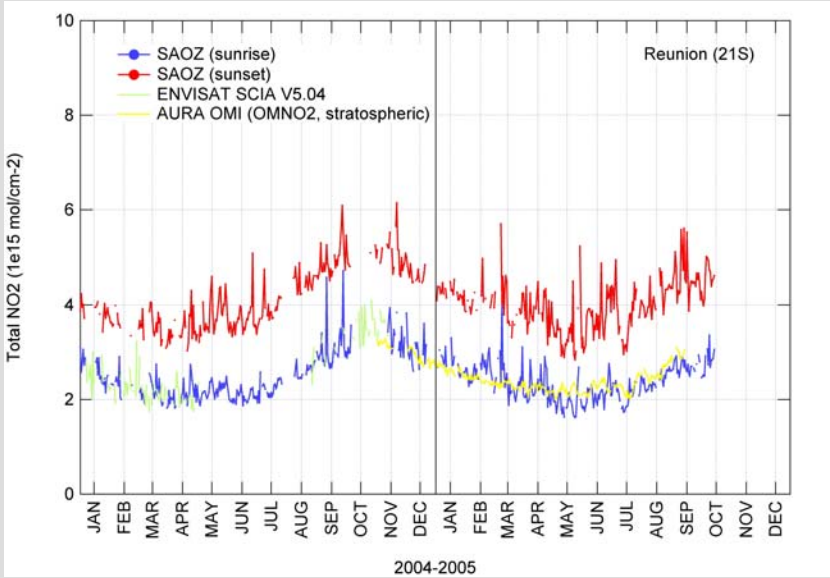


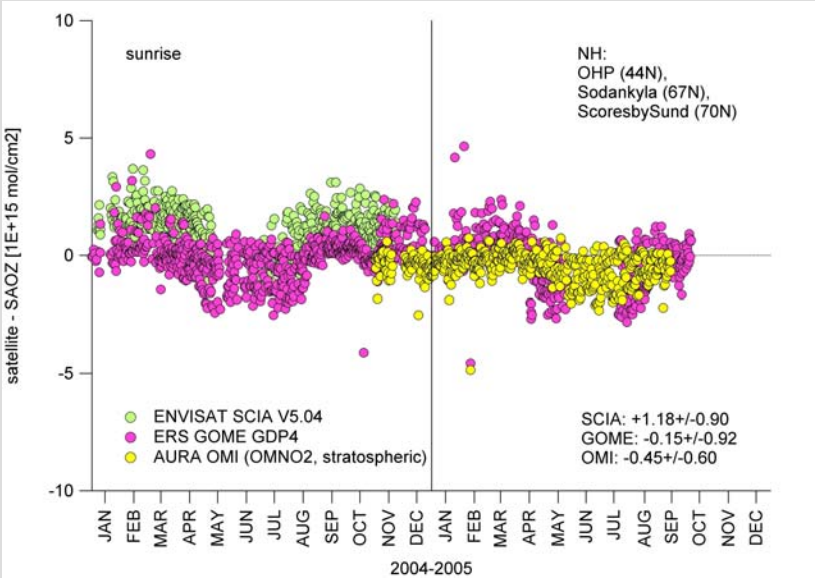


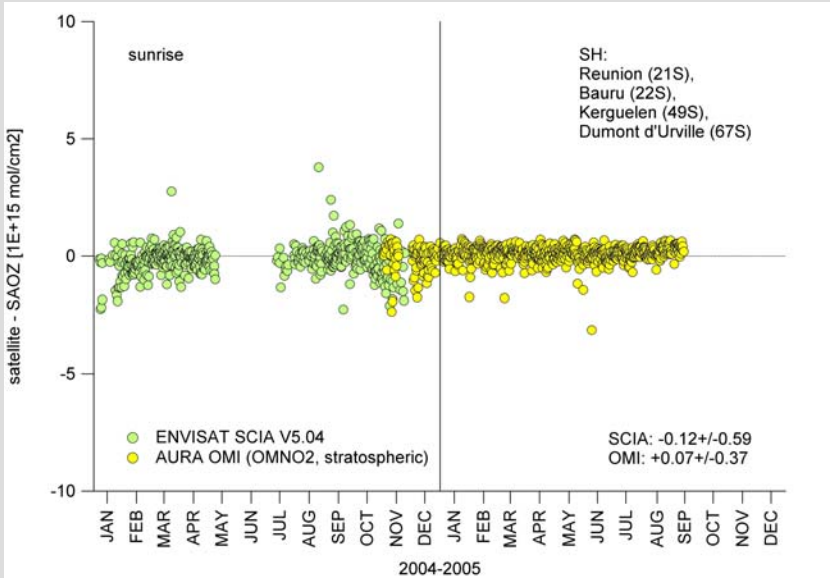
2926 - Validation of OMI ozone and NO2 vertical column data with ground-based spectroscopic measurements in Russia. Prof. Dr. Yury Timofeyev, St. Petersburg State University, Russian Federation

NO2 – Ground Based Validation









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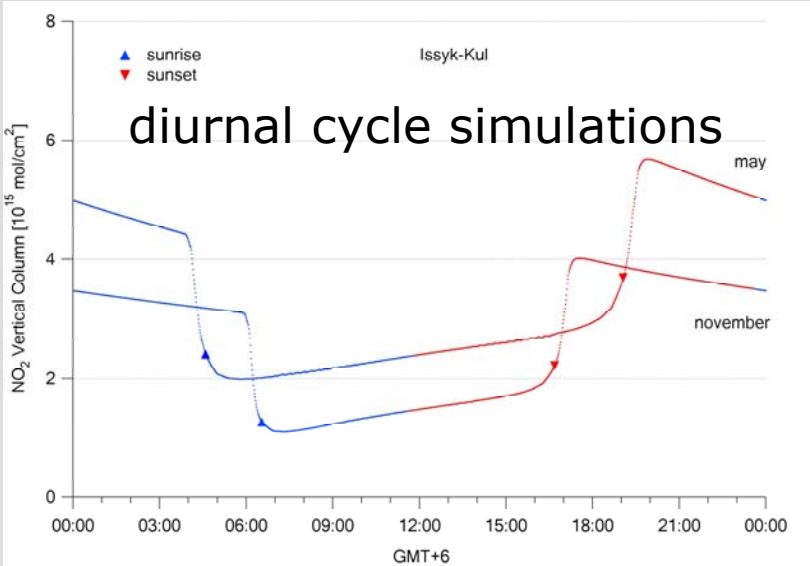
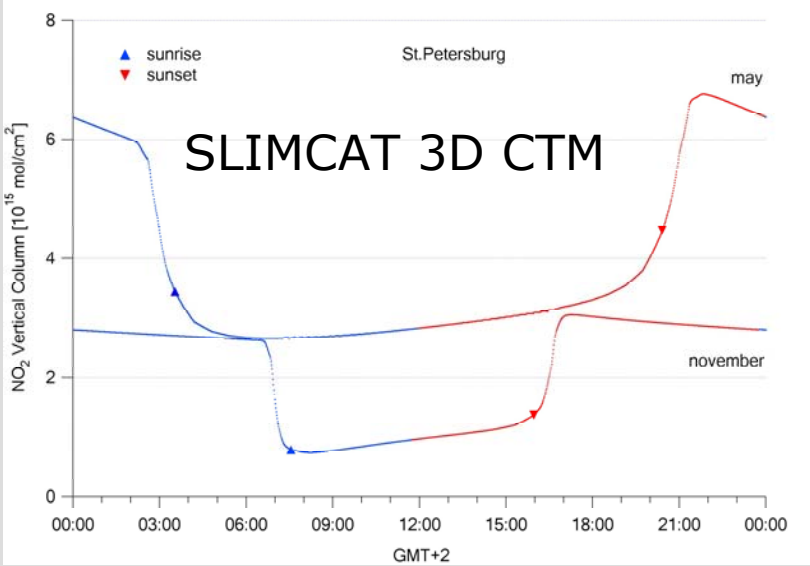
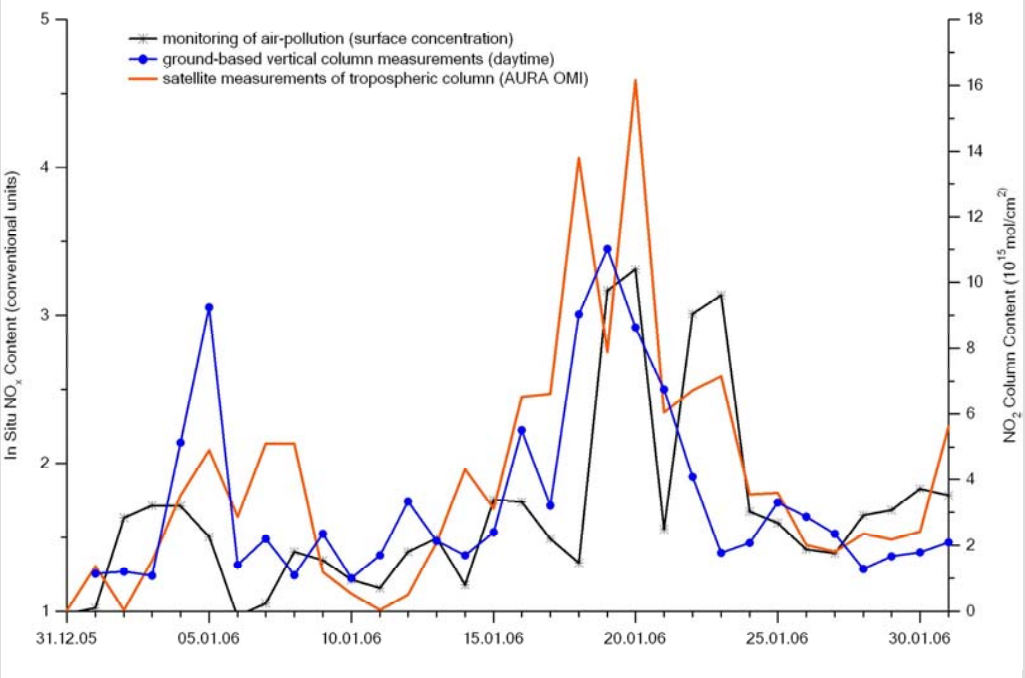
NO2 – Modeling and Measuring







Comparison of ground-based column NO2 observations at St.Petersburg with in situ NOx measurements and provisional AURA OMI tropospheric NO2 in January 2006

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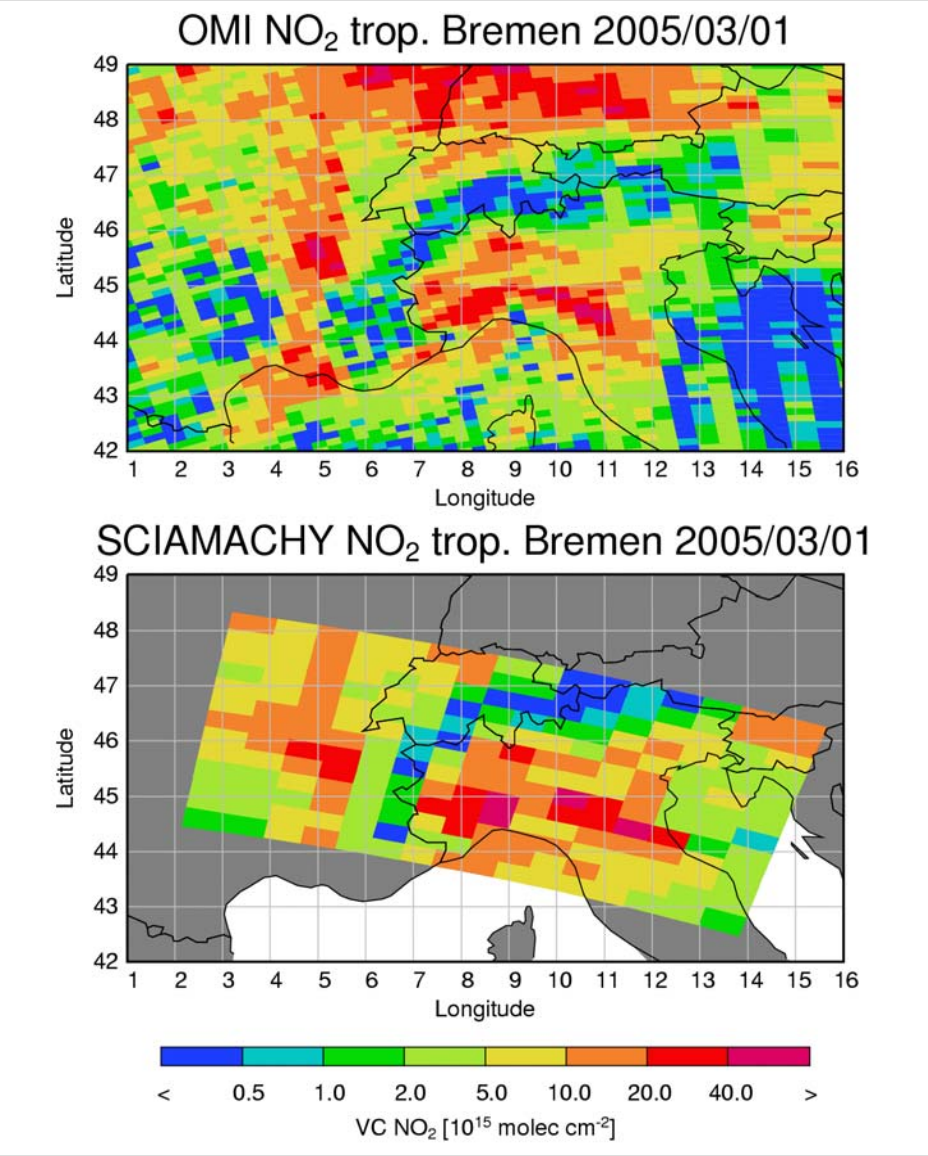
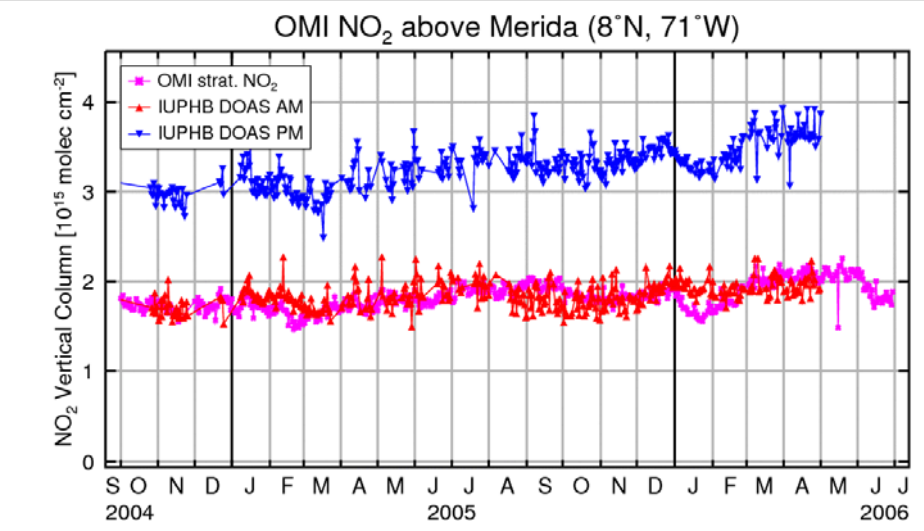
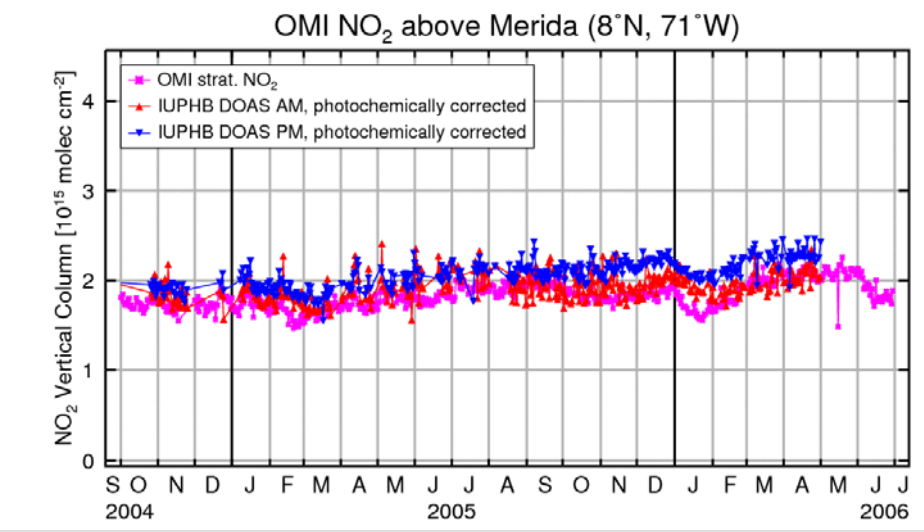
NO2 – Retrievals and Observations

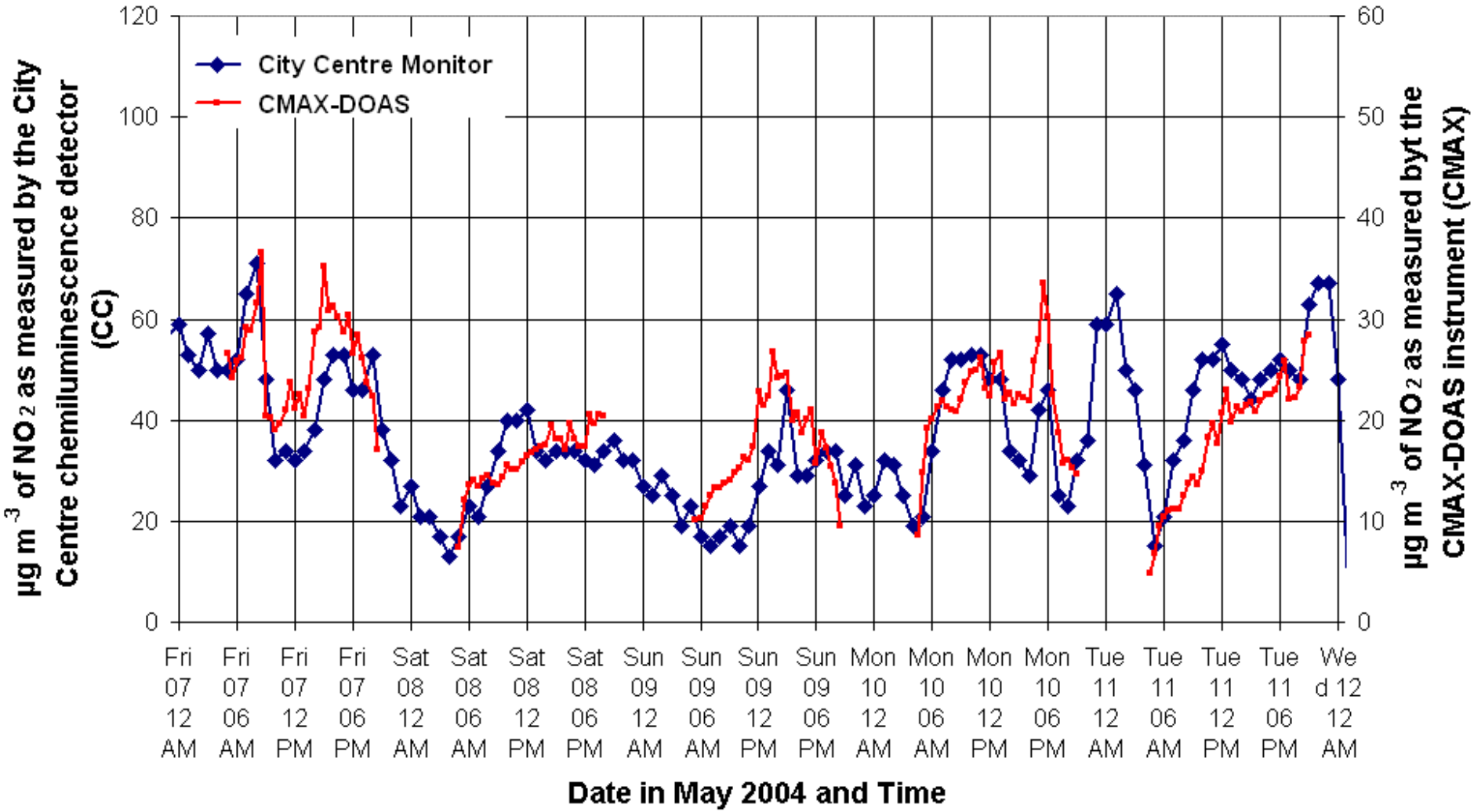




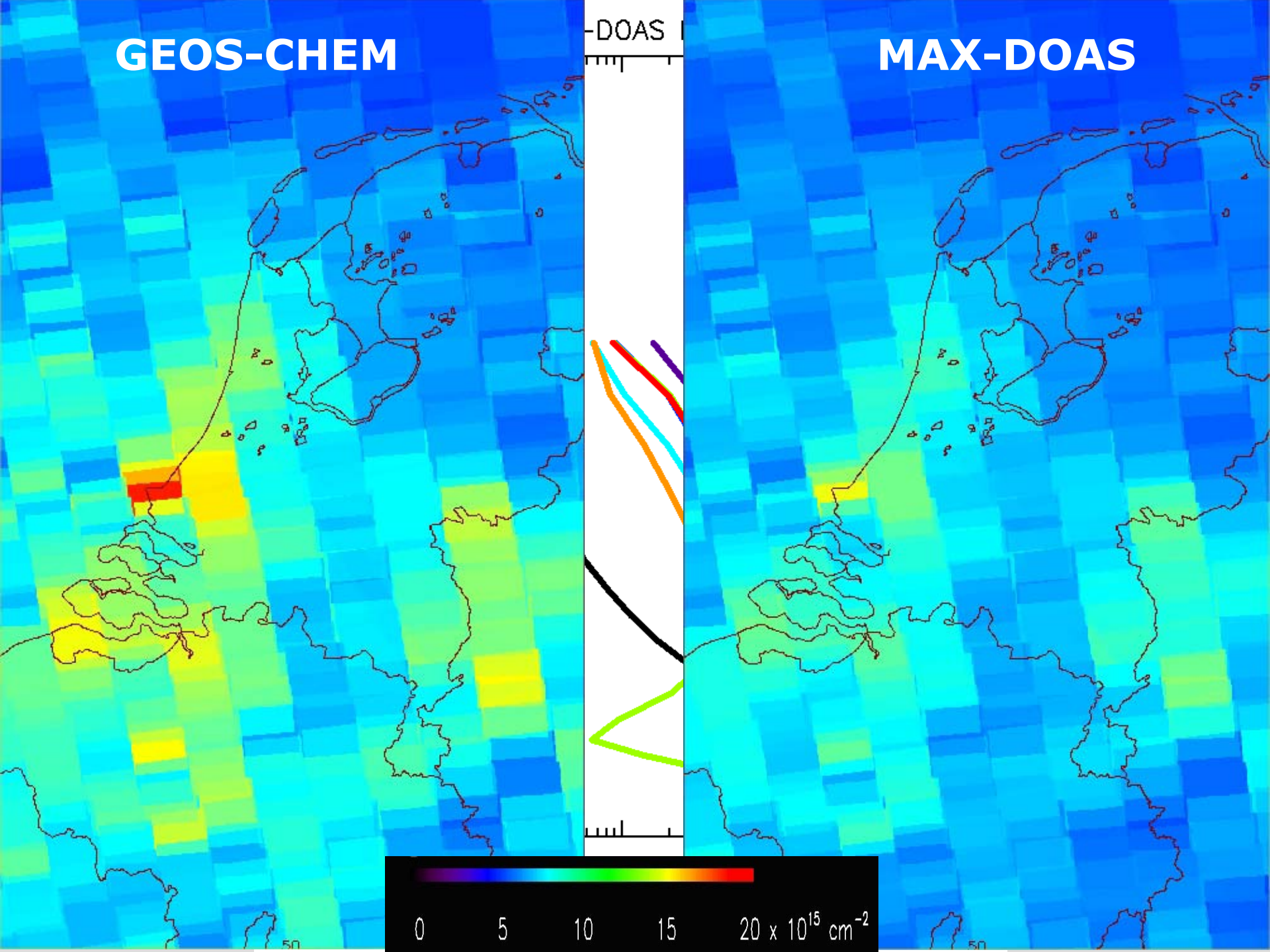


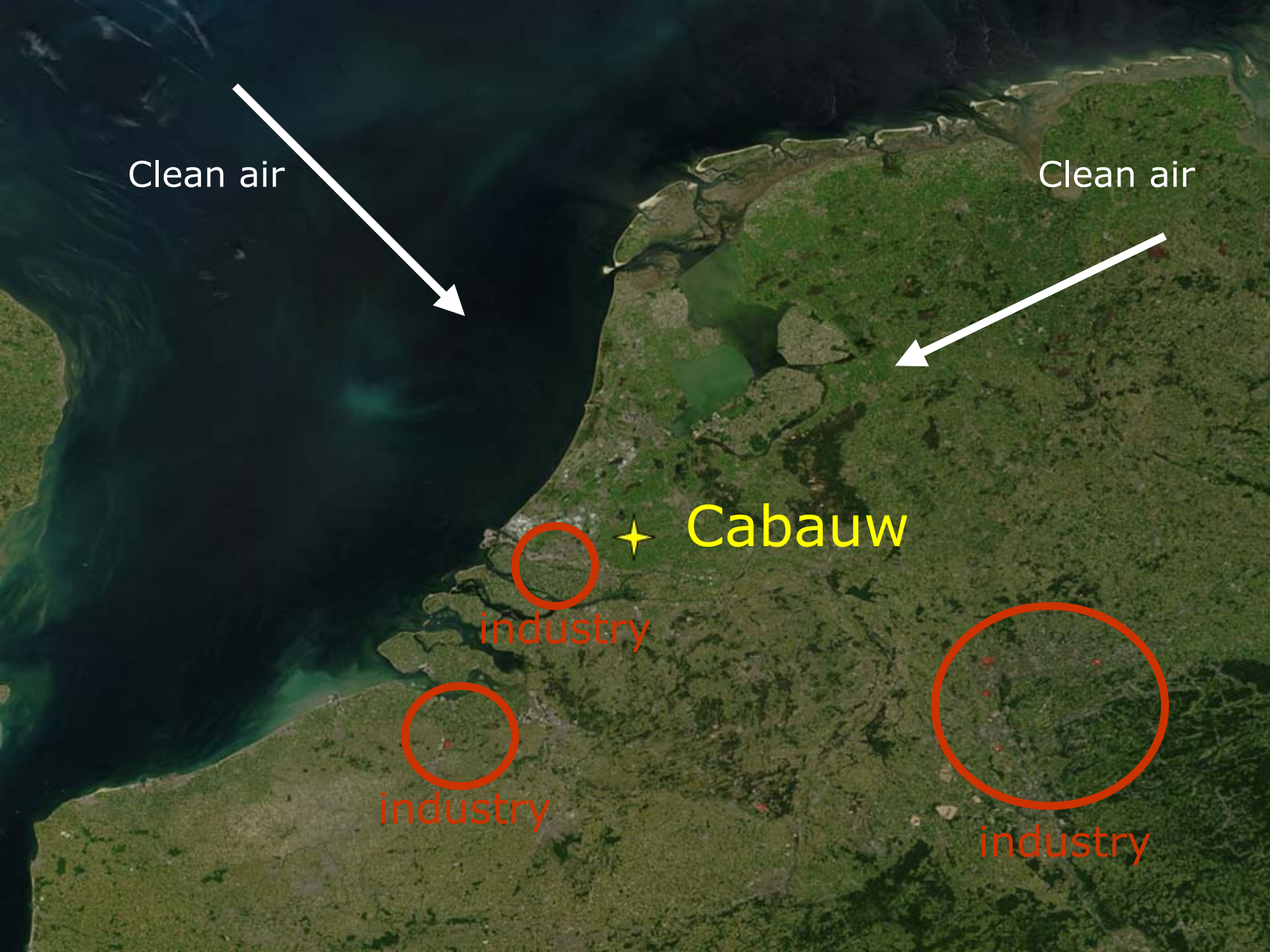
2921 - Using OMI measurements to extend the GOME/SCIAMACHY tropospheric NO2 record. Dr. Andreas Richter, Institut für Umwelt Physik, University of Bremen, Germany

NO2 – System Development

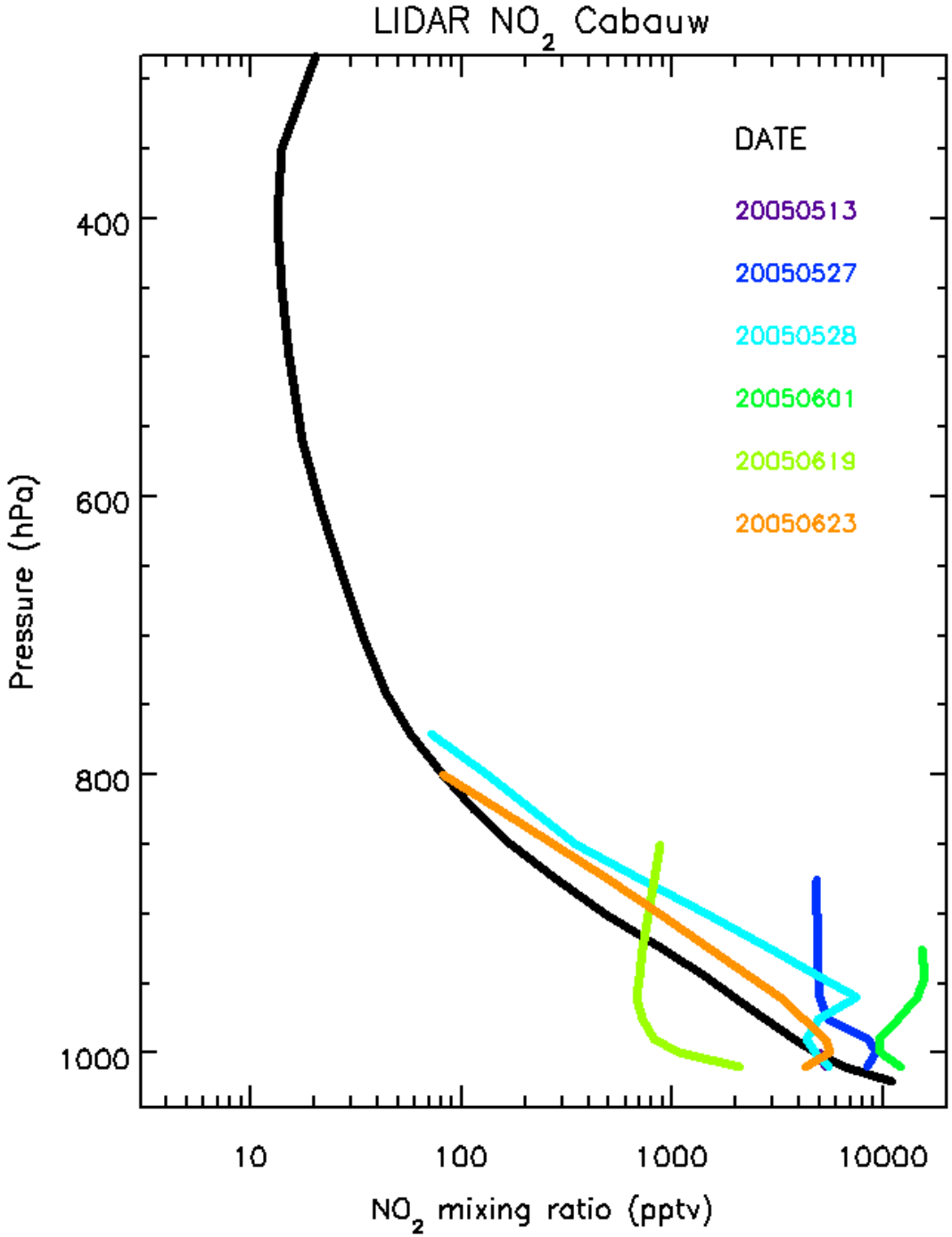


2929 - Validation of tropospheric NO2 measurements from OMI in urban and suburban sites in the UK.
Dr. Paul Monks, University of Leicester, Department of Chemistry, University of Leicester, UK


GEOS-CHEM
-DOAS
MAX-DOAS
0
5
10
15
20 x 10^15 cm^-2


Clean air
Clean air
Cabauw
industry
industry
industry

NO2 - N

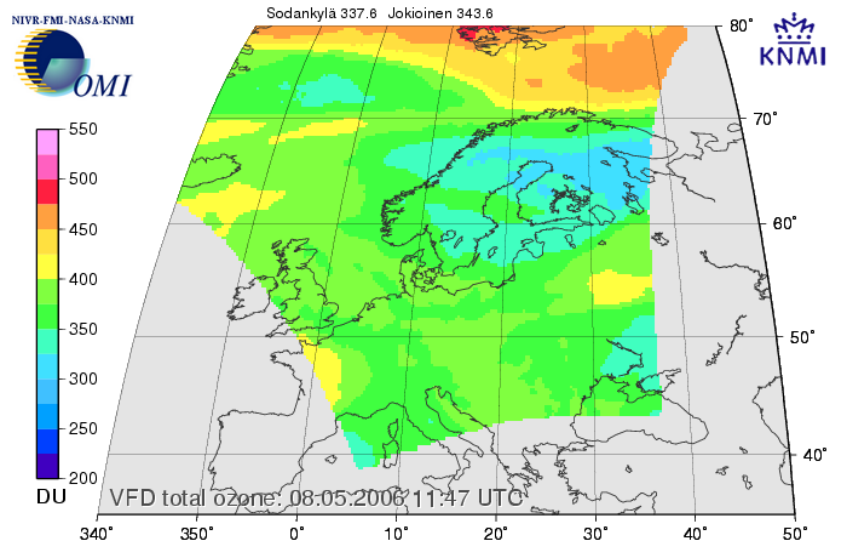

LIDAR NO2 Cabauw
DATE
20050513
20050527
20050528
20050601
20050619
20050623
Pressure (hPa)
400
600
800
1000
10
100
1000
10000
NO2 mixing ratio (pptv)

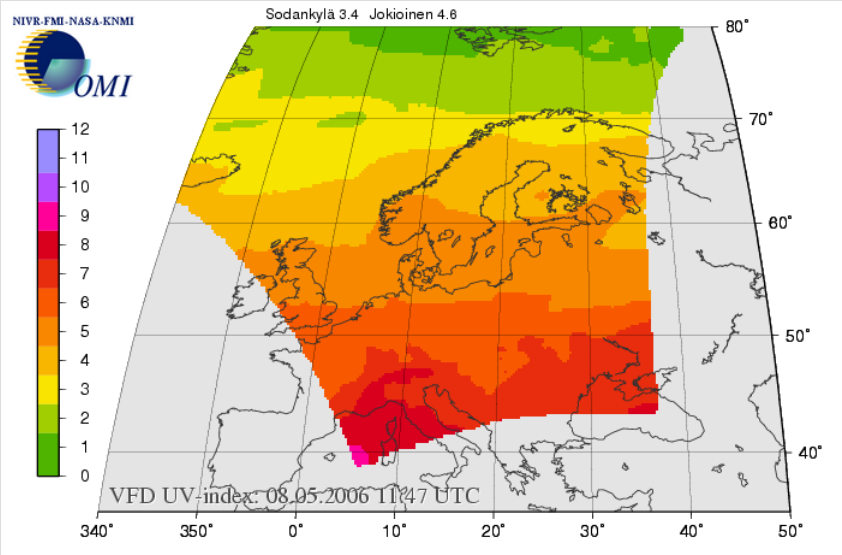
Surface-UV – Very fast Delivery

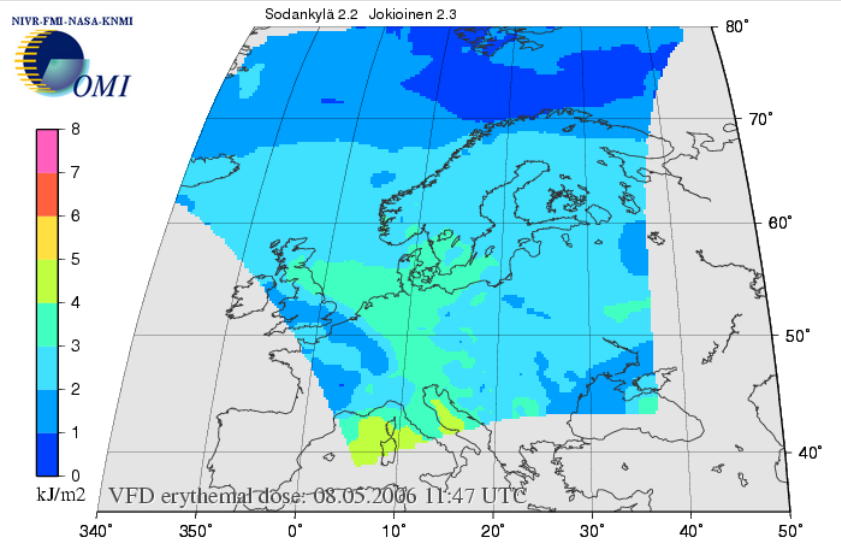
OMI Very-Fast-Delivery has been operational since March 2006

OMI data is received by Direct Broadcast in Sodankylä and is processed immediately after each overpass of the Aura satellite. Distribution plots for total column ozone, UV Index and Erythemal daily dose are published within 30 minutes after the overpass at

http://omivfd.fmi.fi/index_eng.html

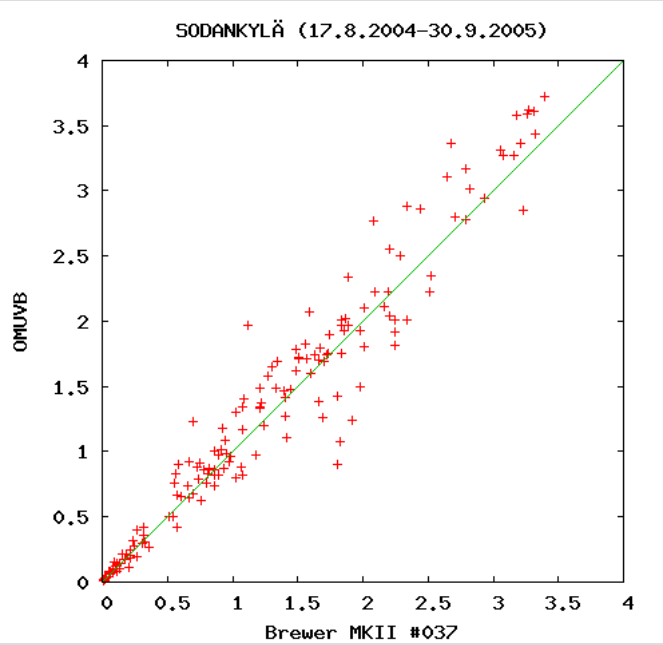






2915 - Validation of the OMI surface UV irradiance products and Finnish contribution to validation of the OMI ozone profile products. Dr. Aapo Tanskanen, Finnish Meteorological Institute, Finland

Surface-UV – Ground Based Validation



Validation Statistics for Daily Doses [kJ/m2]

Validation instrument	***n***	***%Bias***	***%RMS***	***r***
Jokioinen Brewer Mk-III #107	421	3.6%	33%	0.99
Sodankylä Brewer Mk-II #037	175	7.6%	22%	0.97
Toronto Brewer Mk-II #014	262	-3.7%	24%	0.98
Toronto Brewer Mk-III #145	232	-9.4%	25%	0.97
San Diego SUV-100	293	31%	41%	0.95
Ushuaia SUV-100	339	2.6%	25%	0.97
Barrow SUV-100	203	19%	36%	0.94
Palmer	438	7.3%	24%	0.97
Tokyo	251	58%	75%	0.92

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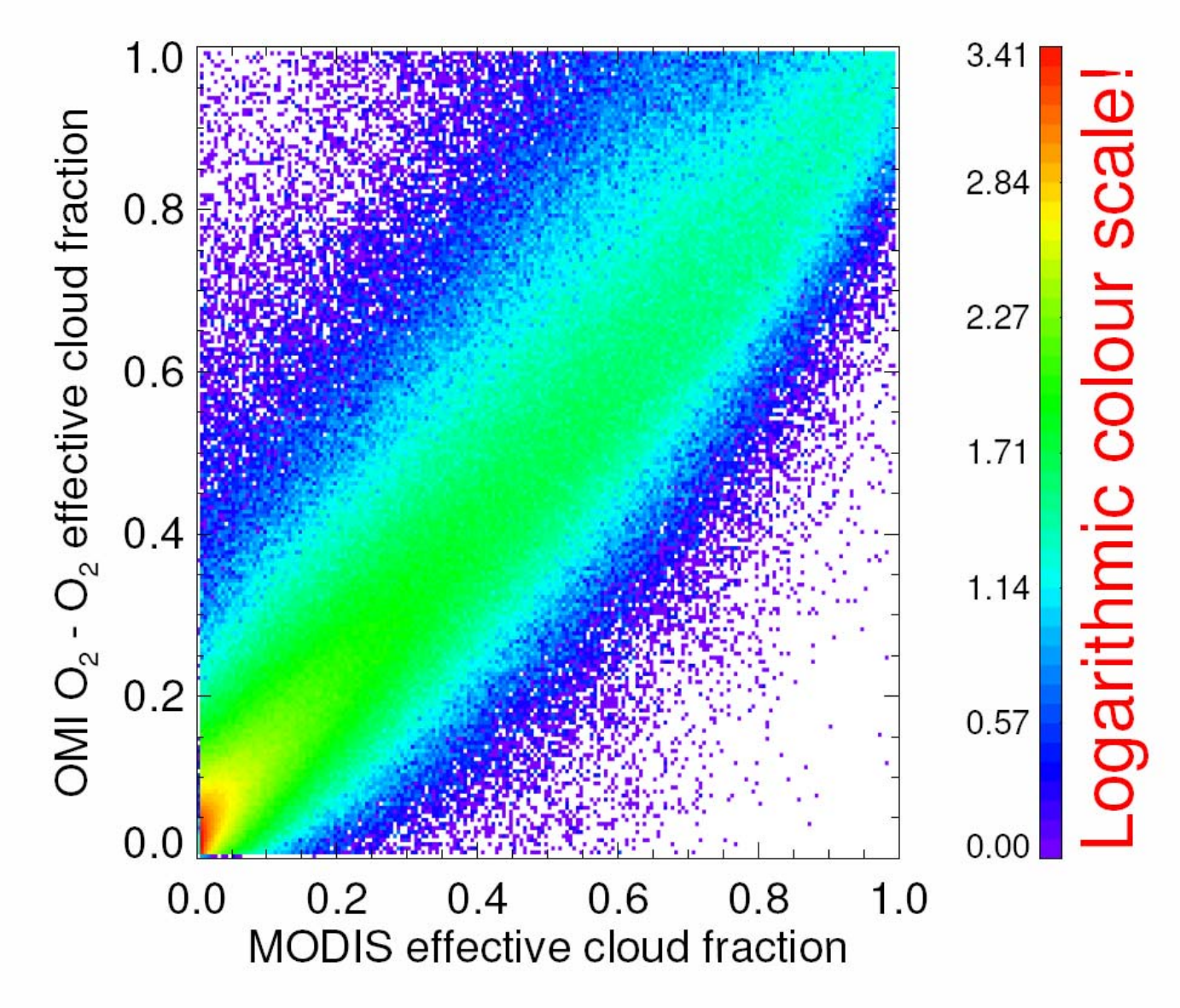
Results – Clouds



2940 - Cloud validation for OMI (OMI-Clouds). Dr. Pieter Stammes, KNMI, De Bilt, The Netherlands

Results – Systems and Networks

Systems

Mini MAX-DOAS (many including KNMI)
MF-DOAS (Leicester)
MAX-DOAS (Bremen, Heidelberg, Brussels)
NO2 Lidar (RIVM)

Networks

BREDOM MAX-DOAS (IUP-Bremen, IUP-Heidelberg)
AERONET
FTIR
SAOZ
Surface-UV
Brewer
Dobson
Umkehr
Sondes

Satellite Instruments

SCIAMACHY (O3, NO2, OClO, HCHO, BrO, CHO-CHO, Aerosols)

Results – People – OMI AO PI's

Dr. Dimitris Balis	LAP	Greece
Dr. Philippe Demoulin	IAG	Belgium
Dr. Fabio Del Frate	TVU	Italy
Dr. Aleksandr N. Gruzdev	IAP	Russian Federation
Dr. Ernest Hilsenrath	GSFC	USA
Prof. Dr. Janusz Krzyscin	IGFPAS	Poland
Dr. Jean-Christopher Lambert	BIRA	Belgium
Dr. Rene Lemoine	KMI	Belgium
Dr. Pieternel F. Levelt	KNMI	Netherlands
Dr. Stefano Migliorini	NERC	United Kingdom
Dr. Paul Monks	LU	United Kingdom
Prof. Dr. Justus Notholt	IUP	Germany
Dr. Andreas Richter	IPU	Germany
Dr. Vincenzo Rizi	CETEMPS	Italy
Dr. Angelina Shavrina	MAO	Ukraine
Dr. Pieter Stammes	KNMI	Netherlands
Dr. Aapo Tanskanen	FMI	Finland
Prof. Dr. Yury Timofeyev	SPB	Russian Federation
Dr. Thomas Wagner	IUP	Germany
Dr. Mark Weber	IUP	Germany
Prof. Dr. Philipp Weihs	BOKU	Switzerland

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