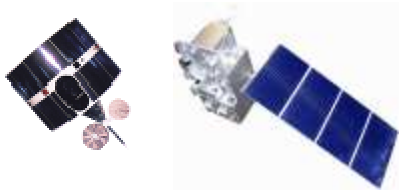


Air Quality Monitoring and Forecasting In China (AMFIC)

P. Zhang, X.Y. Zhang, W.G. Bai, W.H. Wang, F.X. Huang, X.J. Li, L. Sun, G. Wang, J. Qi, H. Qiu, Y. Zhang

National Satellite Meteorological Center/CMA

R.J. van der A c, B. Mijling

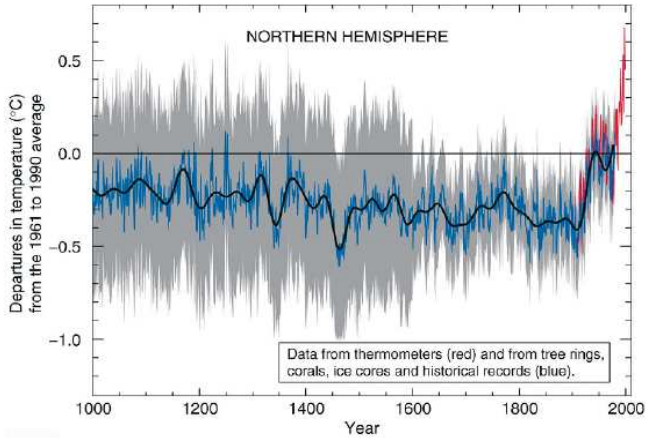
Royal Netherlands Meteorological Institute

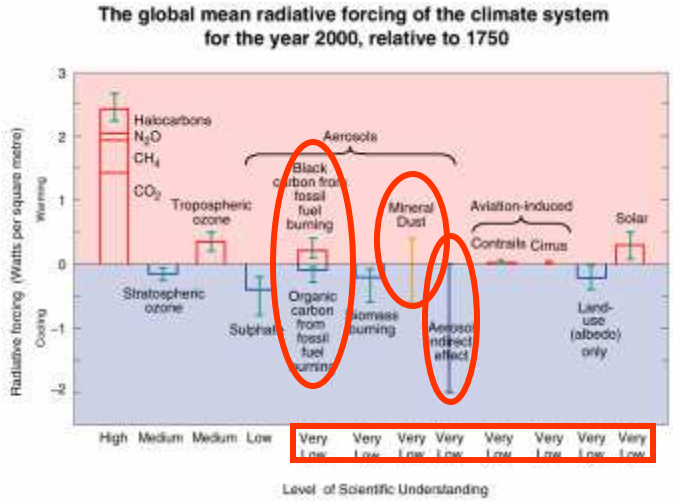
Outline

1. Scientific Background
2. What is AMFIC ?
3. What we got from AMFIC ?
4. Summary

1. Scientific Background

Composition - Climate

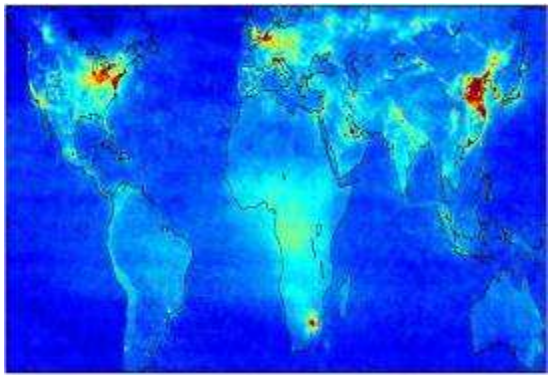


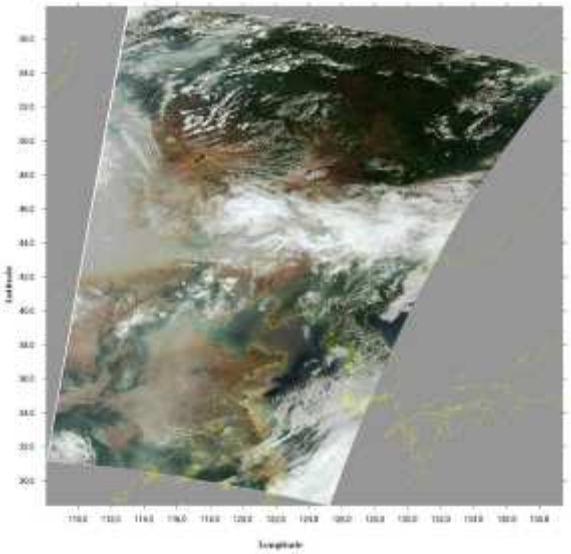


Ozone & Surface UV

- Aerosol
- Radiatively Active Trace Gases
- Chemically Active Trace Gases

Air Pollution





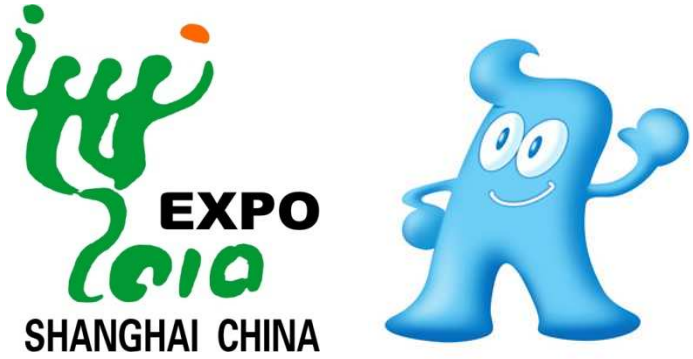
Chemical species	Air Quality	Oxidation Capacity	Climate	Stratospheric Ozone Depletion
O_3	✓	✓	✓	✓
CO	✓	✓		
UV-A j(NO_2)	✓	✓		
UV-B j(O_3)	✓	✓		
H_2O (water vapour)	✓	✓	✓	✓
HCHO	✓	✓		
C_2H_6	✓	✓		
active nitrogen: NO_x = NO+NO_2 *reservoir species*: HNO_3	✓ ✓	✓ ✓	✓	✓ ✓
SO_2	✓	✓	✓	✓
active halogens: BrO, ClO, OClO *reservoir species*: HCl, $ClONO_2$ *sources*: CH_3Br, CFC-12, CFC-11, HCFC-22				✓ ✓ ✓
aerosol optical properties	✓		✓	✓
CO_2			✓	
CH_4		✓	✓	✓

Targeted Variables IGACO

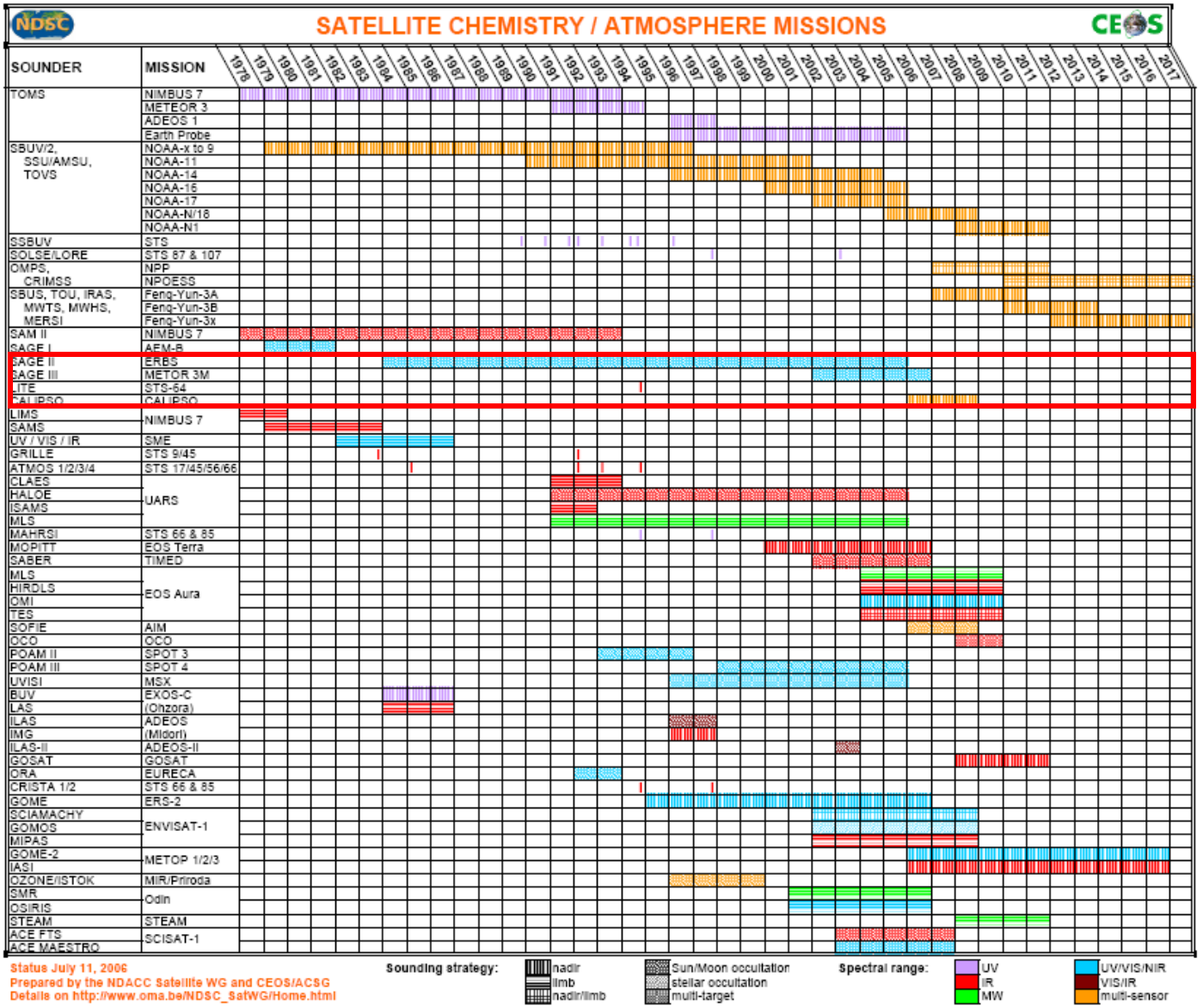
Group 1 & Group 2

Policy In China

- Chinese Government sign the agreement on the Kyoto Protocol
- Beijing Olympics: an environment-friendly Olympics (Green Olympics)
- Shanghai Expo: Better City, Better Life



Satellite Chemistry/Atmosphere Missions

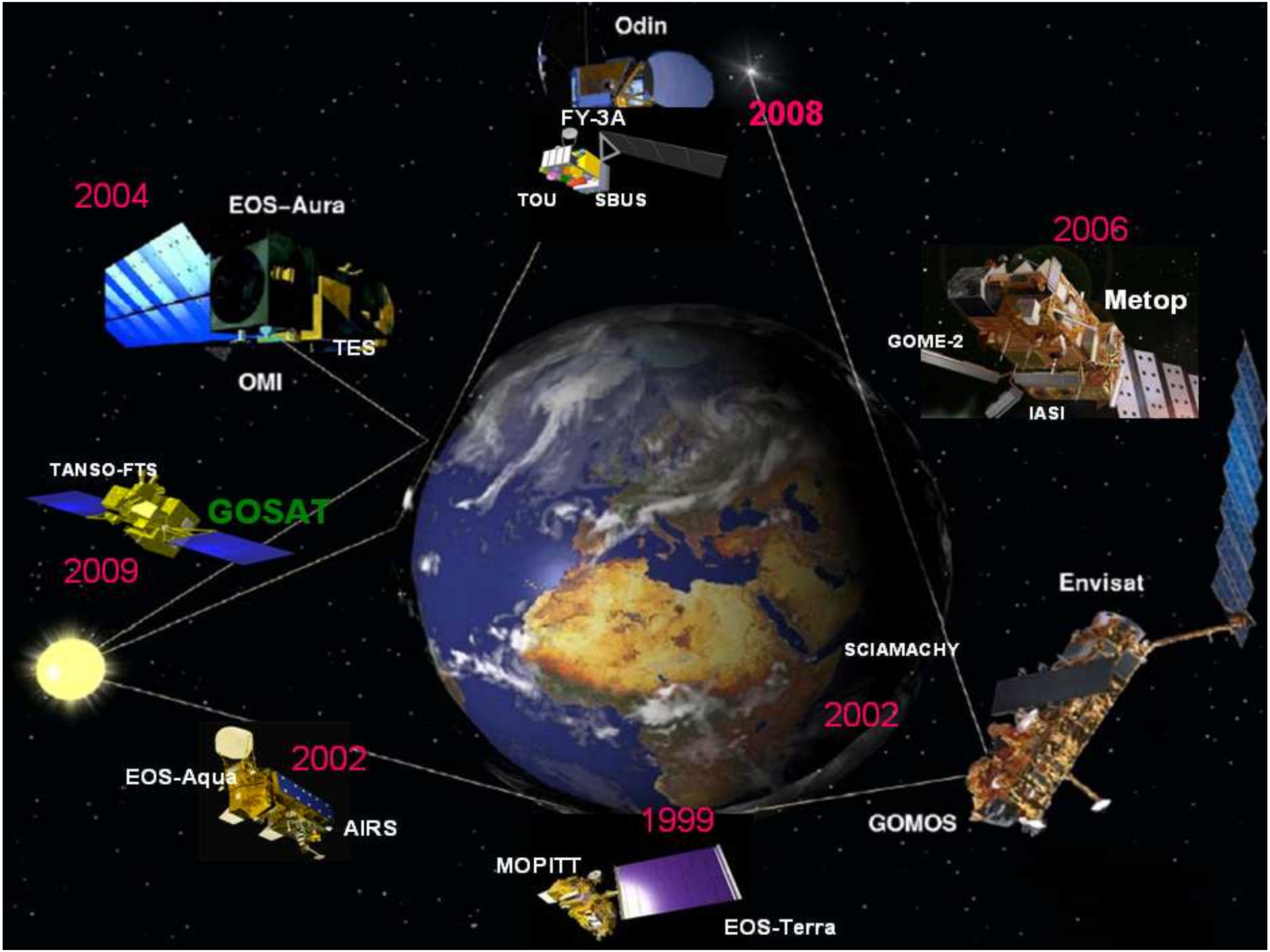


FY-3A

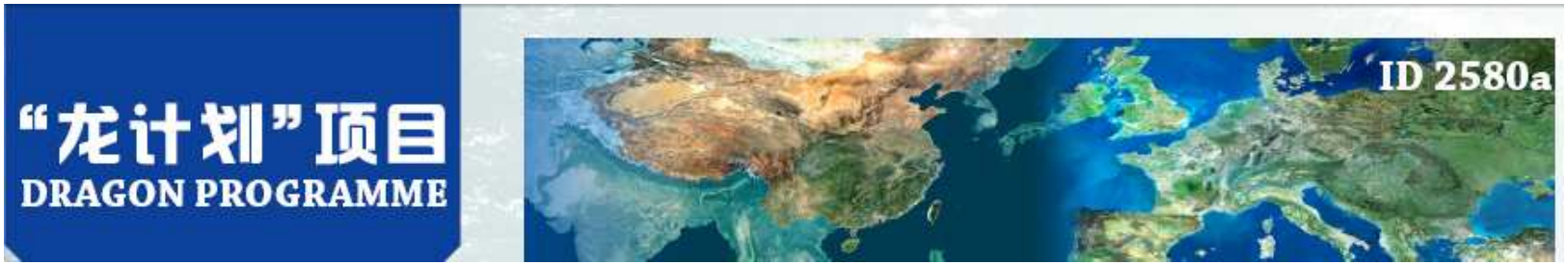
Aura

Envisat

Metop


Odin
FY-3A
2008
TOU
SBUS
2004
EOS-Aura
TES
OMI
2006
Metop
GOME-2
IASI
TANSO-FTS
GOSAT
2009
Envisat
SCIAMACHY
2002
2002
EOS-Aqua
AIRS
1999
MOPITT
EOS-Terra
GOMOS

- Dragon I 2004 - 2008
- Dragon II 2008 - 2012

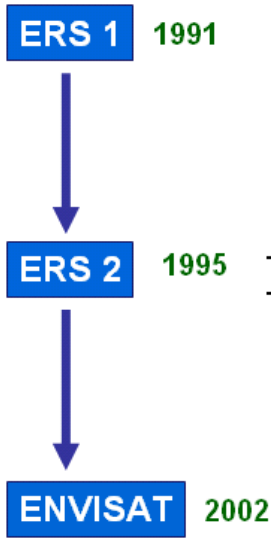


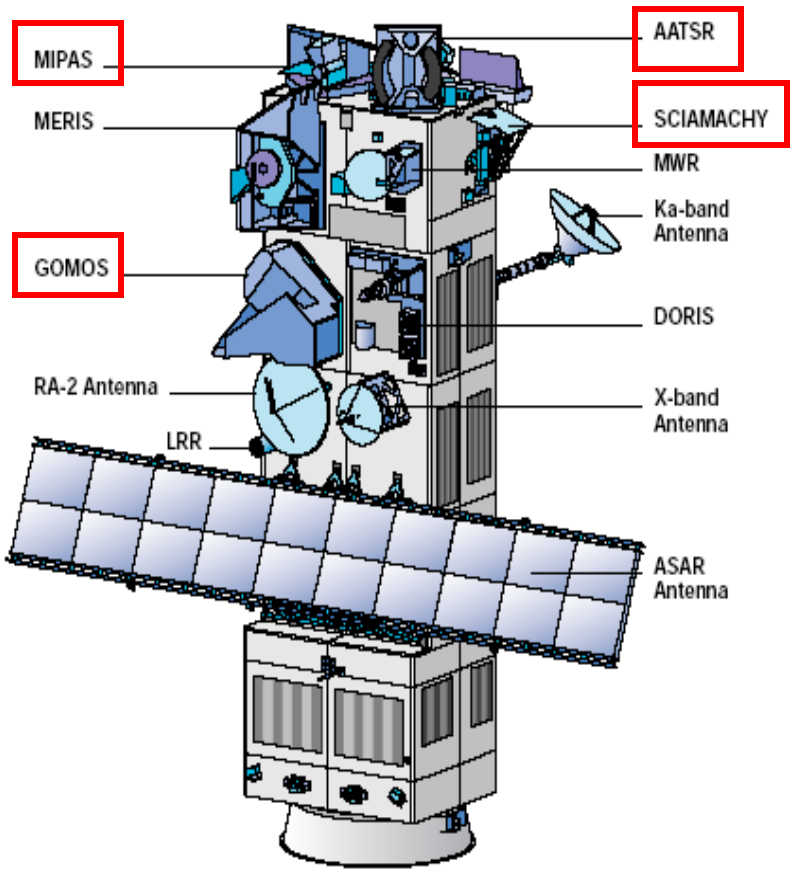
:: DRAGON PROJECT ID 2580

Air Quality Monitoring and Forecasting in China

Prof. Hennie Kelder, e-mail: Kelder@knmi.nl
Dr. Zhang Peng, e-mail: zhangp@nsmc.cma.gov.cn

Prof. John Burrows, Prof. Gerrit de Leeuw, Dr. Zhao Fangsheng, Dr. JianZhong Ma, Dr. Zhang Peng, Dr. Qiu Hong, Dr. Paul Simon, Dr. Ronald van der A, Dr. Roeland van Oss





Atmospheric Composition monitoring by ENVISAT

Scientific Research Progress

- Symposium
- Joint proposal
- Joint Workshop
- Scientists Exchange

图 12 中国－欧盟合作“龙计划”学术会议
The 4th dragon symp2007 in France

图 13 中国－欧洲国际合作项目AMFIC
AMFIC project meeting in France

图 14 中国－比利时合作项目专家论证会
Cooperation between the Belgian Institute for Space Aeronomy (BIRA-IASB) and National Satellite Meteorological Center (NSMC/CMA)

- FP6-2005-Space-1: 2007 – 2009
- PI: Ronald van der A

Contract Preparation Forms

EUROPEAN COMMISSION

6th Framework Programme on Research, Technological Development and Demostration

Specific Targeted Research or Innovation Project

A1

Proposal Number	030940	Proposal Acronym	AMFIC

GENERAL INFORMATION ON THE PROPOSAL

Proposal Title	*Air quality Monitoring and Forecasting In China*		
Duration in months	*24*	*Call (part) identifier*	*FP6-2005-Space-1*
Activity code(s) most relevant to your topic			
Keyword code 1			
Keyword code 2			
Keyword code 3			
Free keywords			

Abstract (max. 2000 char.)

AMFIC addresses atmospheric environmental monitoring over China. The aim is to develop an integrated information system for monitoring and forecasting tropospheric pollutants over China. The system uses satellite and in situ air quality measurements and modelling to generate consistent air quality information over China. The data will cover the recent years and the actual situation including an air quality forecast for several days ahead. Air pollutants covered are ozone, nitrogen dioxide, sulphur dioxide, formaldehyde, carbon monoxide, methane and aerosol/particular matter.
The proposed system will supplement and broaden the existing ground-level monitoring and air quality assessment activities in China. Satellite data will cover regions where no ground-based stations are available; air quality models fill-in the sparse temporal and spatial sampling of the measurements and connect them in a physically consistent manner.
The system targets environmental agencies in China, some of whom are participating in AMFIC, and assists them in their reporting duties on air quality. A case study for the city of Shenyang will be demonstrated. The proposed project will also improve our understanding of the transport of air pollution within, from and to China. AMFIC builds on aspects of the ESA GMES Atmosphere Service Element PROMOTE which has a strong potential for providing the European atmospheric monitoring contribution to GEOSS.

2. What is AMFIC ?

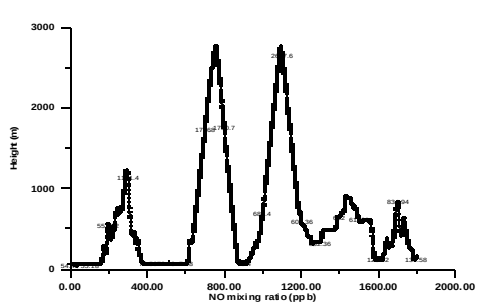
- KNMI Royal Netherlands Meteorological Institute, **Netherlands** (PI)
- BIRA-IASB Belgium Institute for Space Aeronomy, **Belgium**
- VITO Flemish institute for technological research, **Belgium**
- DUTH Democritus University of Thrace, **Greece**
- NOA National Observatory of Athens, **Greece**
- LAP-AUTH Lab. of Atmospheric Physics, **Greece**
- FMI Finnish Meteorological Institute, **Finland**
- IFE University of Bremen, **Germany**
- NSMC National Satellite Meteorological Center, **China**
- IAP-CAS Institute of Atmospheric Physics, **China**

AMFIC

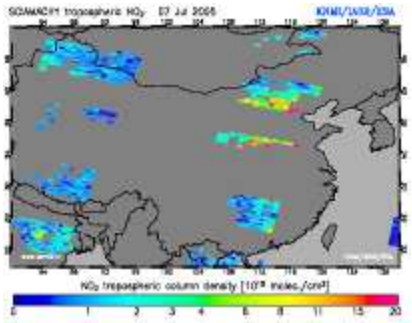
Air quality **M**onitoring and **F**orecasting **I**n **C**hina

AMFIC

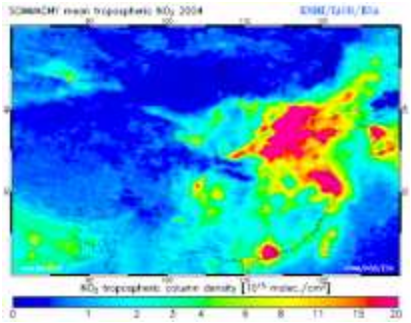
- AMFIC addresses **atmospheric environmental** monitoring over China.
- The system uses **satellite** and **in situ** air quality measurements and **modelling** to generate consistent air quality information over China.
- The data will cover the recent years and the actual situation including an **air quality forecast** for several days ahead.
- The aim is to develop **an integrated information system** for monitoring and forecasting tropospheric pollutants over China.
- Air pollutants covered are **ozone**, **nitrogen dioxide**, **sulphur dioxide**, **formaldehyde**, **carbon monoxide**, **methane** and **aerosol/particular matter**.



In-Situ



Satellite



Model

Objectives

- Monitoring air pollutants over China
  - Focused on SO_2, O_3(smog), NO_2, CO, CH_4, HCHO and aerosols
- Regional modeling of air quality
  - Nested model on city level (test case Shenyang)
- Validation of model and measurement results
  - Extensive number of ground observations available
- Forecasting of air quality China
  - 2 day forecast for air pollutants in the heavy populated east of China
- User service (in line with INSPIRE directives)

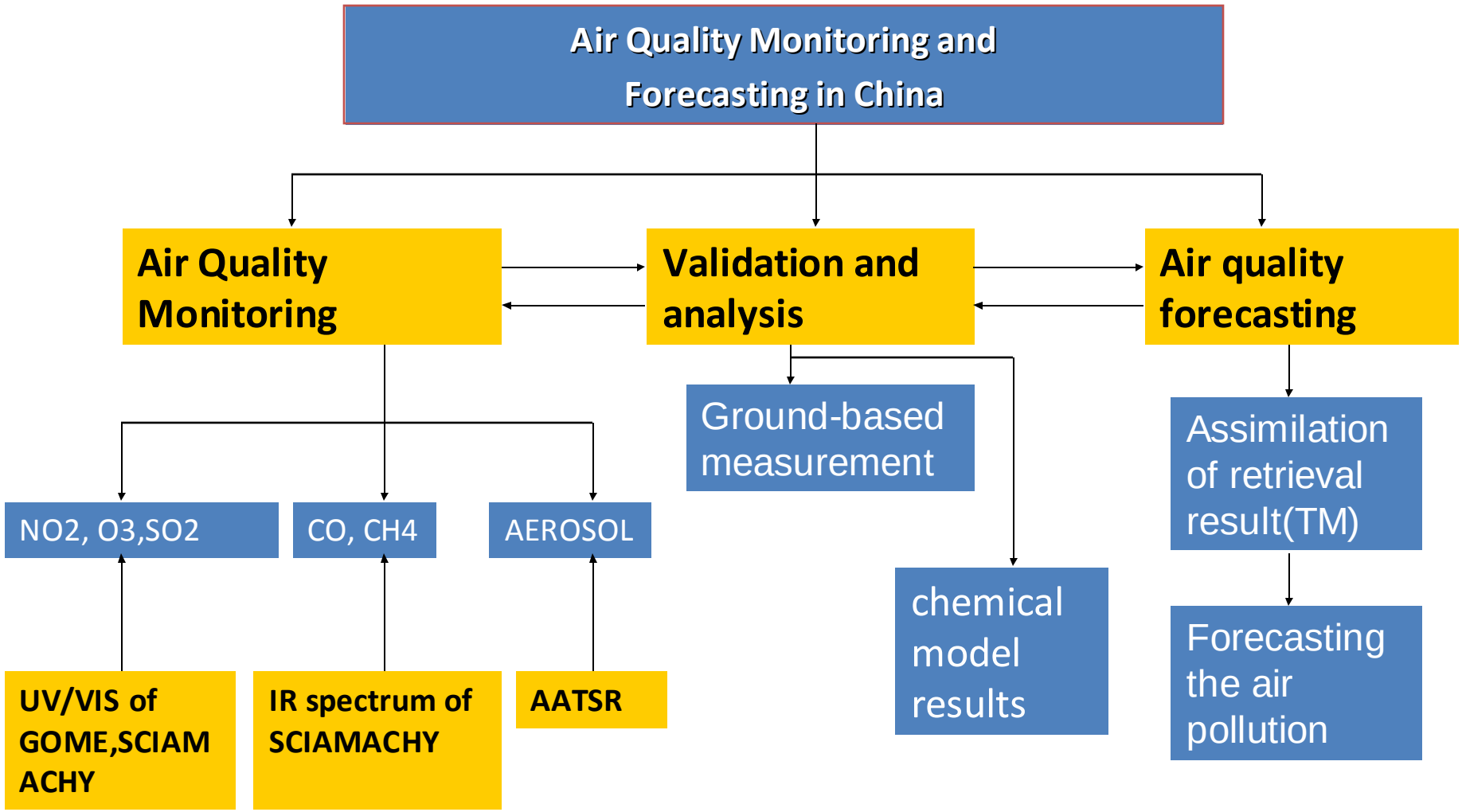
Advantage of AMFIC

The proposed system will supplement and broaden the existing **ground-level** monitoring and air quality assessment activities in China. **Satellite** data will cover regions where no ground-based stations are available; **air quality models** fill-in the sparse temporal and spatial sampling of the measurements and connect them in a physically consistent manner.

Practice of AMFIC

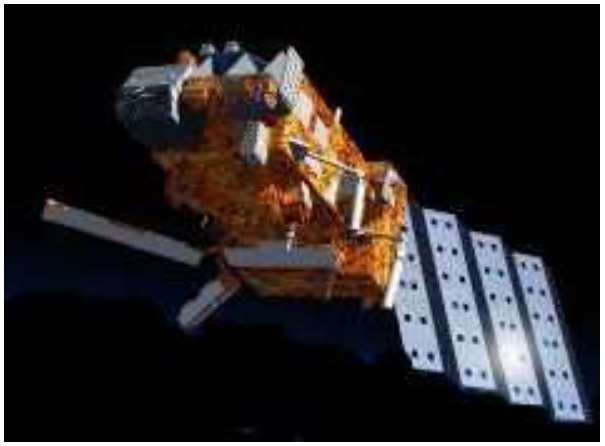
The system **targets environmental agencies in China**, some of whom are participating in AMFIC, and assists them in their reporting duties on air quality. A case study for the city of **Shenyang will be demonstrated**. The proposed project will also improve our understanding of the transport of air pollution within, from and to China. AMFIC builds on aspects of the ESA GMES Atmosphere Service Element PROMOTE which has a strong potential for providing the European atmospheric monitoring contribution to GEOSS.

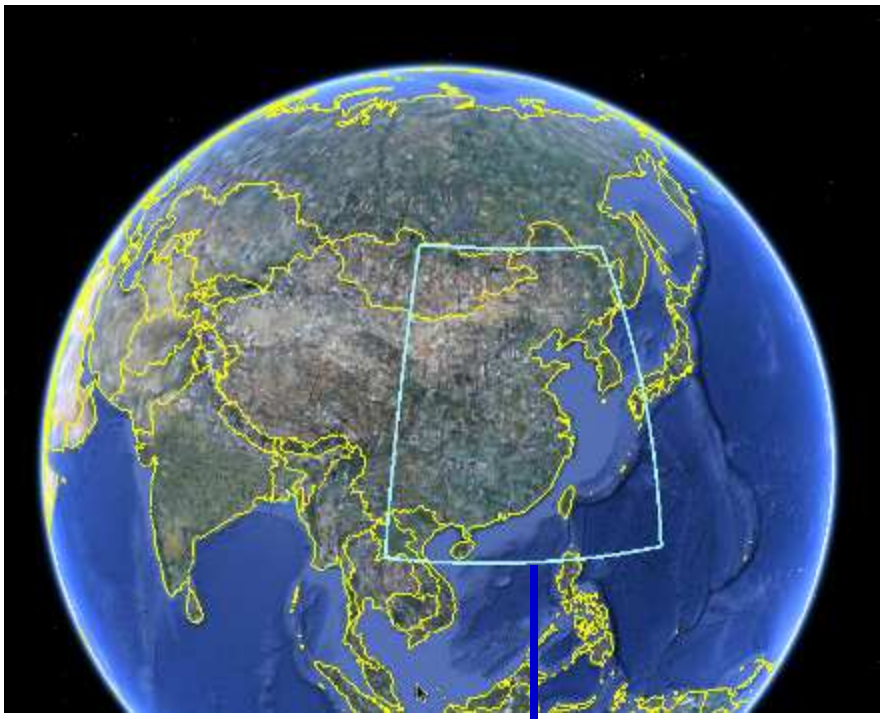
AMFIC Infrastructure



Satellite products

- **GOME / SCIAMACHY / OMI**
  UV/VIS retrievals (KNMI, BIRA-IASB)
  - Tropospheric O_3
  - Tropospheric NO_2
  - SO_2
  - Formaldehyde (CH_2O)
- **SCIAMACHY**
  IR retrievals (IFE)
  - CH_4, CO and CO_2
- **ATSR** (FMI, IAP-CAS, NSMC)
  - Aerosols





CHIMERE
0.25°×0.25°

Global Numerical Weather Forecasting Model: ECMWF to provide the meteorological condition

Regional Air Quality Model: CHIMERE (0.25×0.25°)

Emission Database: INTEX-B 2006 (Zhang and Streets)

Chinese Partners In AMFIC

- National Satellite Meteorological Center

  (NSMC/CMA: Dr./Prof. Zhang Peng)

- Chinese Academy of Meteorological Sciences

  (CAMS/CMA: Dr./Prof. Zhang Xiaoye)

- Anhui Institute of Optical and Fine Machine

  (AIOFM/CAS: Dr./Prof. Liu Wenqing/ Dr. Liu Jianguo)

- Environmental Science and Engineering Department, Fudan University

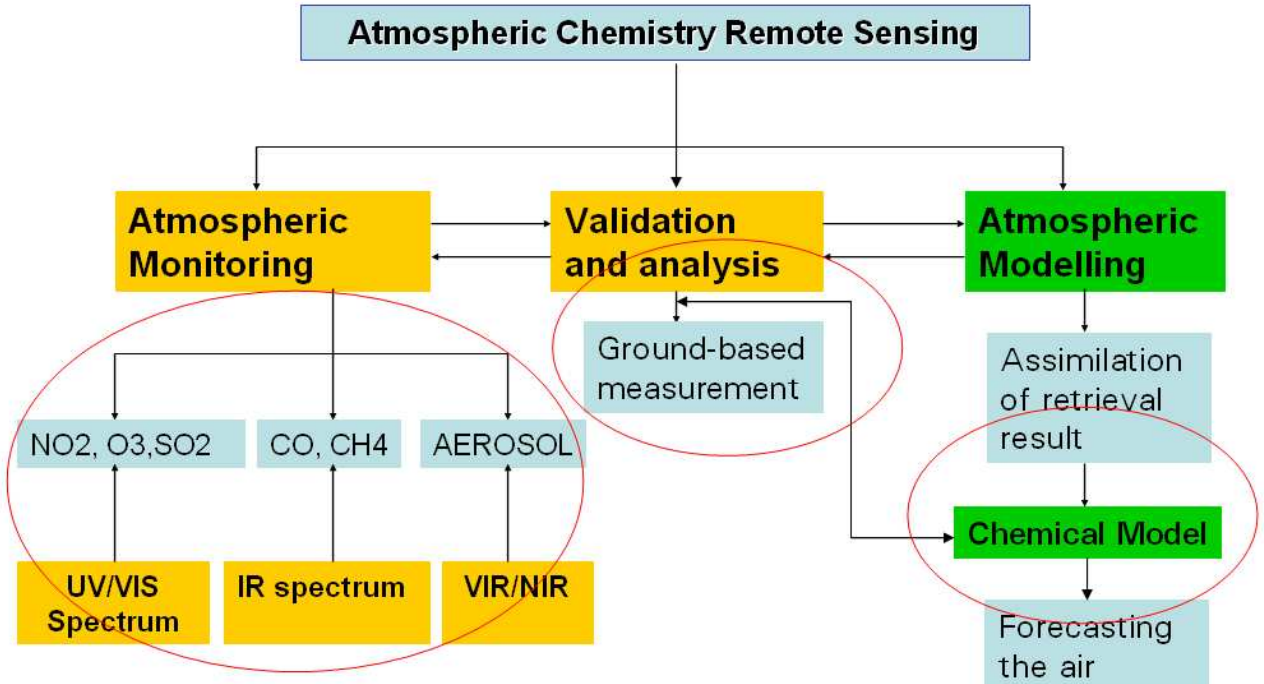
  (Dr./Prof. Chen Jianmin, Dr. Cheng Tiantao)

- Institute of Atmospheric Physics, Chinese Academy of Sciences

  (IAP/CAS: Dr./Prof. Liao Hong)

Involved Activities in China

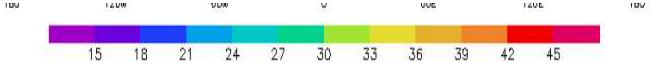
1) In-situ measurement（SO2, NO2 , O3， CO）
2) Ground-based Remote Sensing（SO_2, NO_2 , O_3， CO）
3) Chemical Transportation Model
4) Retrieval Algorithm (Aerosol, SO2, NO2 , O3)



Courtesy to Ronald van der A (KNMI)

3. What we got from AMFIC ?

- Satellite Retrieval Algorithm Development
- Satellite Product Validation with in-situ Measurements
- Temporal and Spatial Trend of Atmospheric Composition over China from Satellite Products
- Satellite Data Assimilation into Regional Air Quality Model
- Air Quality Forecasting and Demonstration over China



Satellite Retrieval Algorithm Development

- Atmospheric Profile
- Total Ozone Amount
- Ozone Profile
- Aerosol
- Dust
- NO_2

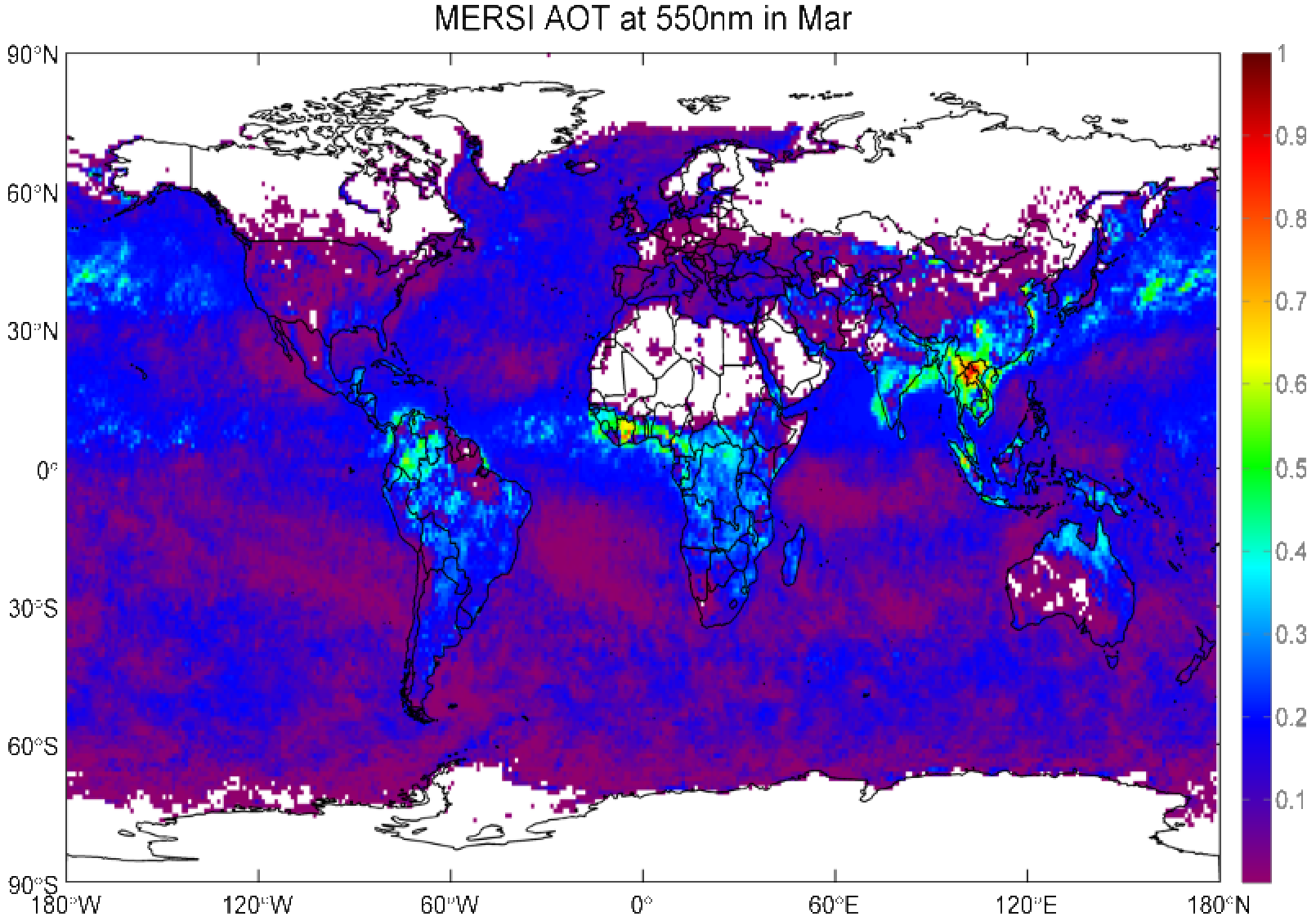
developed

- SO_2
- CH_4
- CO_2
- CO

on going

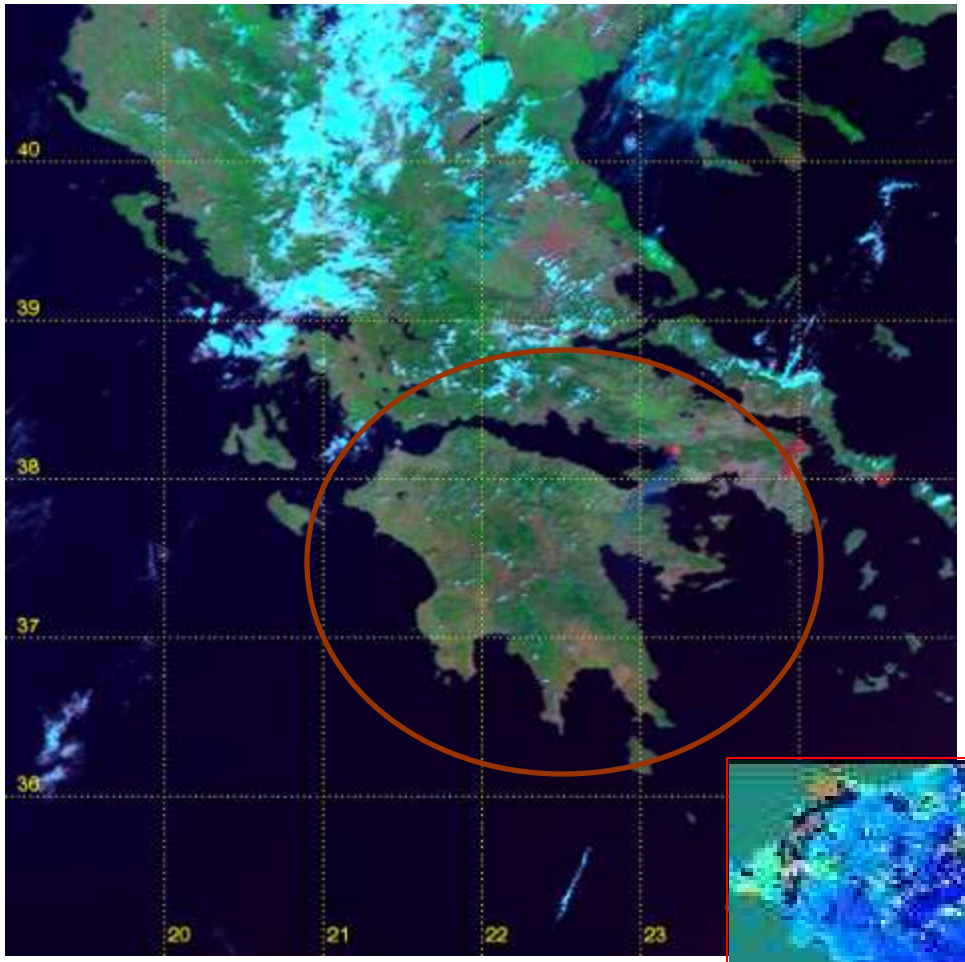
11 instruments on board FY-3A/B, including:
VIRR: Visible and Infra-Red Radiometer
MERSI： Medium Resolution Spectral Imager
IRAS： Infrared Atmospheric Sounder
MWTS： MicroWave Temperature Sounder
MWHS: MicroWave Humidity Sounder
MWRI: MicroWave Radiation Imager
SBUS: Solar Backscatter Ultraviolet Sounder
TOU: Total Ozone mapping Unit
SIM: Solar Irritation Monitor
ERM: Earth Radiation Monitor
SEM: Space Environment Monitor

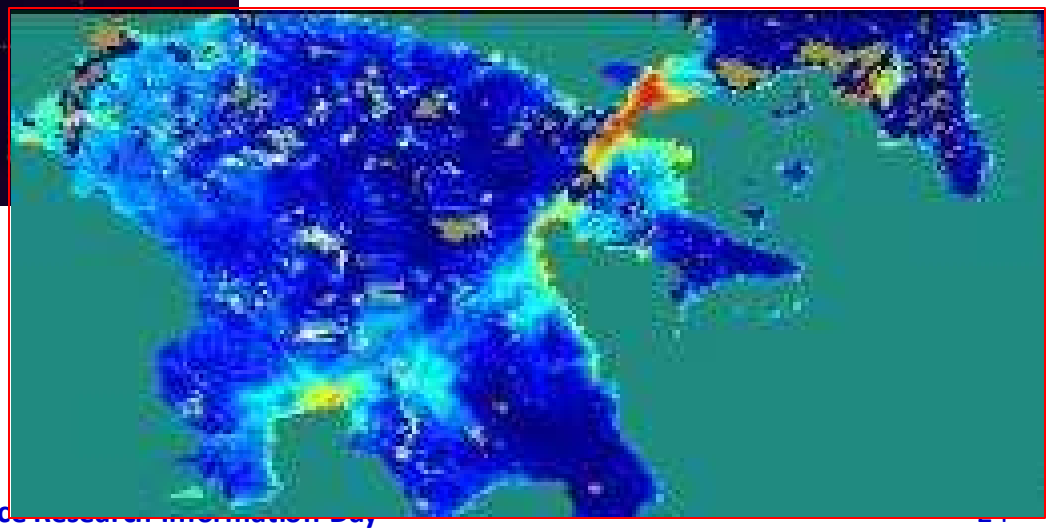
AOD Month Average Global from MERSI/FY-3A



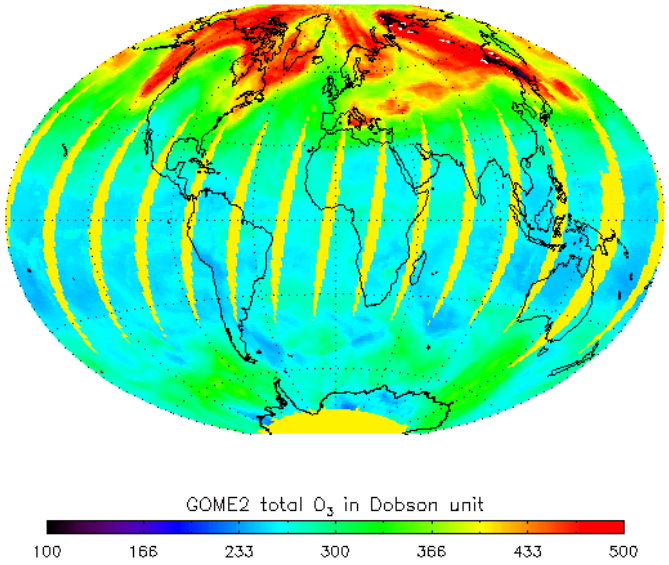
Greece Forest Fire

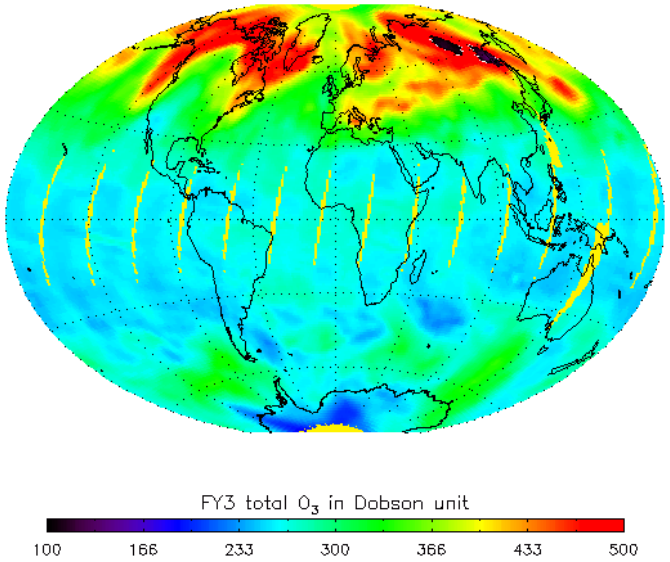
August 24, 2009

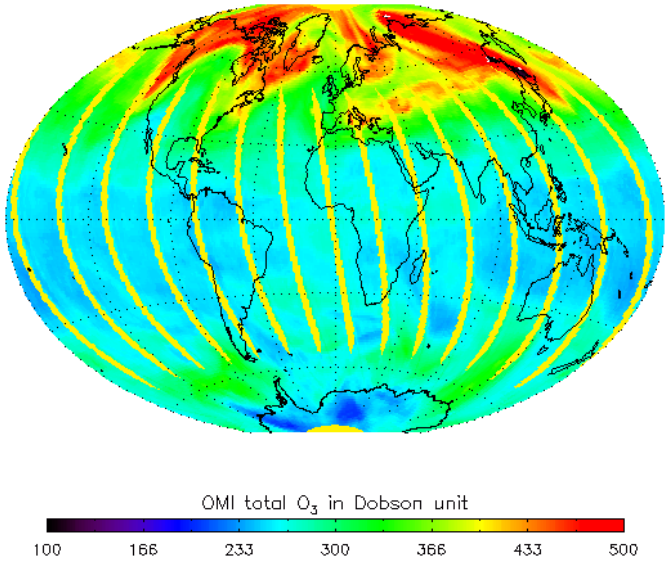


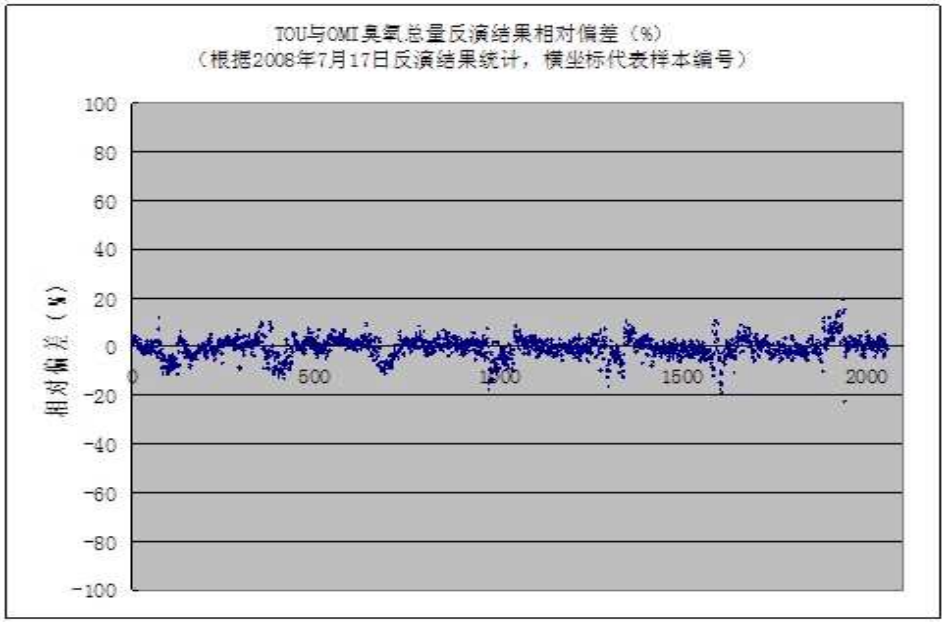


Ozone Product Comparison





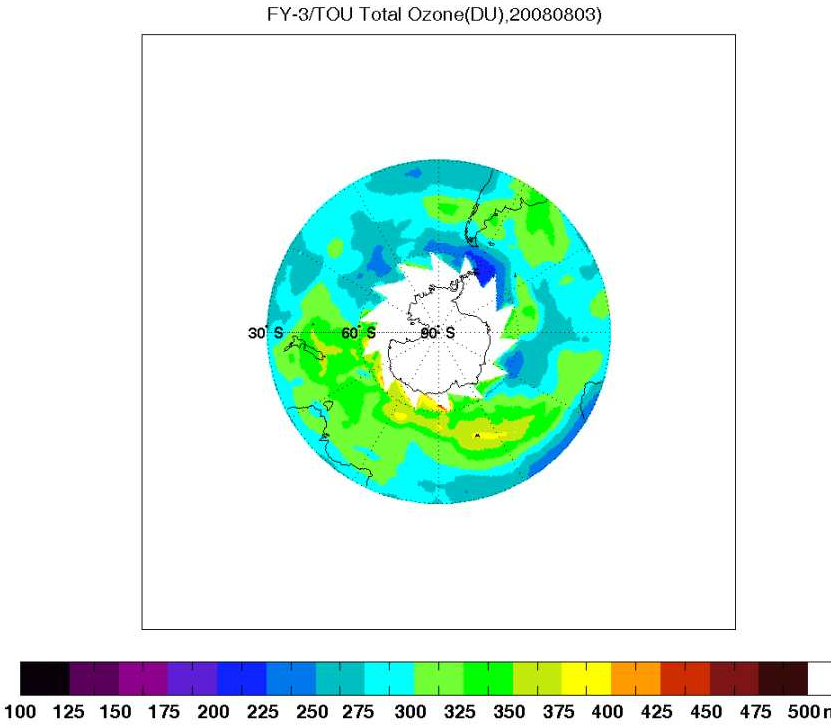




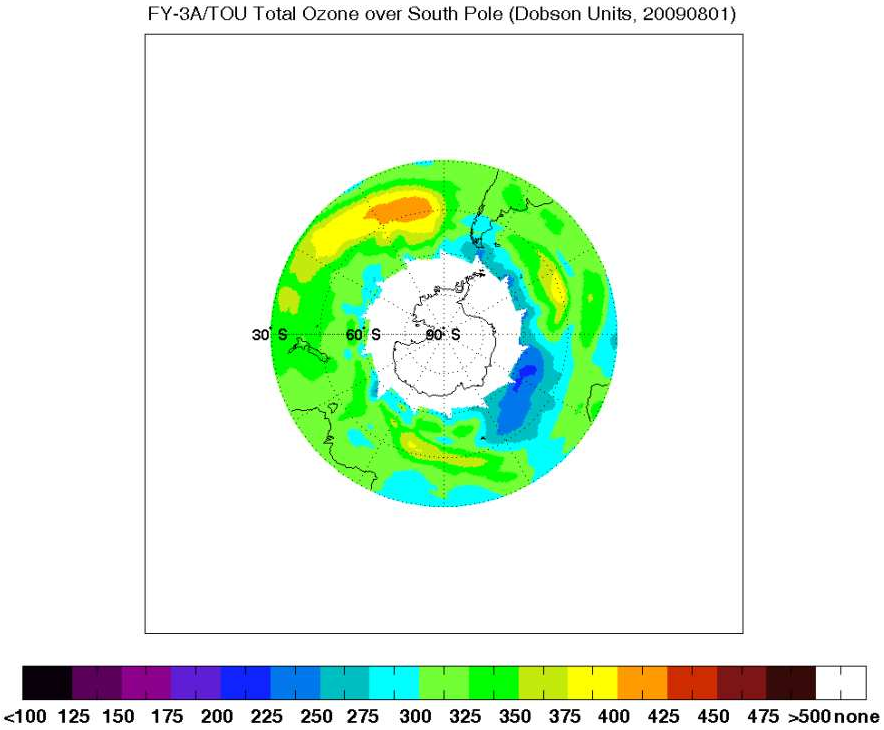
ear

Ozone hole Monitoring from TOU/FY-3A

From 300 DU decrease to lower than 100 DU

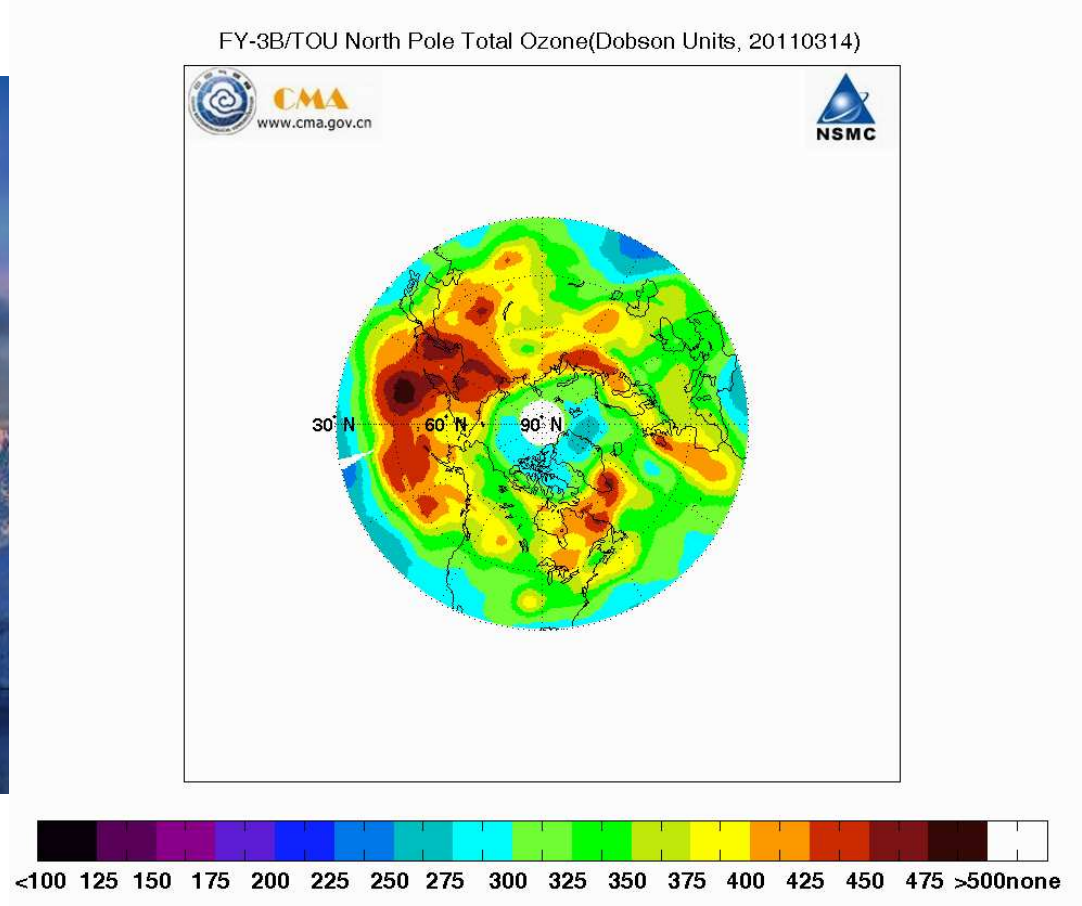


Year 2008



Year 2009

Ozone hole near the arctic area

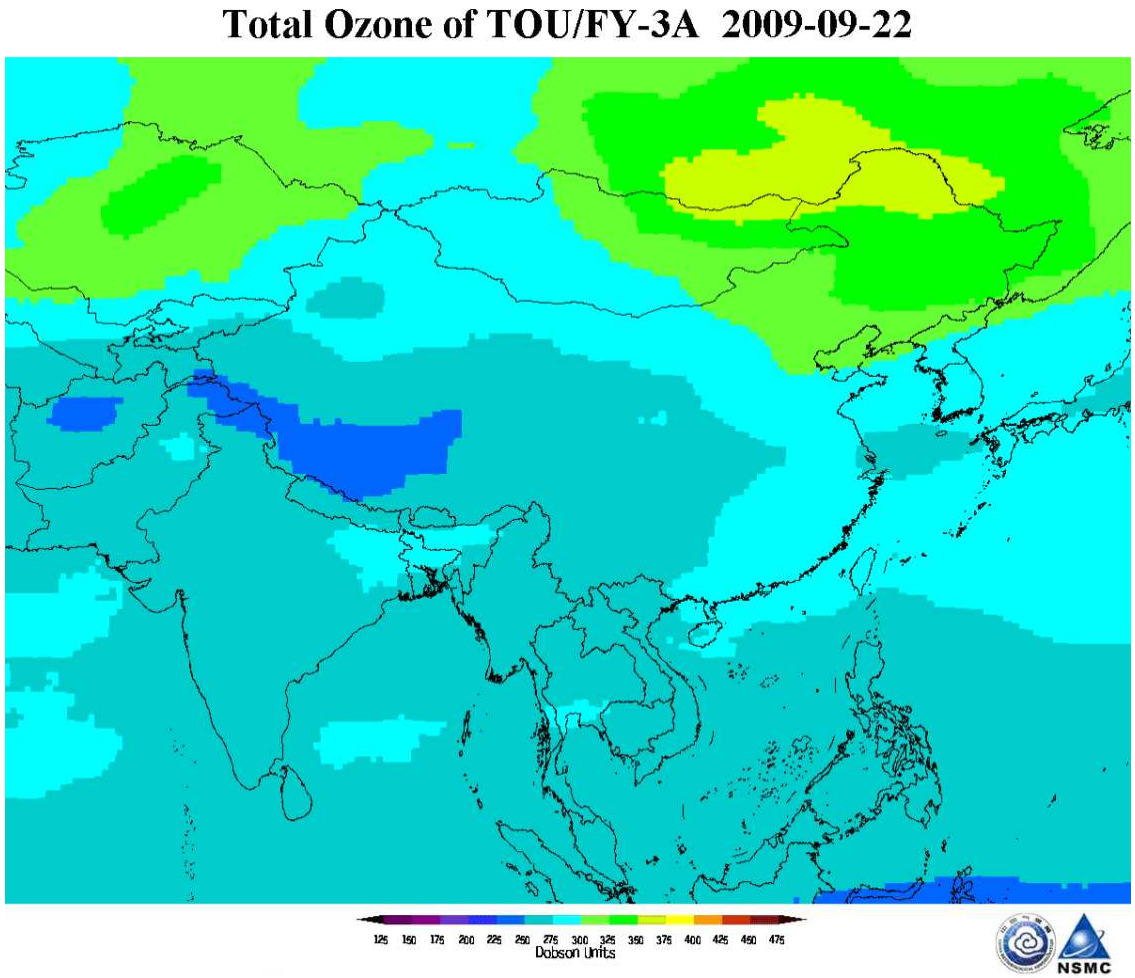


Polar stratospheric clouds

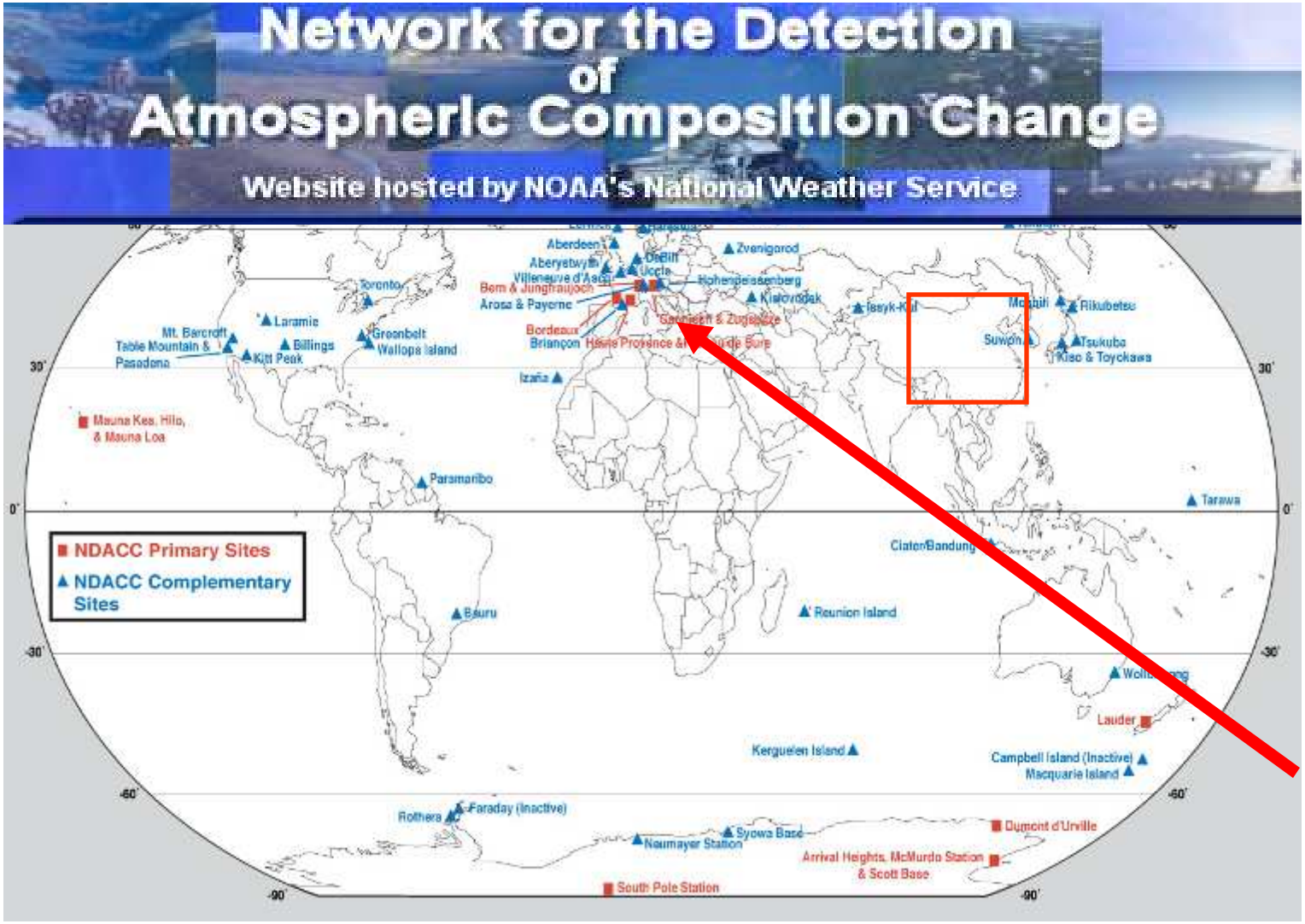
Total ozone amount

polar stratospheric clouds generated by polar vortex release **Halogen atoms**

Ozone valley in Tibetan Plateau



Satellite Product Validation ------ blank area in China



More than 70 sites over the world

Ground-based remote sensing for air quality

AMFIC STATIONS:

- One FTIR station in NSMC/Beijing (long-term)
- Three MaxDOAS station (long-term)

  Beijing, Anhui, Shanghai
- 10 stations in BEIJING for Olympic campaign- MaxDOAS

  (Short-term: July 2008-September 2008)
- Four GAW stations - Thermo and Brewer spectrophotometers (long-term)

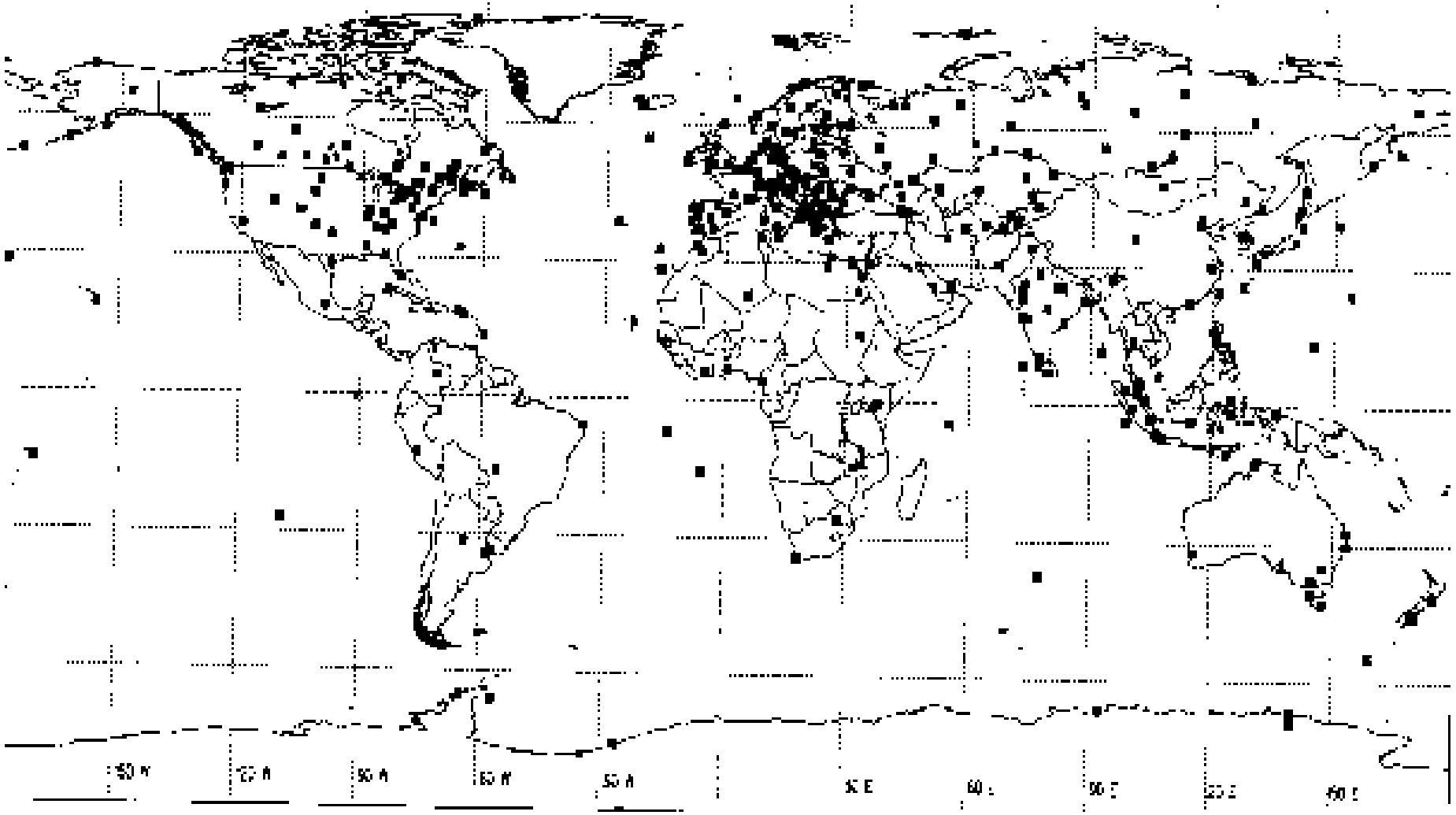
  Waliguan, LinAn, ShangDianZi and LongFengShan

  } Operated by CAWAS
- 28 CE-318 stations for AOD (long-term)

Products:

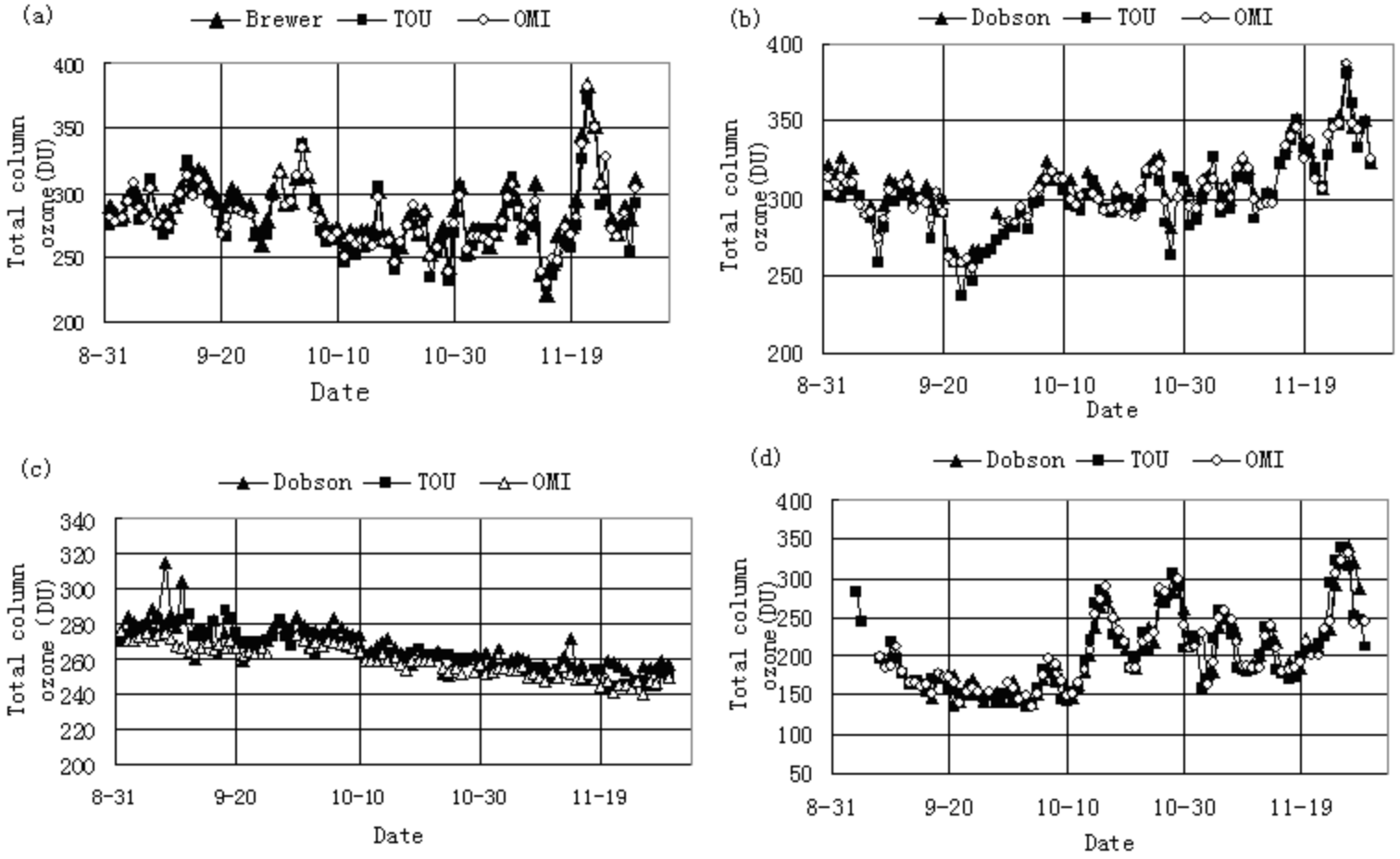
- Vertical Column amounts of O_3, NO_2 , SO_2 etc
- AOD
- Vertical Column amounts and profile of CO,CH_4, N_2O etc

In-Situ Measurements from Ground Stations



Four GAW stations-**Thermo**

FY-3A/TOU, OMI O_3 product validation



Ground Based Remote Sensing by hyperspectral Radiometer

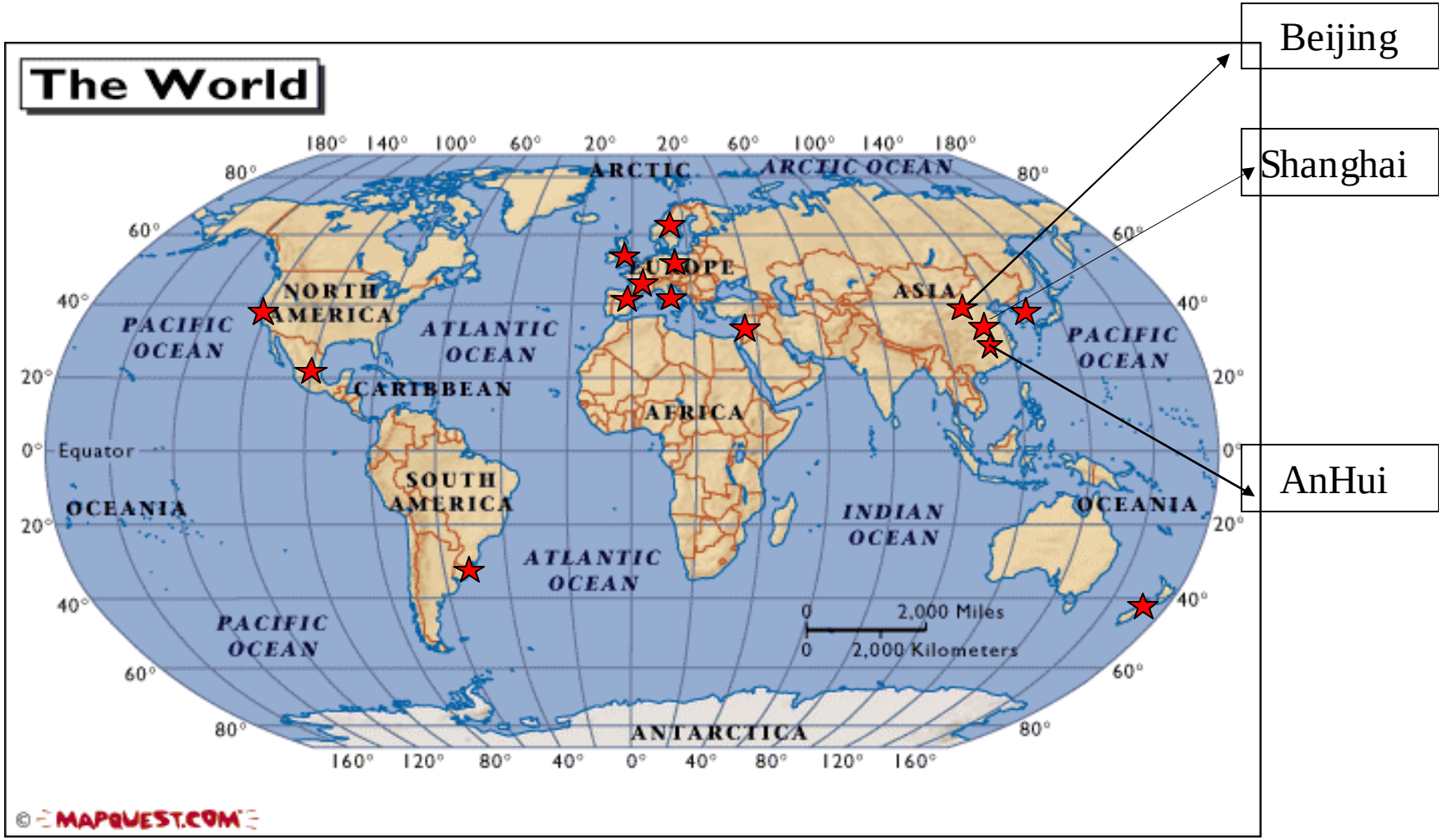
Ultraviolet

Thermal Infrared

Main parameters of MAX-DOAS and FTIR

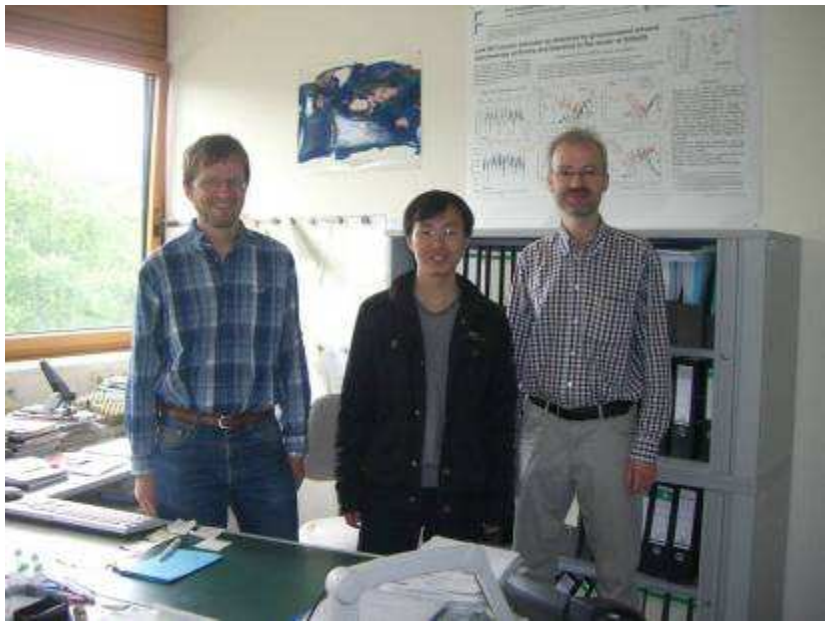
Instrument Type	MAX-DOAS	FTIR
Manufacture	Germany BRUKER	China AIOFM/CAS
Measured Spectrum	700 - 5000cm^{-1} (IR/NIR)	300 – 700nm (UV/VIS)
Spectral Resolution	0.0035 cm^{-1} (Max)	0.4 – 1.5 nm
Detected Target	O_3, NO_2, SO_2, OClO, BrO …	O_3, H_2O, NO, N_2O, NO_2, HNO_3, CO, CH_4, CO_2, HF, HCl, $ClONO_2$ ...

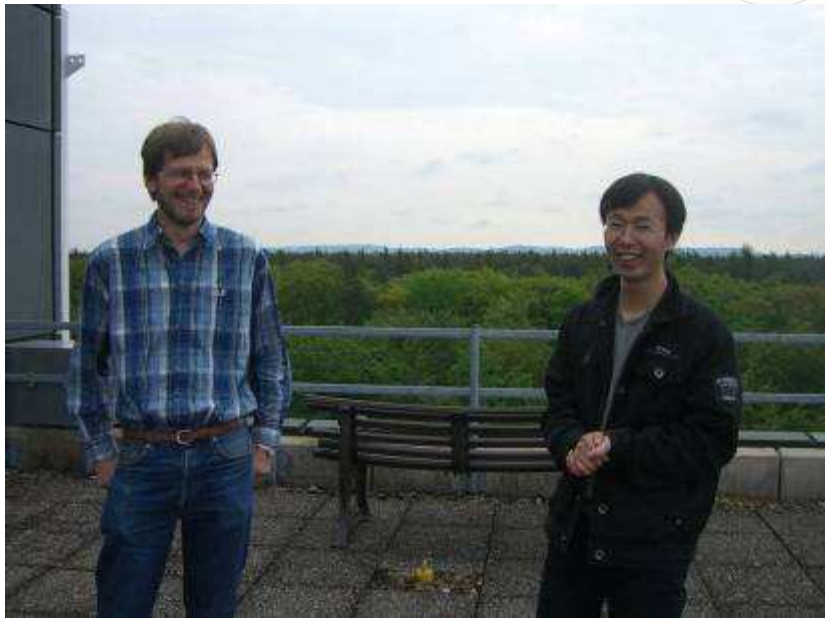
Ground-based remote sensing by MAX-DOAS

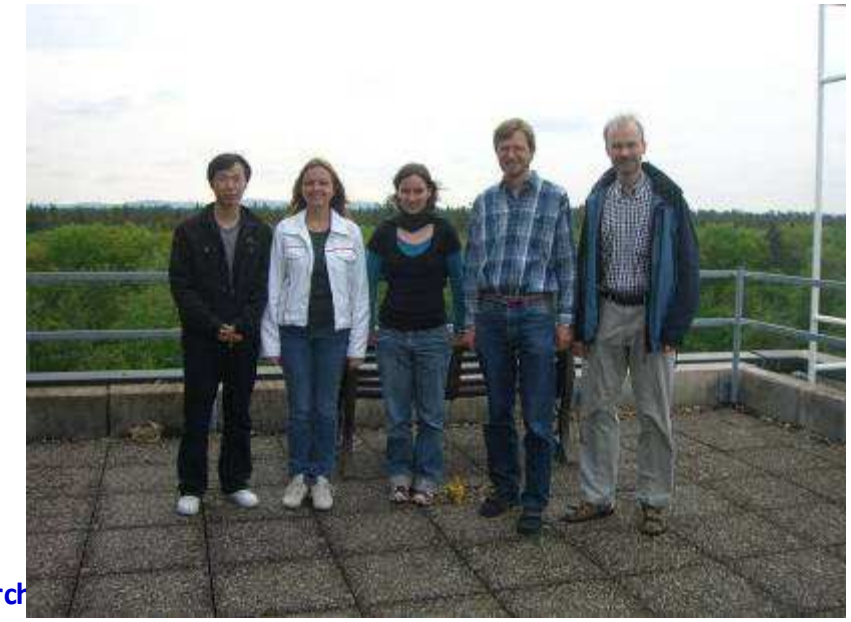



新疆维吾尔自治区
内蒙古自治区
中国北京
青海省
中国
西藏自治区
尼泊尔
Kathmandu
加德满都
Thimphu
不丹
孟加拉国
Dhaka
达卡
缅甸
中国广东省深圳市
老挝
Yangon
仰光
Vientiane
万象
泰国
Bangkok
曼谷
Taipei
台湾
菲律宾
马尼拉
Manila
南中国海
Google

Young Visiting Scientist at IMK

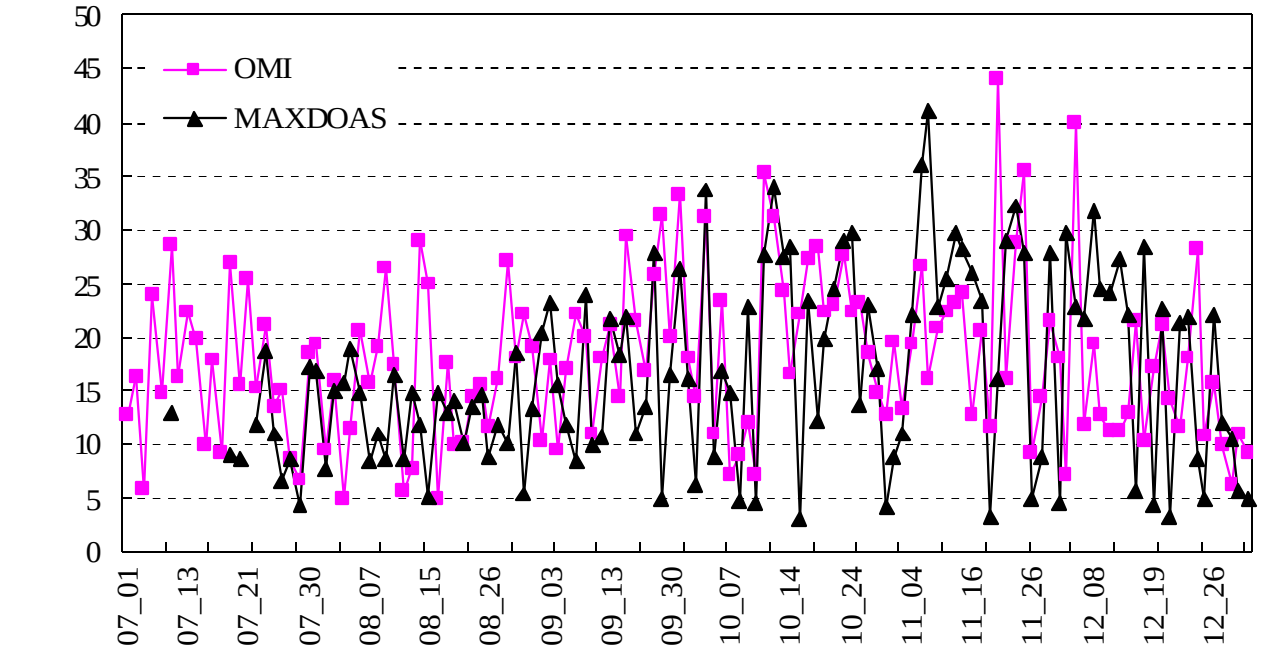


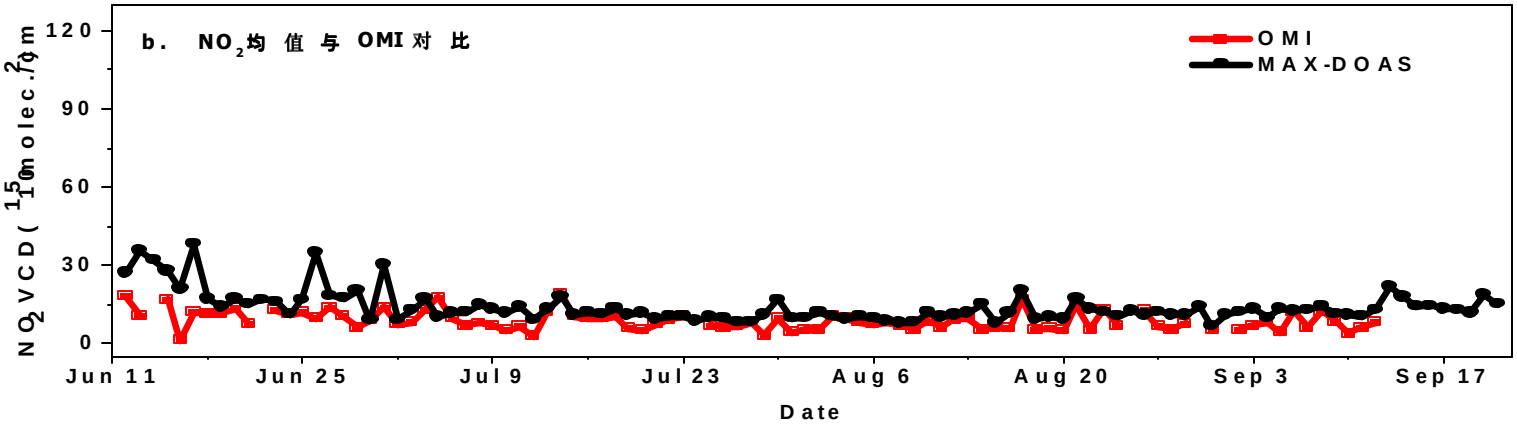




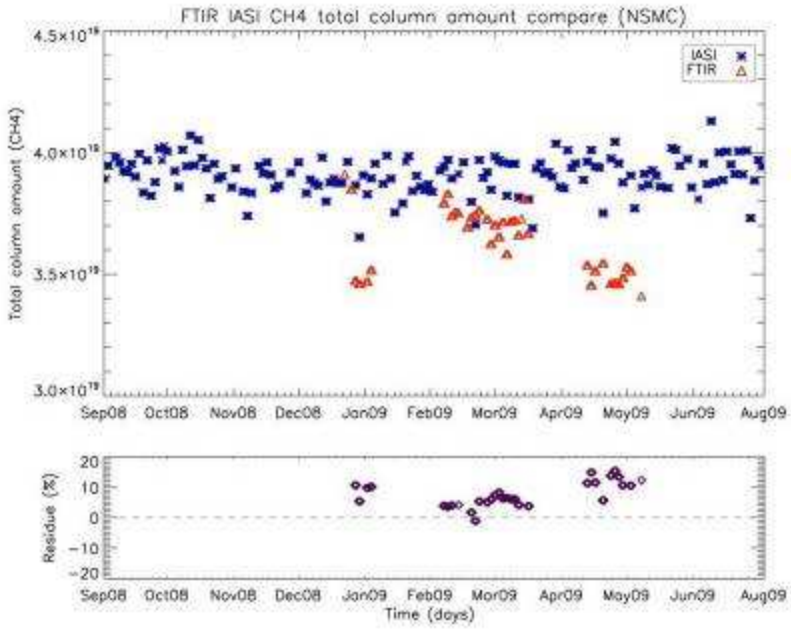
Retrieval Algorithm: PROFFIT 9.5 (IMK, Frank.Hase)

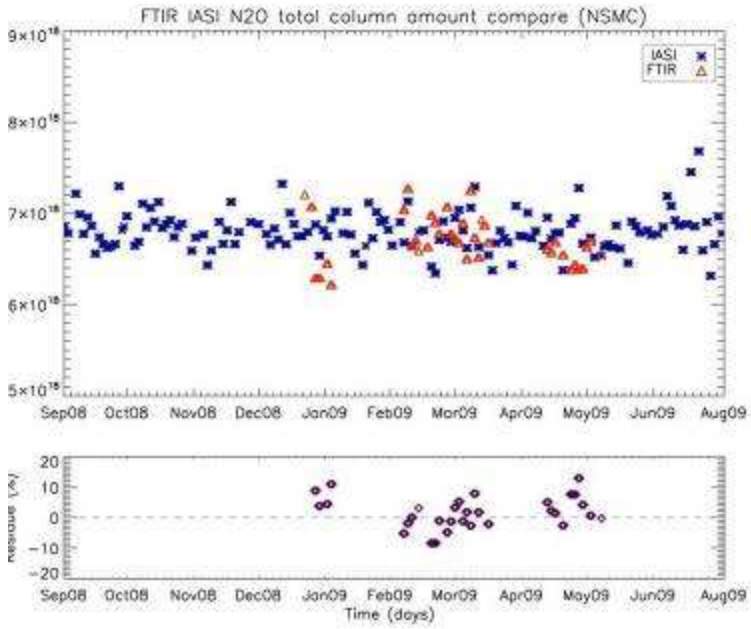
OMI NO_2 validated with MAX-DOAS of NSMC





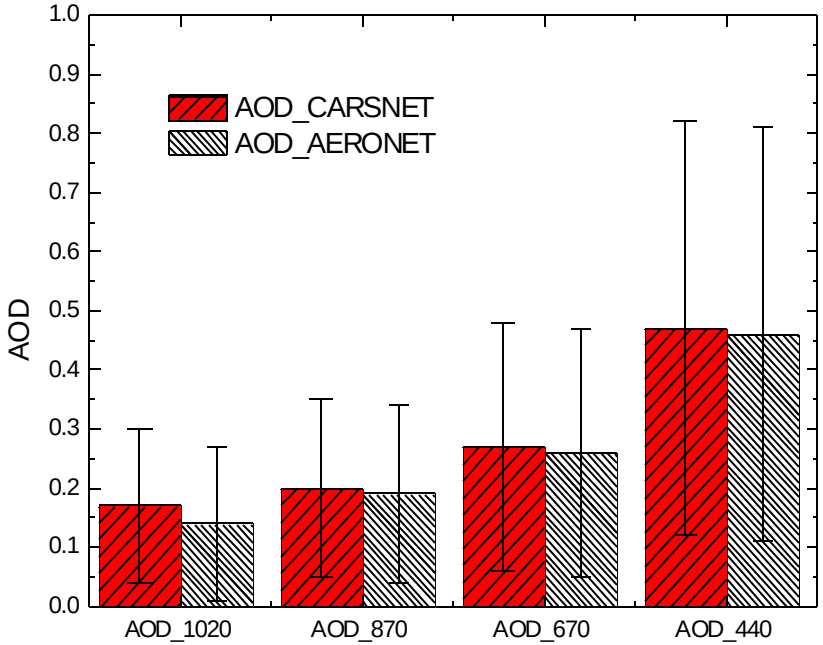
IASI CH_4, N_2O validated with ground-base FTIR measurement



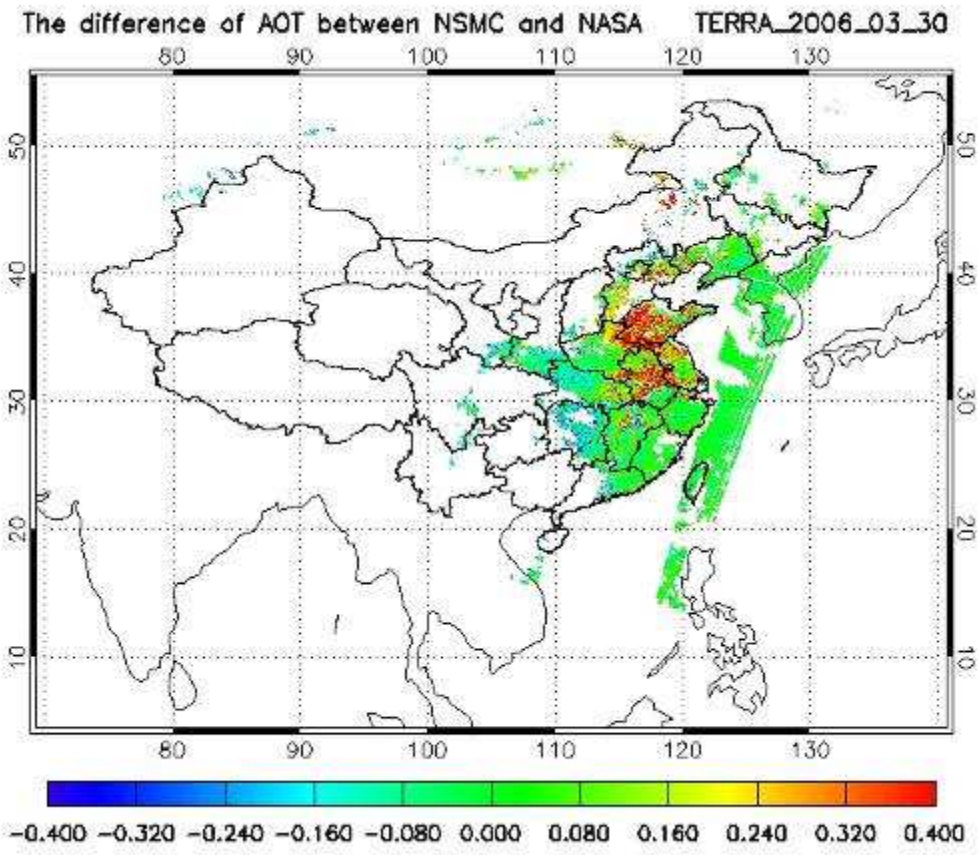


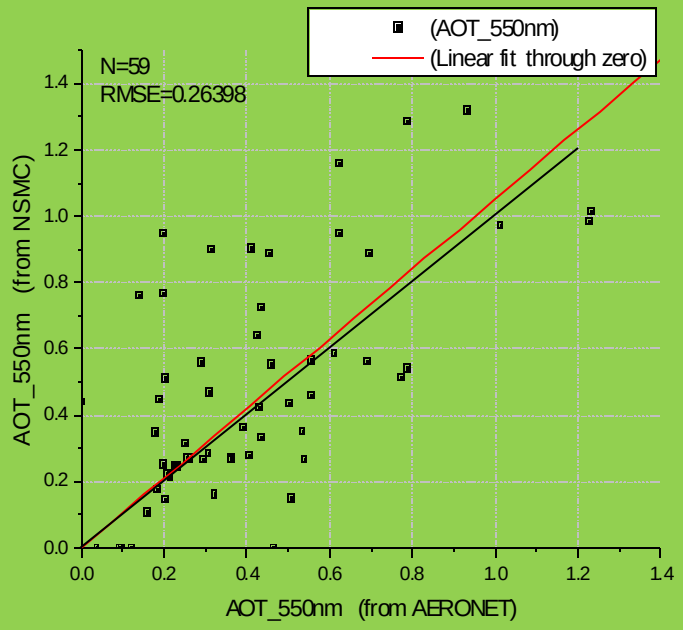
Result shows: the total column amount deviation for CH4 is less than 20%, IASI results higher than FTIR measurement; deviation for N_2O is less than 10%.

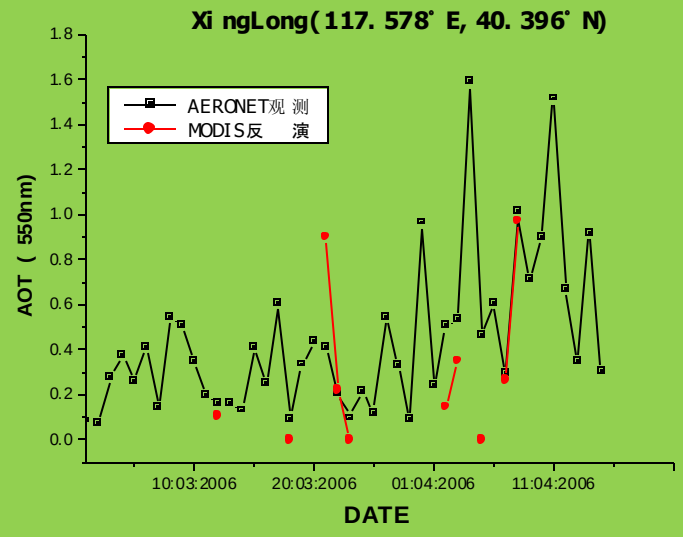
CARSNT
China Aerosol Remote Sensing Network



Aerosol Optical Depth Validation

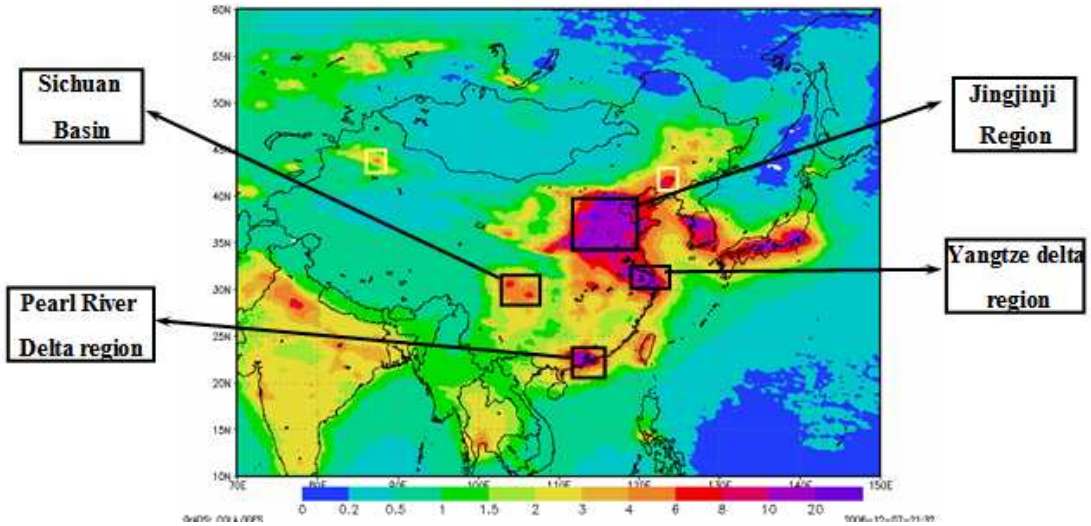


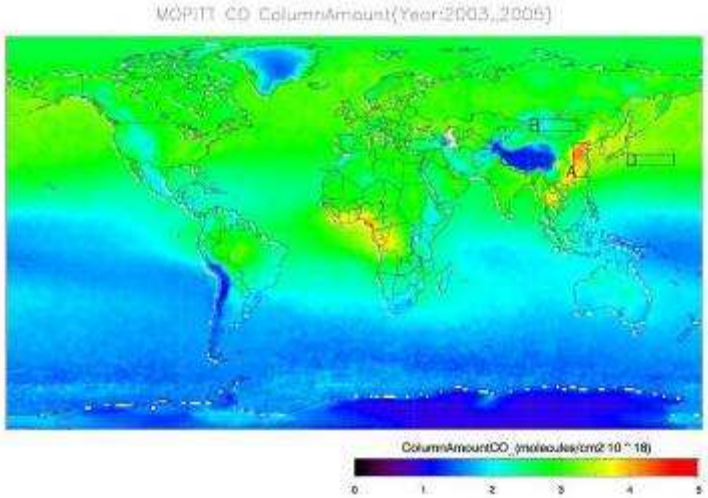


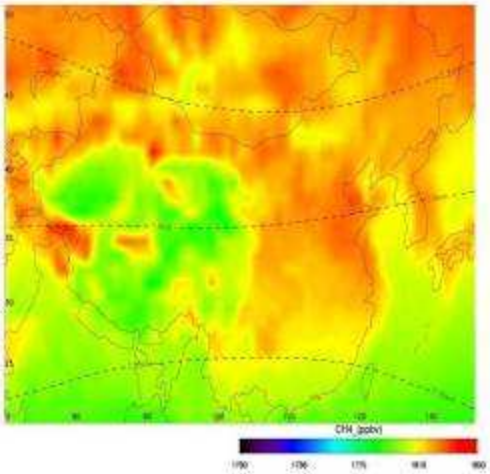


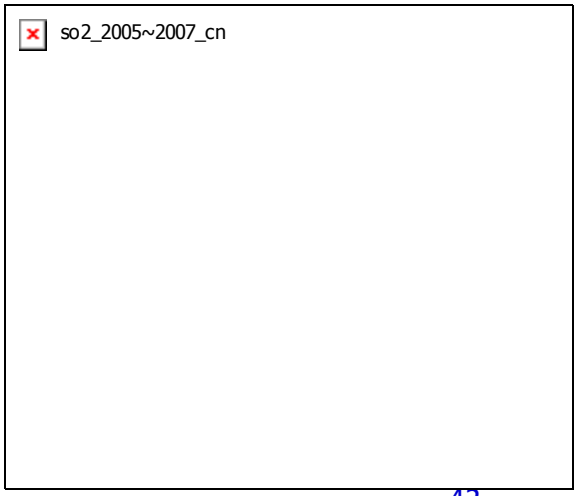
Trend, seasonal cycle, and sources of atmospheric composition Over China

- Aerosol
- Ozone
- NO_2
- SO_2
- CH_4
- CO
- CO_2



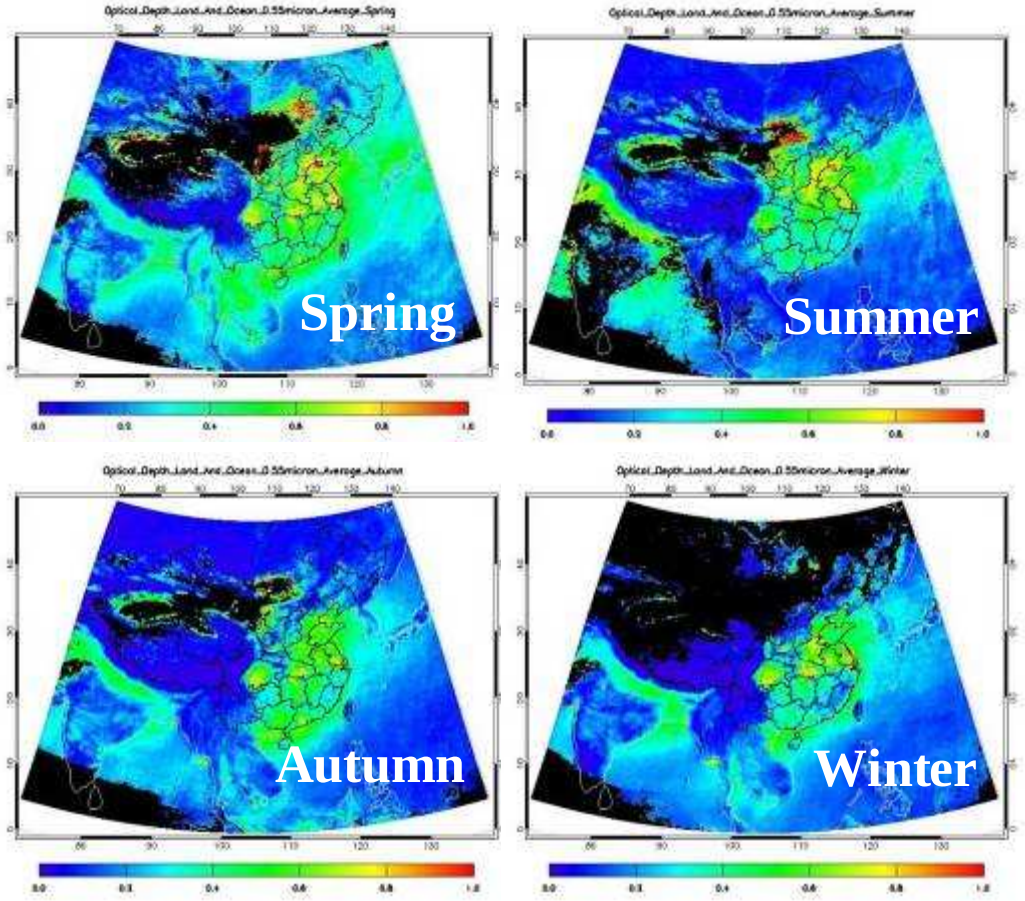




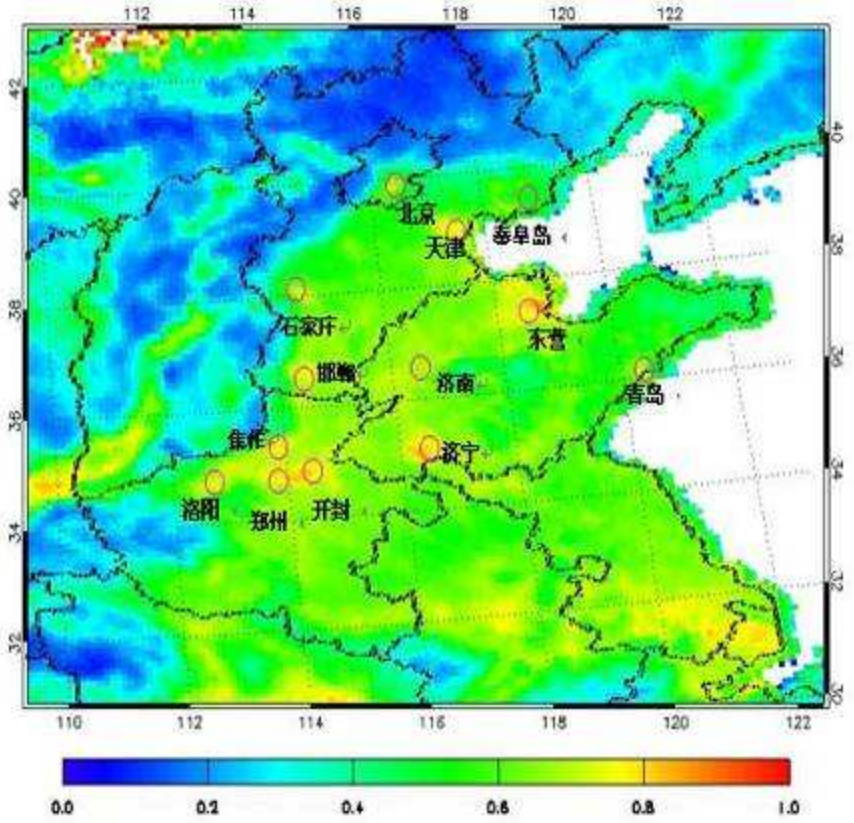


Aerosol Pattern over China by MODIS AOD 2005-2008

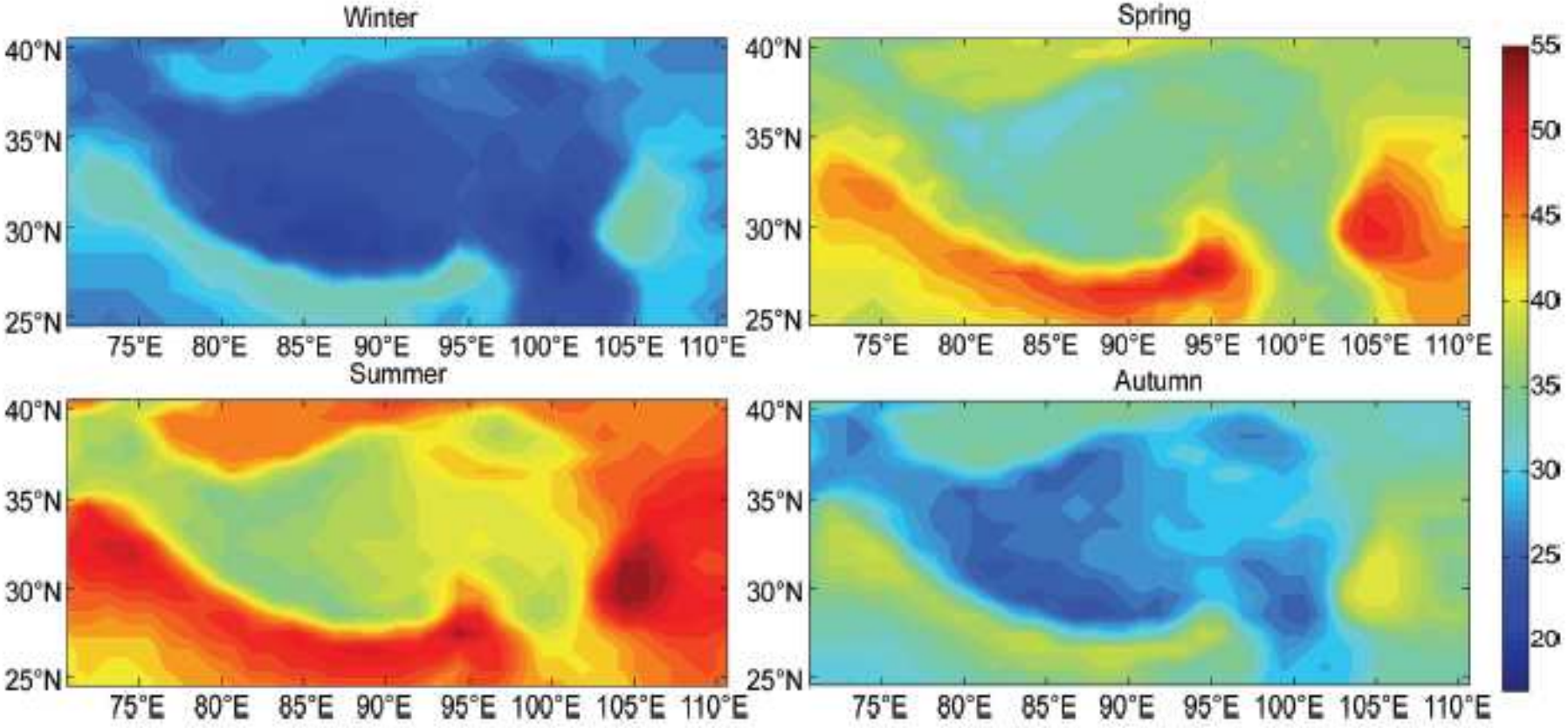
Seasonal Averaged



North East Part of China Year Averaged

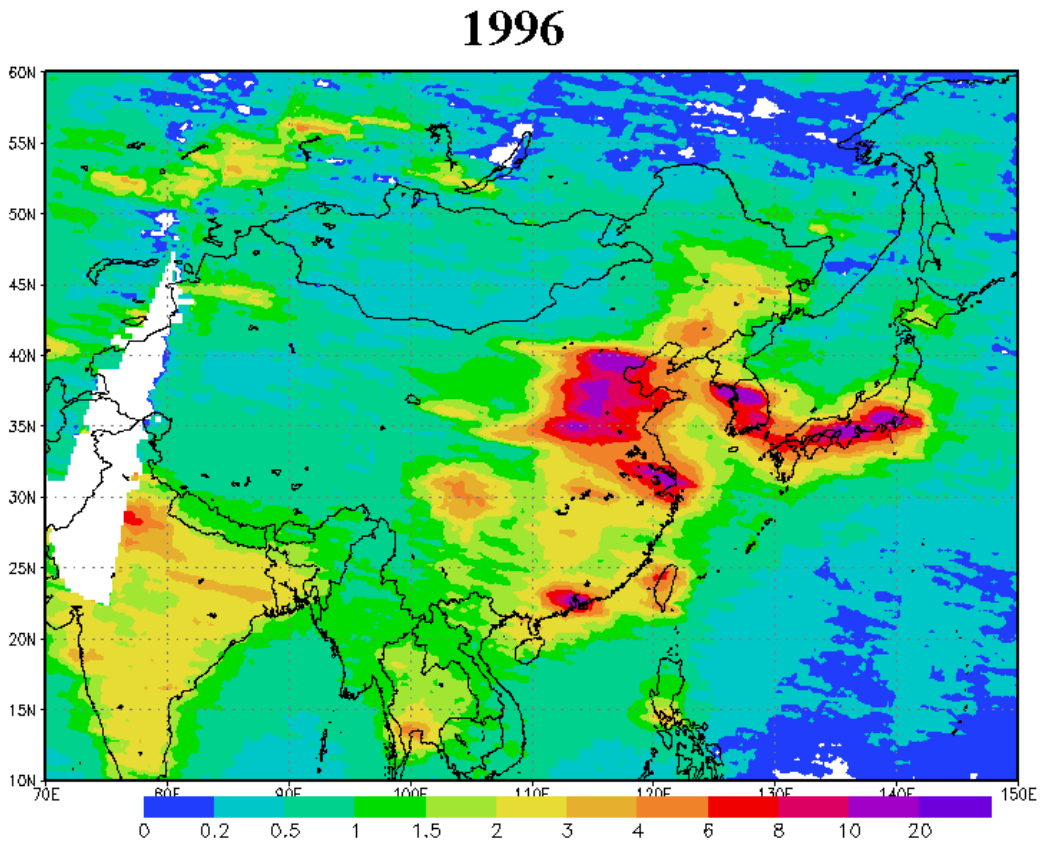


Distribution of tropospheric ozone over TP and comparison with the nearby area in different seasons during 1979-1992



TOR (Tropospheric ozone residual) Data

The trend, seasonal cycle, and sources of tropospheric NO2 over China during 1997—2006



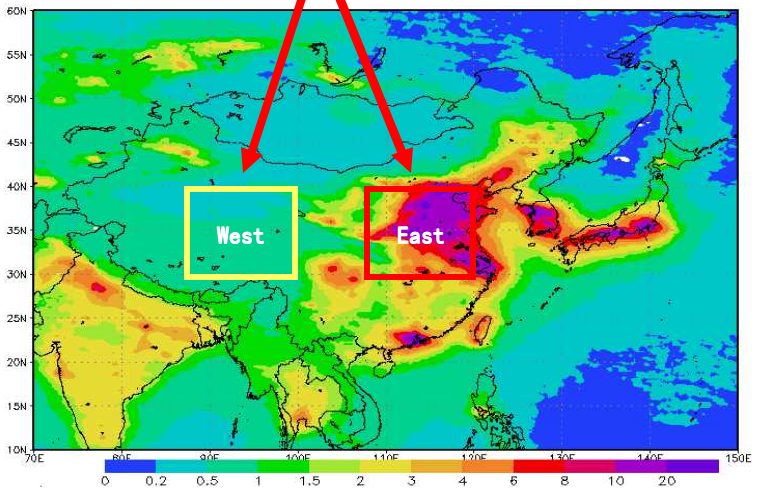
10-Year's tropospheric NO_2 column density concentration（1996—2006）
（unit:10^{15} molecules cm^{-2}）

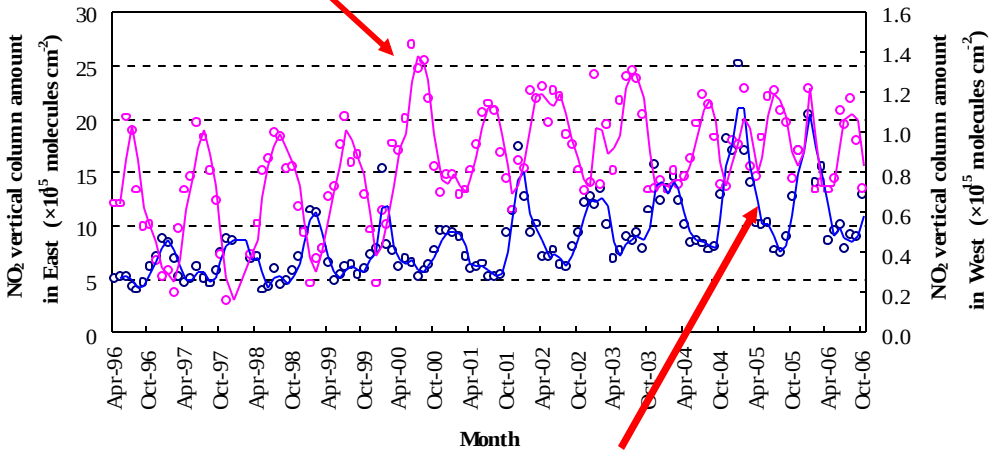
The paper has been published by *Sciences in China: D*

Satellite Product from KNMI

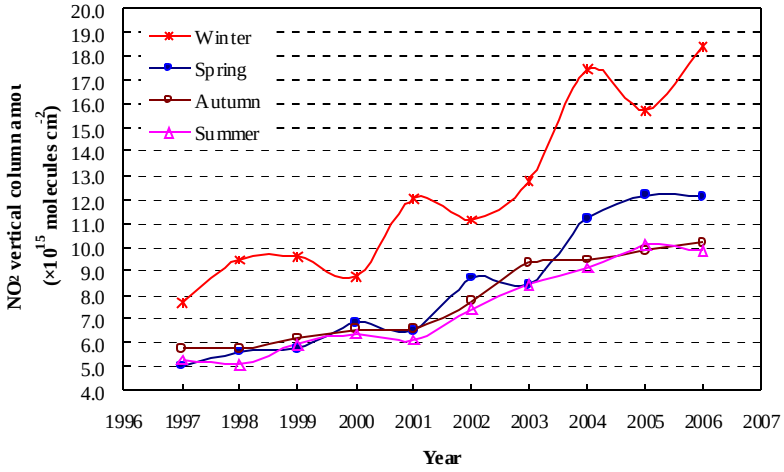
West (0.6 10E15 molec/cm²)

15

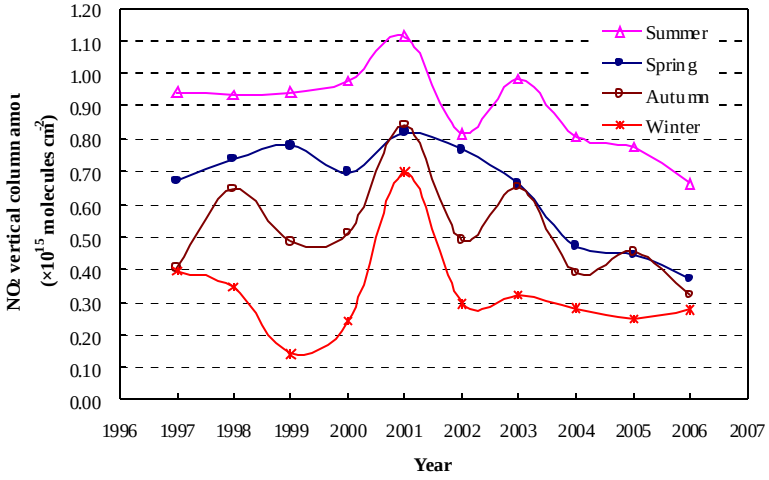




East (9.3 10E15 molec/cm²)

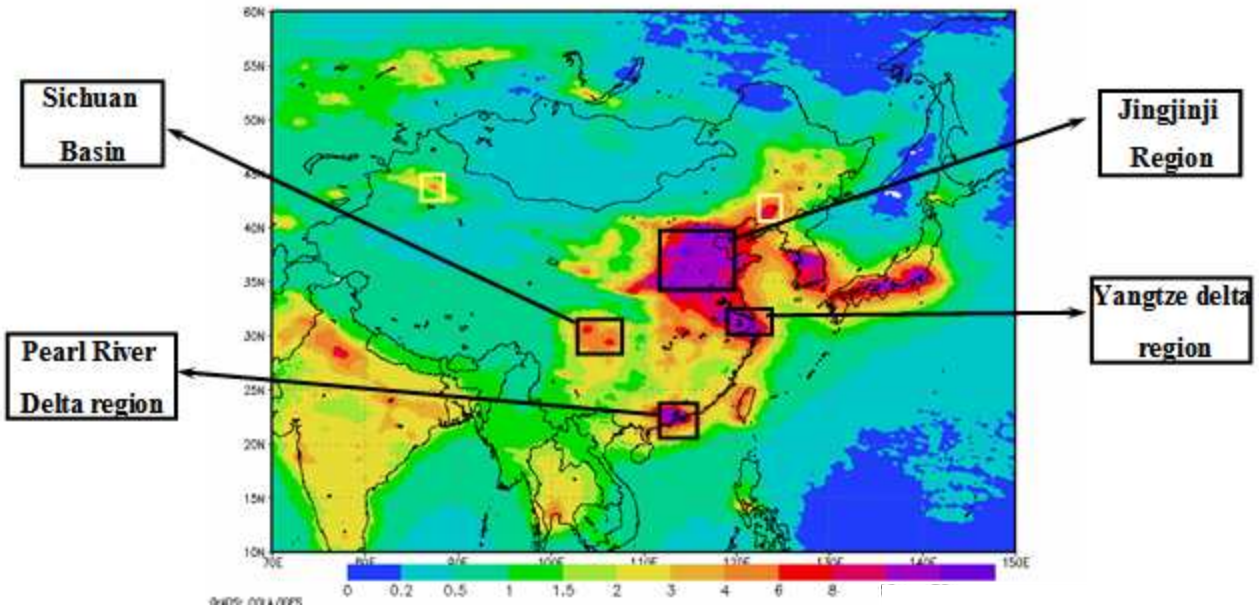


East area (110–1230E, 30–400N)

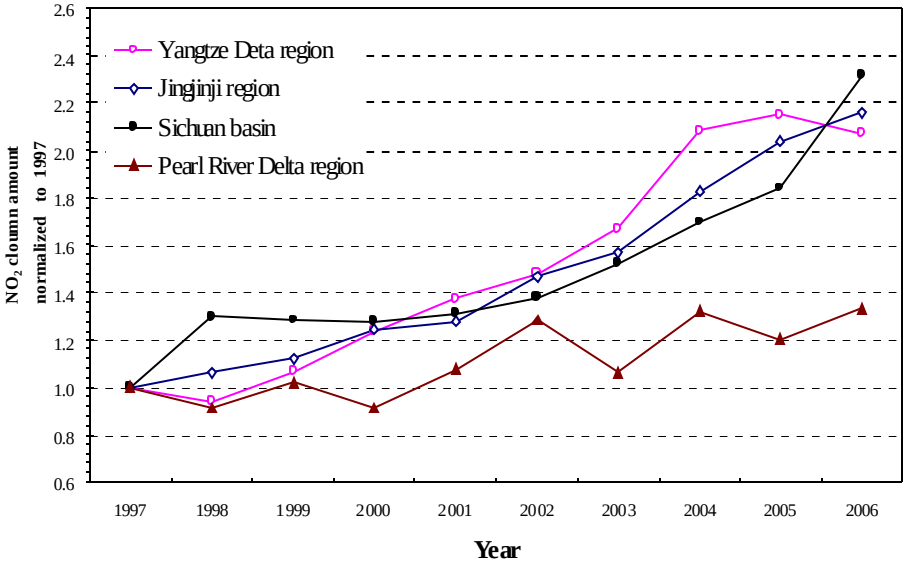


West area (80–1000E, 30–400N)

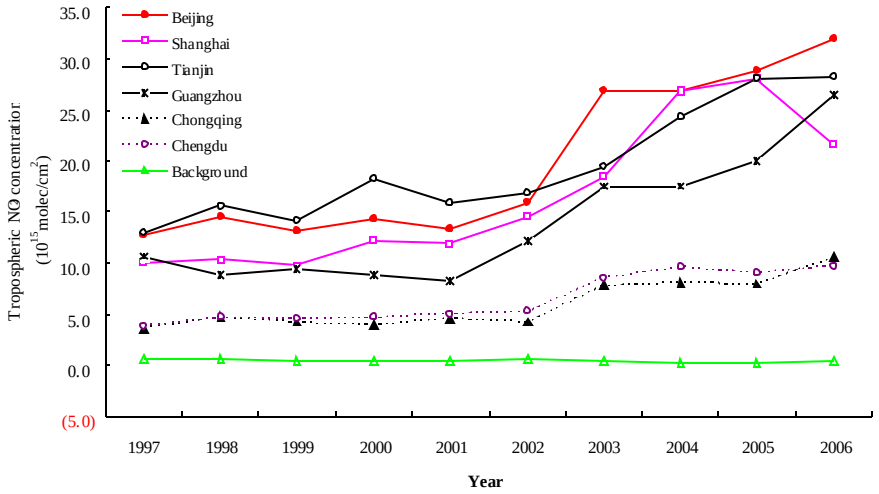
Ten years increment of troposphere NO_2 over the four typical regions



Jingjinji Region (111–1200E, 30–400N)
Yangtze delta region (116–1220E, 29–340N)
Sichuan Basin (104–1070E, 29–310N)
Pearl River Delta region (111–1160E, 21–240N)



Ten years increment of tropospheric NO2 over megacities in China



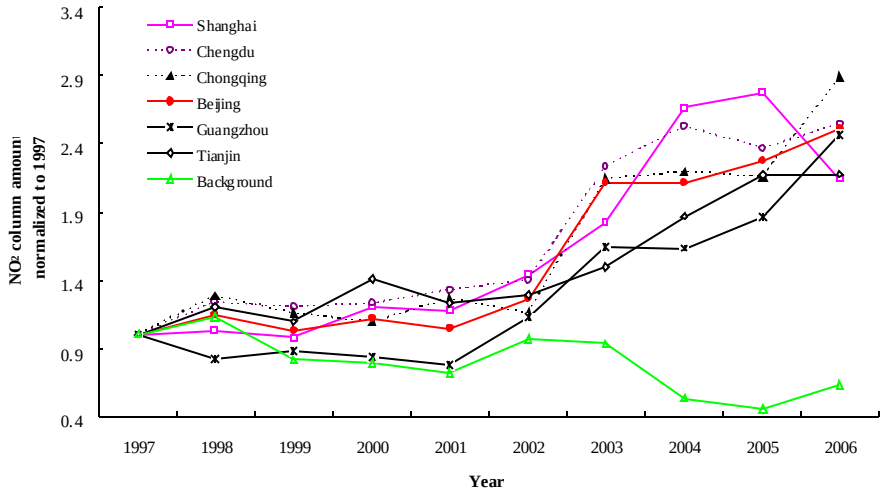
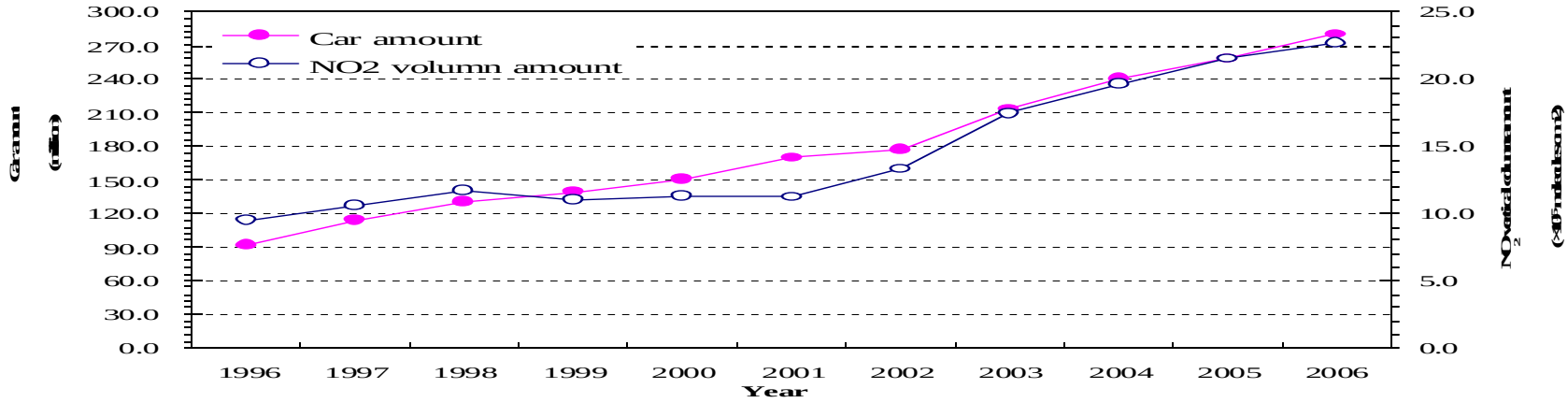


Table 1 Tropospheric NO_2 vertical columns over megacities in China

	Mean Concentration NO_2 in 1997 (10^{15} molec/cm^2)	Linear Trend in NO_2, (10^{15}molec/cm^2/year)	Growth (Reference Year 1997) %	Regression coefficient
Beijing	**12.7**	**2.3**	**18.0**	**0.82**
Shanghai	**13.0**	**2.0**	**20.0**	**0.77**
Tianjin	**10.1**	**1.7**	**13.1**	**0.85**
Guangzhou	**10.7**	**0.9**	**16.4**	**0.59**
Chengdu	**3.8**	**0.7**	**19.1**	**0.85**
Chongqing	**3.7**	**0.7**	**19.0**	**0.78**
Background (86±0.5^{0}E ×40±0.5^{0}N)	**0.6**	**-0.03**	**-5.2**	**0.56**

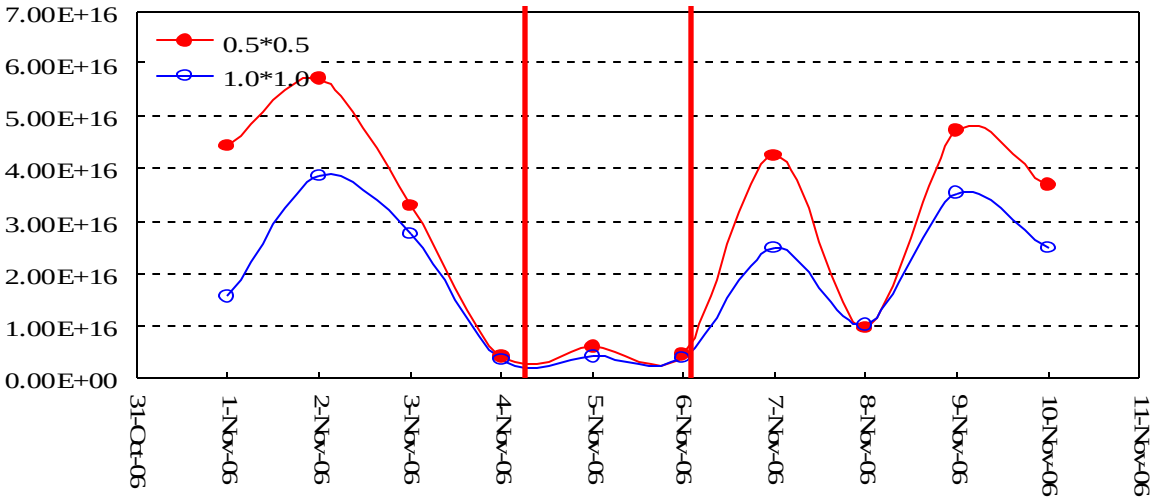
Correlation between NO2 and vehicles population during 1996~2006



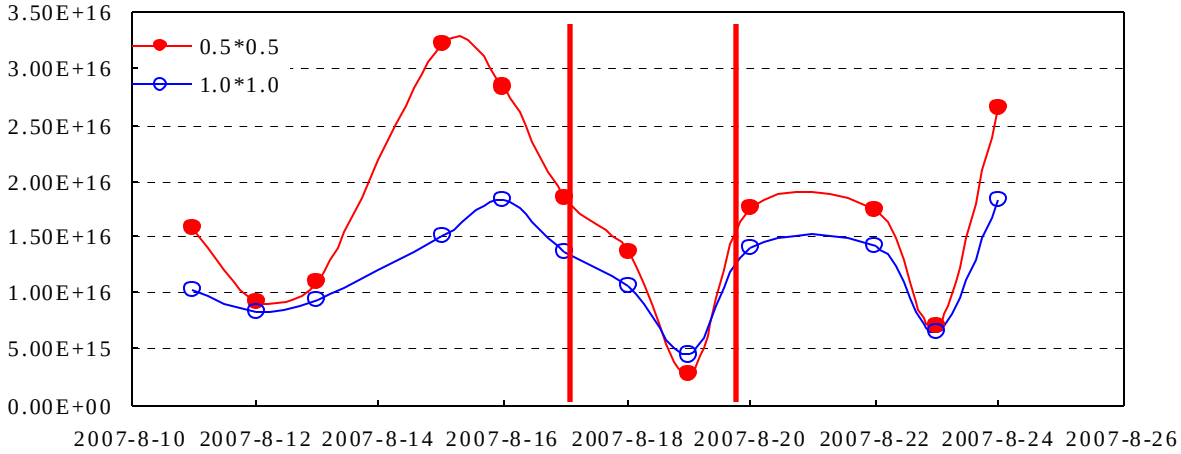
Beijing

Shanghai

Effect assessment with satellite data during Temporary traffic control

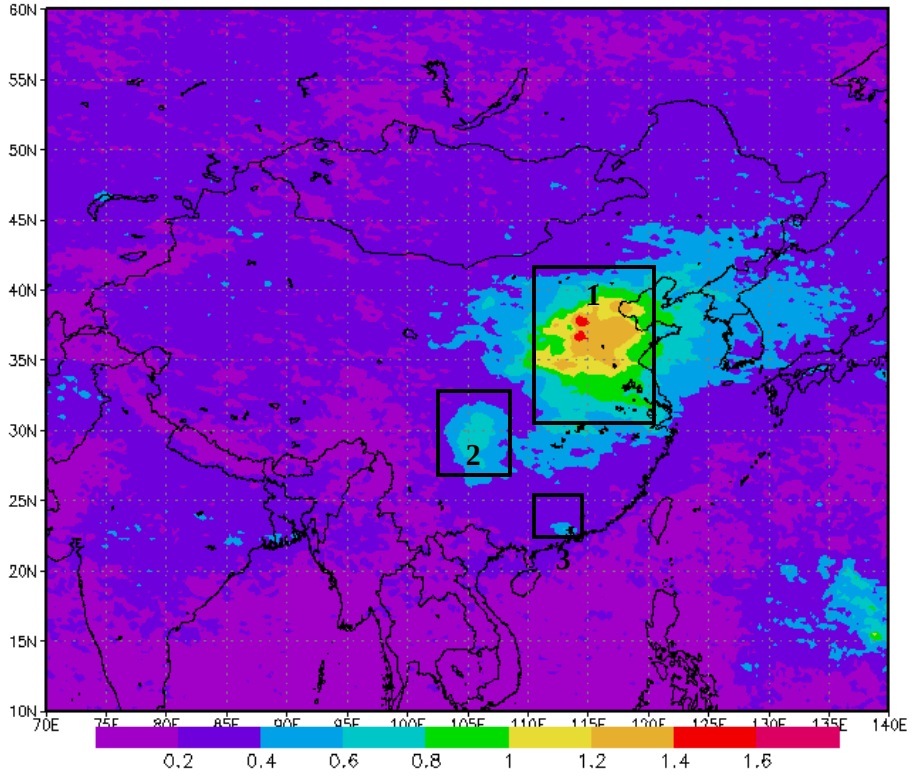


Traffic control during forum on China-Africa cooperation in 2006

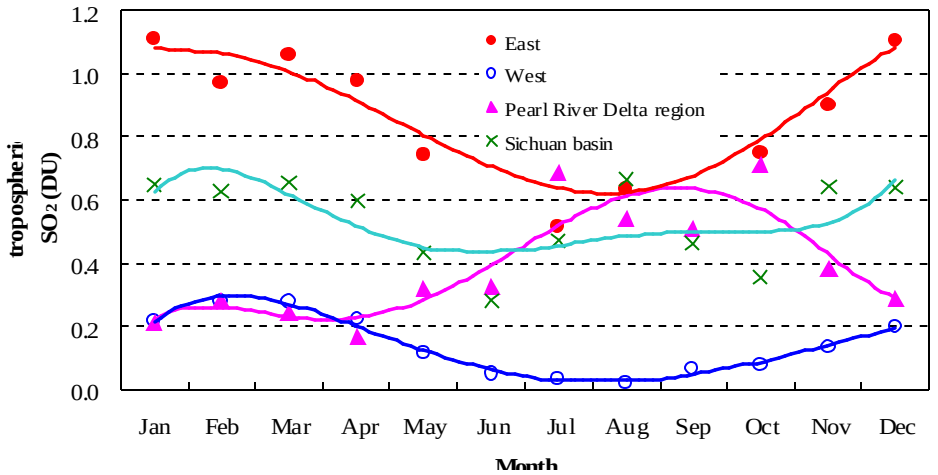


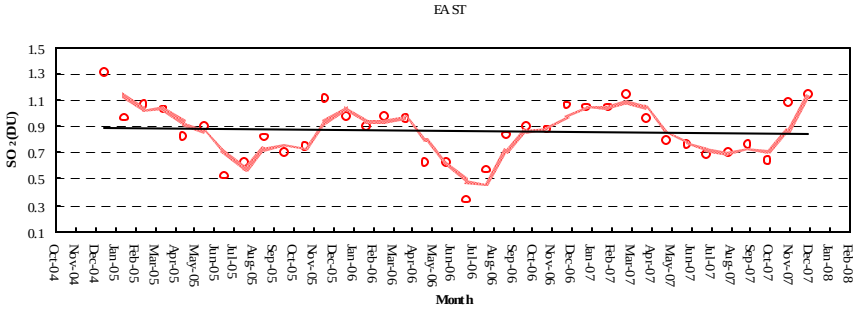
Traffic control during the "Lucky Beijing“ series comprehensive test competition in 2007

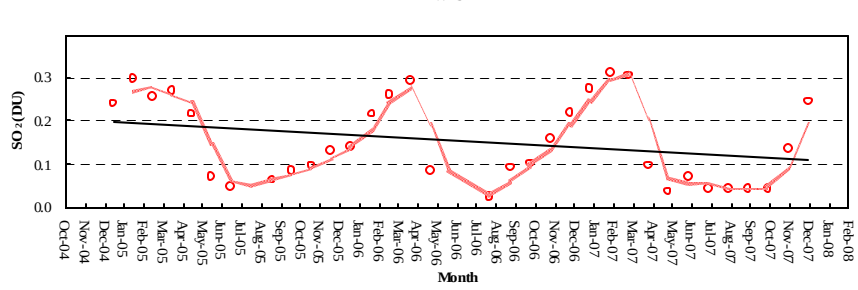
Tropospheric SO_2 over China during 2005-2007



Tropospheric SO_2 vertical columns in DU averaged during 2005 - 2007 over China

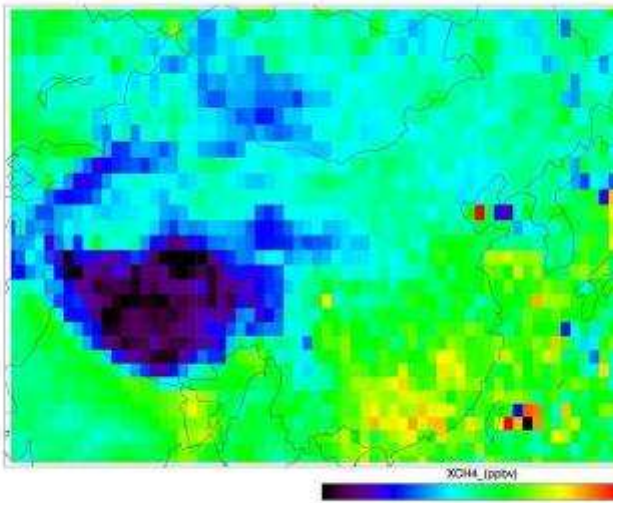




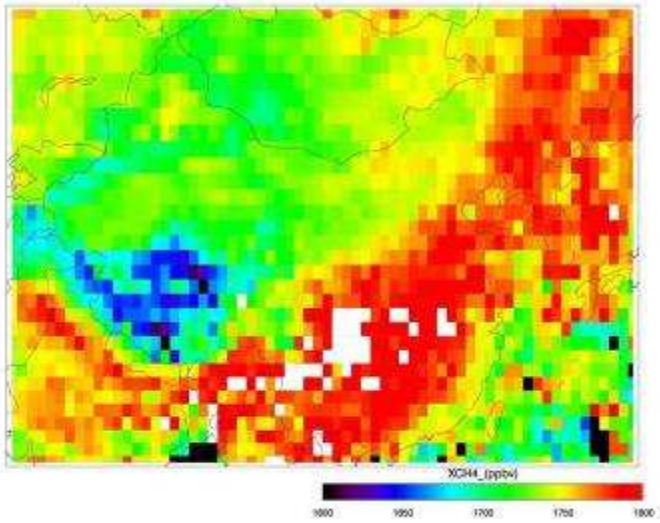


CH4 Temporal and spatial distribution—— SCIMACHY

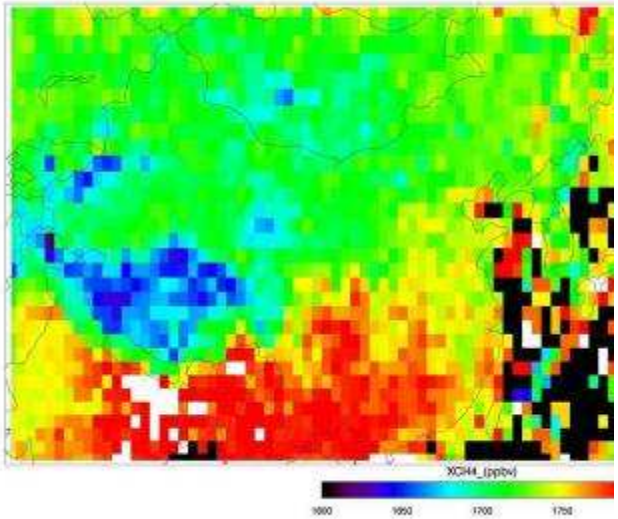
Spring



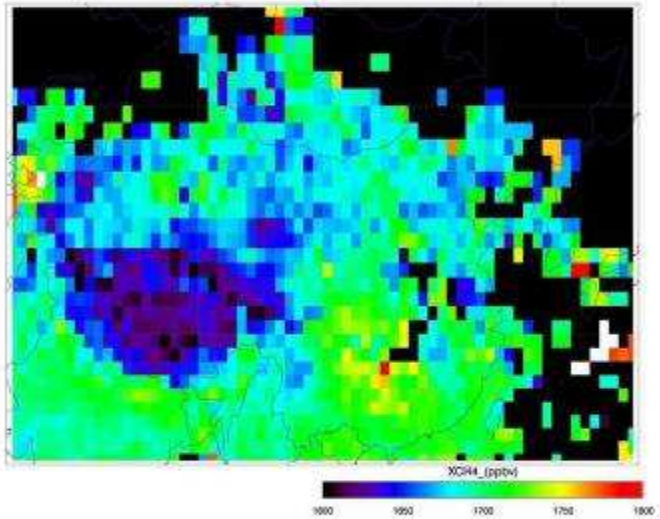
Summer



Autumn

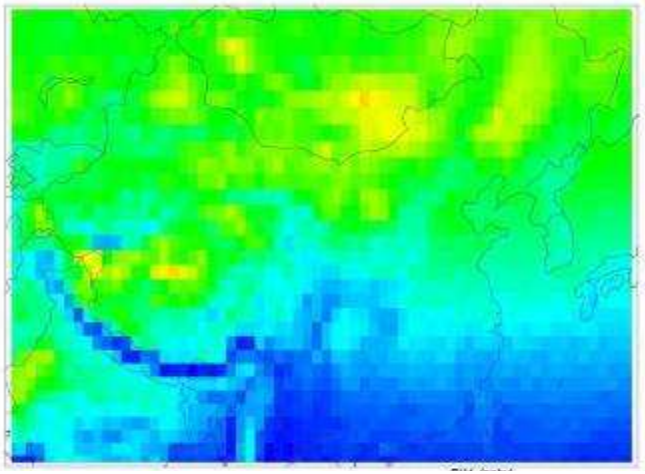


Winter

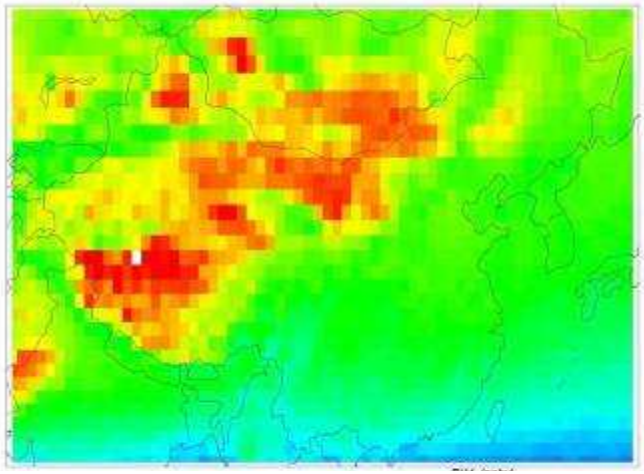


CH4 Temporal and spatial distribution—— AIRS (300mba)

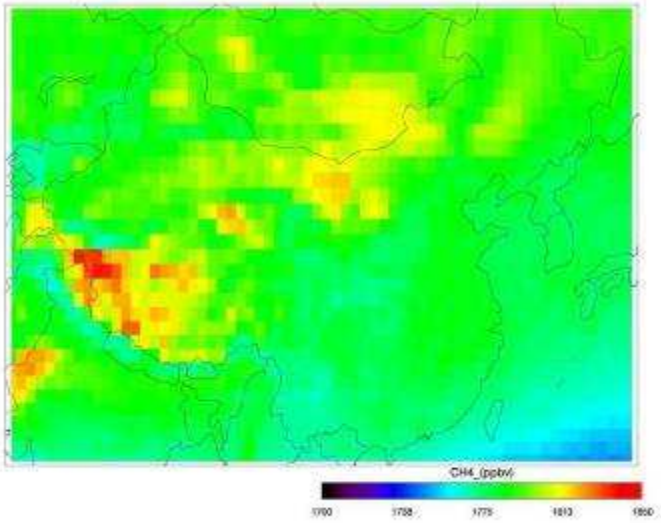
Spring



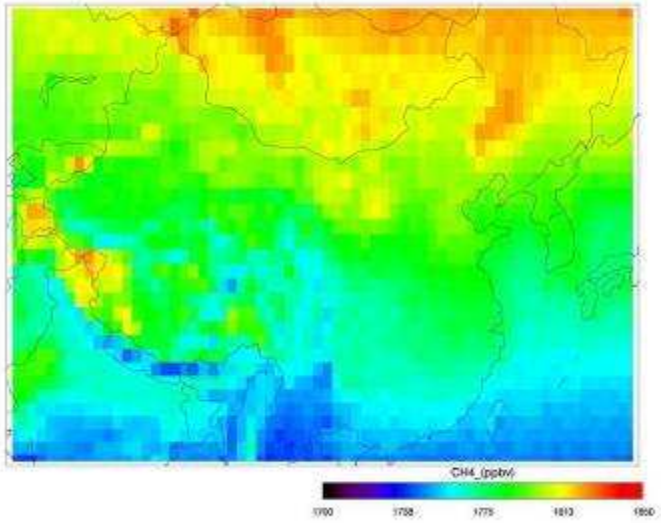
Summer



Autumn

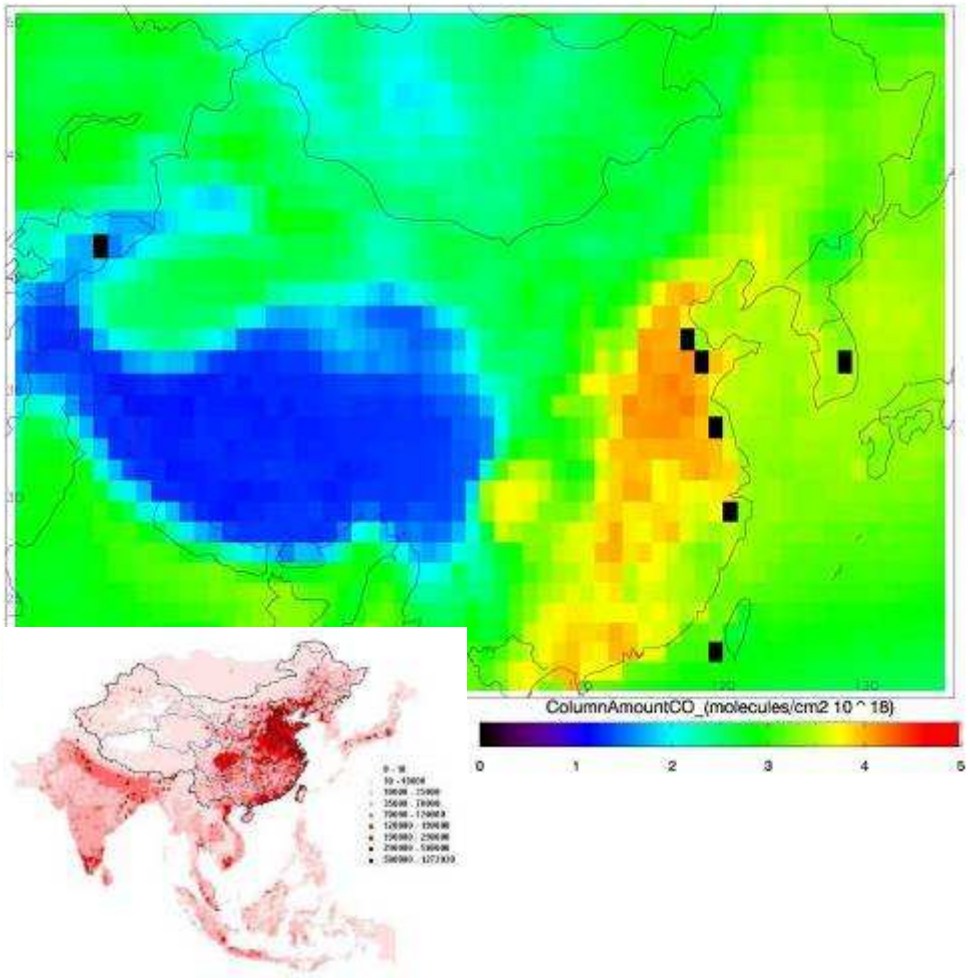


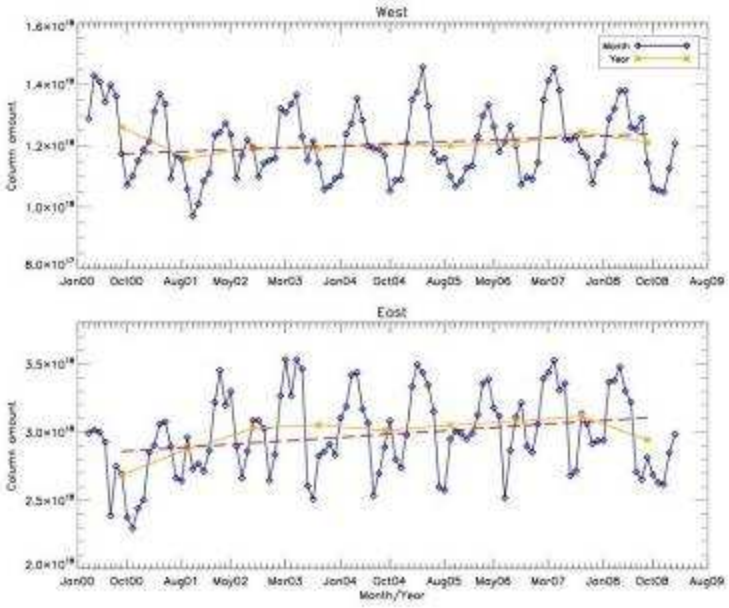
Winter



CO Temporal and Spatial Distribution Characteristics over China

Average over year 2000~2009

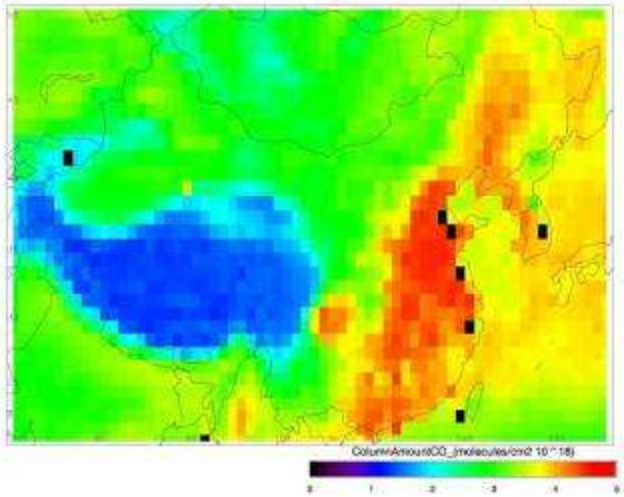




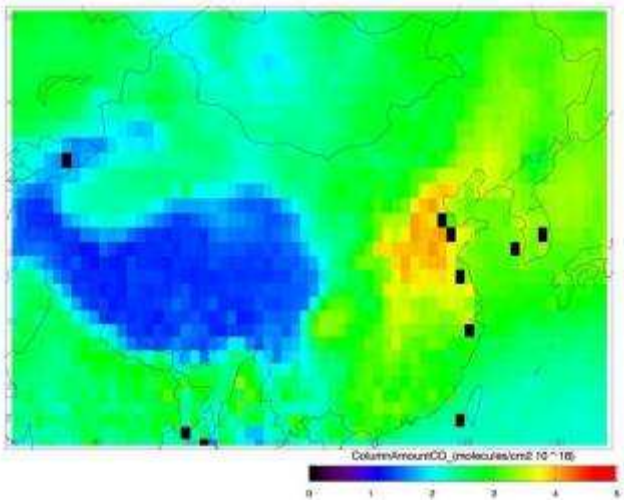
The increasing trend for CO in the west region of China is at magnitude of a few thousandths, but in the east the increasing trend is at magnitude of few hundreds.

Seasonal variation of CO over China

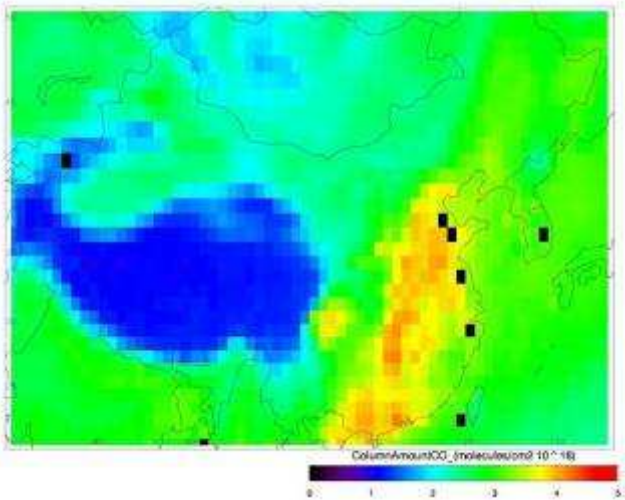
Spring



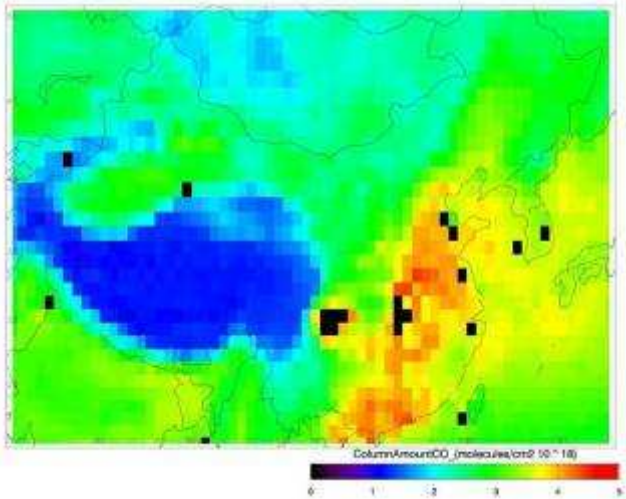
Summer



Autumn



Winter



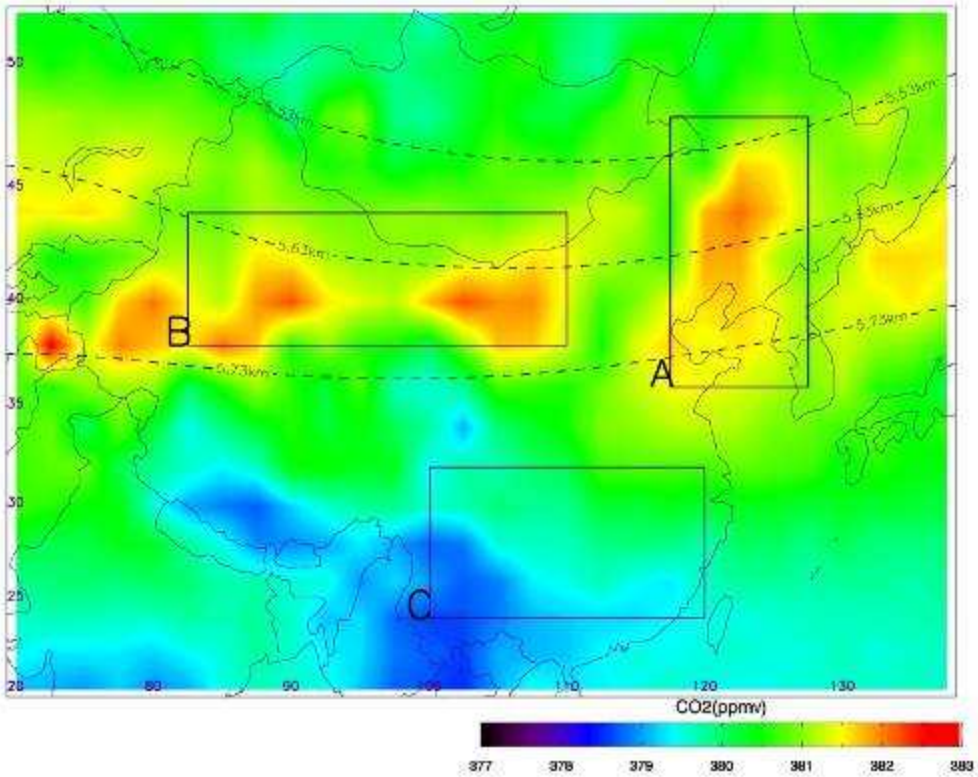


图4 2003年1月～2008年12月中国区域对流层中层CO_2平均浓度分布

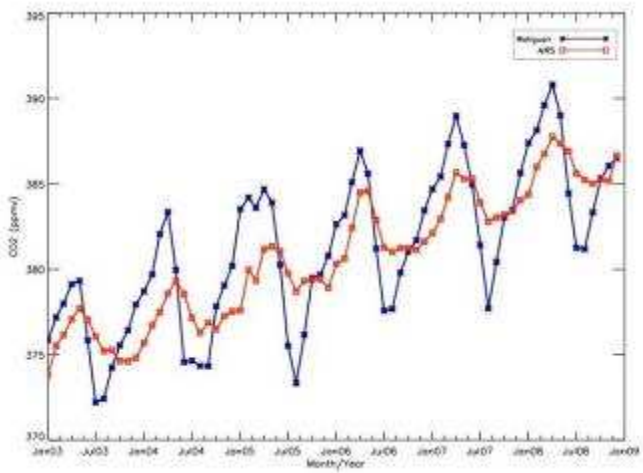


图7 瓦里关地区地面观测结果与卫星观测结果变化特征

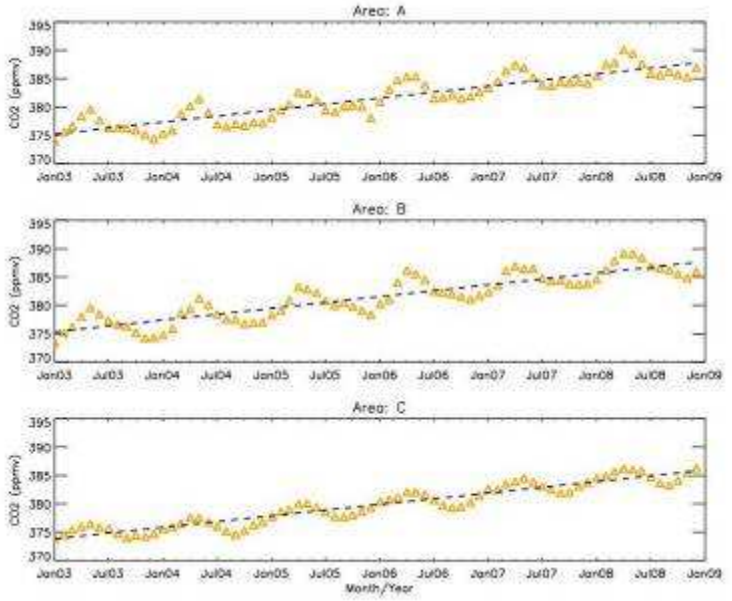


图5 2003年1月～2008年12月对流层CO_2月平均变化

CO2 Temporal and spatial distribution—— AIRS (500mba)

Papers published

30 Papers, **10** in SCI/EI within recent 5 years

1. Zhang, X., Jos van Geffen, Peng Zhang , Jing Wang, **2010**, TREND SPATIAL & TEMPORAL DISTRIBUTION, AND SOURCES OF THE TROPOSPHERIC SO2 OVER CHINA BASED ON SATELLITE MEASUREMENT DURING 2004~2009, Proceedings of the Symposium Dragon 2 Programme Mid-Term Results 2008-2010, Guilin, China, 17-21 May 2010, ESA publications division SP-684, ISBN 978-92-9221-248-3 **(EI)**
2. Weihe Wang, Xingying Zhang*, Xingqin An et al., **2010**, Analysis for retrieval and validation results of FY-3 Total Ozone Unit(TOU), Chinese Science Bulletin，2010 Vol. 55 (26): 3037-3043 **(SCI)**
3. Weihe Wang, Xingying Zhang*, Yongmei Wang et al., 2010, Introduction to the FY-3A Total Ozone Unit (FY-3A TOU): Instrument, Performance, and Results, International Journal of remote sensing, 10.1080/01431161.2010.489073 **(SCI)**
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5. Huang fuxiang, et al , **2010**, Vertical Ozone profiles deduced from measurements of SBUS on FY-3 satellite, Chinese Science Bulletin, 55(10): 943-948 **(SCI)**
6. Zhang, X., Guoshun Zhuang，Kenneth A Rahn, Hui Yuan, Zifa Wang，**2009,** The aerosol particles from dried salt-lakes and saline soils in dust storm in Beijing, Terrestrial, Atmospheric & Oceanic Sciences, Vol. 20, No. 4，619-628. **(SCI)**
7. Zhang, X., P. Zhang, Y. Zhang, X. Li and H.Qiu, **2008**, THE TREND, SPATIAL & TEMPORAL DISTRIBUTION AND SOURCES OF TROPOSPHERIC NO2 OVER CHINA BASED ON SATELLITE MEASUREMENT DURING 1997 TO 2006, Proc. Dragon 1 Programme Final Results 2004–2007, Beijing, China, 21-25 April 2008, ESA publications division SP-655, ISBN 978-92-9221-219-3 **(EI)**
8. Zhang X., Zhang P., Zhang Y., Li X., Qiu H.，**2007**， The trend, seasonal cycle, and sources of tropospheric NO2 over China during 1997~2006 based on satellite measurement，Sci China Ser D-Earth Sci, vol. 50(12), 1877-1884 .**(SCI)**
9. Zhang, X., Zhuang, G., Guo, J., Yin, k., Zhang, P, **2007**，Characterization of aerosol over the Northern South China Sea during two cruises in 2003, Atmospheric Environment, 41(36), 7821-7836.**(SCI)**
10. Zhang, X., Zhuang, G., Chen, J., Wang, Y., Wang, X., An, Z., Zhang, P., **2006,** Heterogeneous reactions of sulfur dioxide on mineral particles. Journal of Physical Chemistry B, 110(25), 12588-12596. **(SCI)**

Air Quality Monitoring and Forecasting in China

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Introduction

AMFIC addresses atmospheric environmental monitoring over China. The aim is to develop an integrated information system for monitoring and forecasting tropospheric pollutants over China. The system uses satellite and *in situ* air quality measurements and modelling to generate consistent air quality information over China. The data will cover the recent years and the actual situation including an air quality forecast for several days ahead. Air pollutants covered are ozone, nitrogen dioxide, sulphur dioxide, formaldehyde, carbon monoxide, methane and aerosol/particulate matter.

The proposed system will supplement and broaden the existing ground-level monitoring and air quality assessment activities in China. Satellite data cover regions where no ground-based stations are available; air quality models fill-in the sparse temporal and spatial sampling of the measurements and connect them in a physically consistent manner.

The system targets environmental agencies in China, some of whom are participating in AMFIC, and assists them in their reporting duties on air quality. A case study for the city of Shenyang will be demonstrated. The project will also improve our understanding of the transport of air pollution within, from and to China.

A list of participants of AMFIC can be found here.

Final meeting in Beijing

The final meeting of the AMFIC project will take place in Beijing at 23 October 2009, and is open to all interested users of the data products. Participants can take advantage of combining this meeting with the Regional Air Quality Management conference on control of NOx sources, held at 26-27 October, also in Beijing.

Calendar

- 26 October 2007: Project kick-off meeting, The Netherlands.

Air Quality Monitoring and Forecasting in China

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NRT Satellite Data

AMFIC web data base

Satellite observations over China

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Images of 11 October 2009

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Month: October
Day: 11

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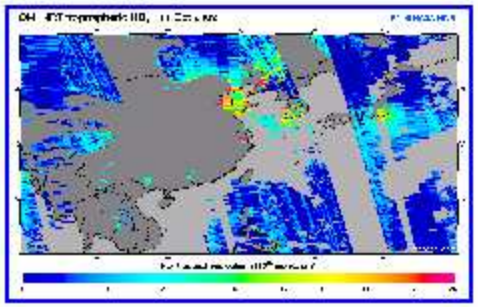
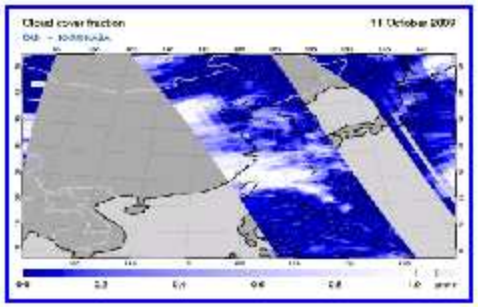


NO_2



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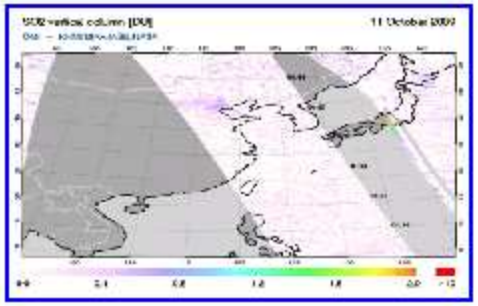

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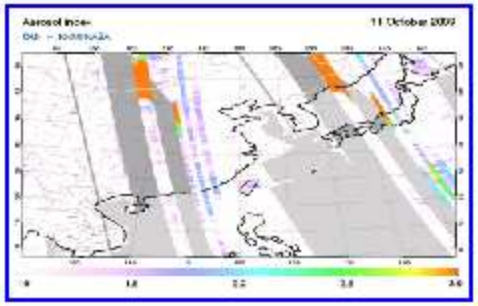


AAI

Air Quality Monitoring and Forecasting in China

AMFIC validation data sets

Name	latitude	longitude	NO2 OMI	SO2 SCIA	SO2 OMI(1)	CO SCIA(2)	Aerosol AATSR	Total O3 OMI	CH2O SCIA	CH2O GOME-2	Trop. O3 GOME-2	Kernel GOME-2
Beijing-NSMC	39.95	116.32	download	download	download	download	-	download	download	download	-	-
Beijing-Tower	39.97	116.37	download	download	download	download	-	download	download	download	download	download
Long Feng Shan	44.73	127.60	download	download	download	download	-	download	download	download	x	-
Lin An	30.30	119.73	download	download	download	download	-	download	download	download	x	-
Shang Dian Zi	40.39	117.07	download	download	download	download	-	download	download	download	x	-
Xianghe-IAP	39.45	116.58	download	download	download	download	-	download	download	download	x	-
Thessaloniki	40.634	22.9565	download	download	download	download	-	download	download	download	x	-
Waliguan	36.30	100.90	download	download					download	download	x	-
Beijing-Baolian	39.95	116.28	download	download					download	download	x	-
Hefei	31.91	117.16	download	download					download	download	x	-
Shanghai-Dongtan	31.53	121.97	download	download					download	download	x	-
Shanghai-Fudan	31.30	121.37	download	download					download	download	x	-
Bracciano	42.10	12.183	download	download	x	x	x	x	download	download	x	-
Cabauw	51.95	4.88	download	download	x	x	x	x	download	download	x	-
El Arenosillo	37.10	-6.73	download	download	download	x	x	x	download	download	x	-
Haute Provence	43.93	5.70	download	download	download	download	x	download	download	download	x	-
Other sites for SO2												
Arosa	46.77	9.67	x	download	download	x	x	x	download	download	x	-
Uccle	50.8	4.35	x	download	download	x	x	x	download	download	download	download
Belsk	51.83	20.78	x	download	download	x	x	x	download	download	x	-
Hradc Kralove	50.18	15.83	x	download	download	x	x	x	download	download	x	-
Hohenpeissenberg	47.8	11.02	x	download	download	x	x	x	download	download	download	download
Budapest	47.43	19.18	x	download	download	x	x	x	download	download	x	-

Air Quality Monitoring and Forecasting in China

Mon 12 Oct, 21:02

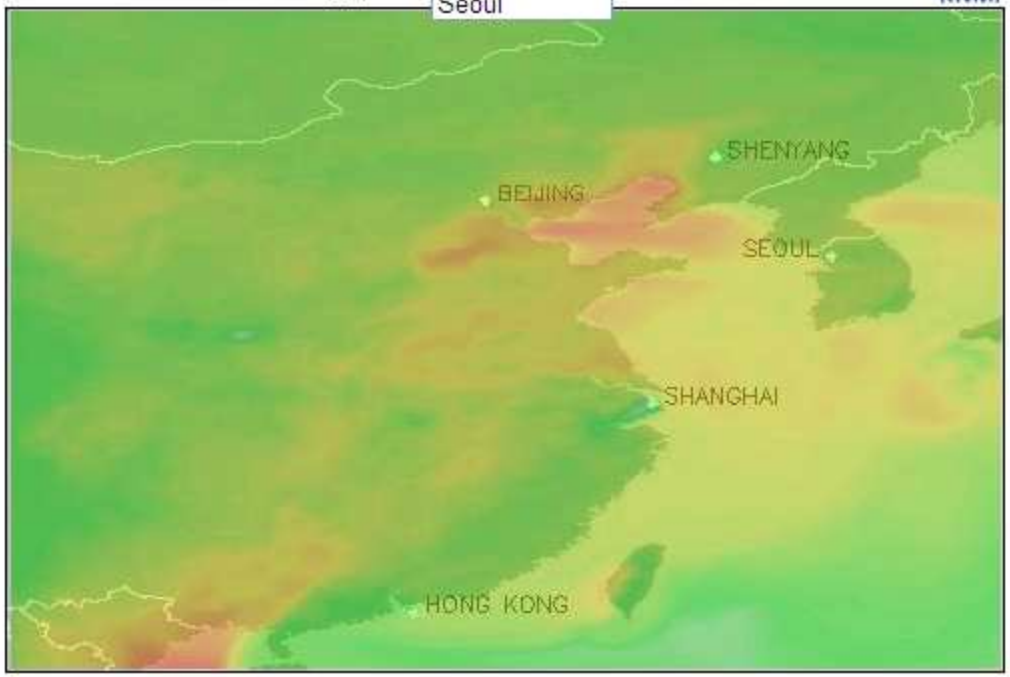
home | air quality bulletin | archive | FAQ

Select bulletin: *Region* East China *Type* Ozone peak value *Day* today Show

East China
Beijing
Shanghai
Shenyang
Hong Kong
Qingdao
Seoul

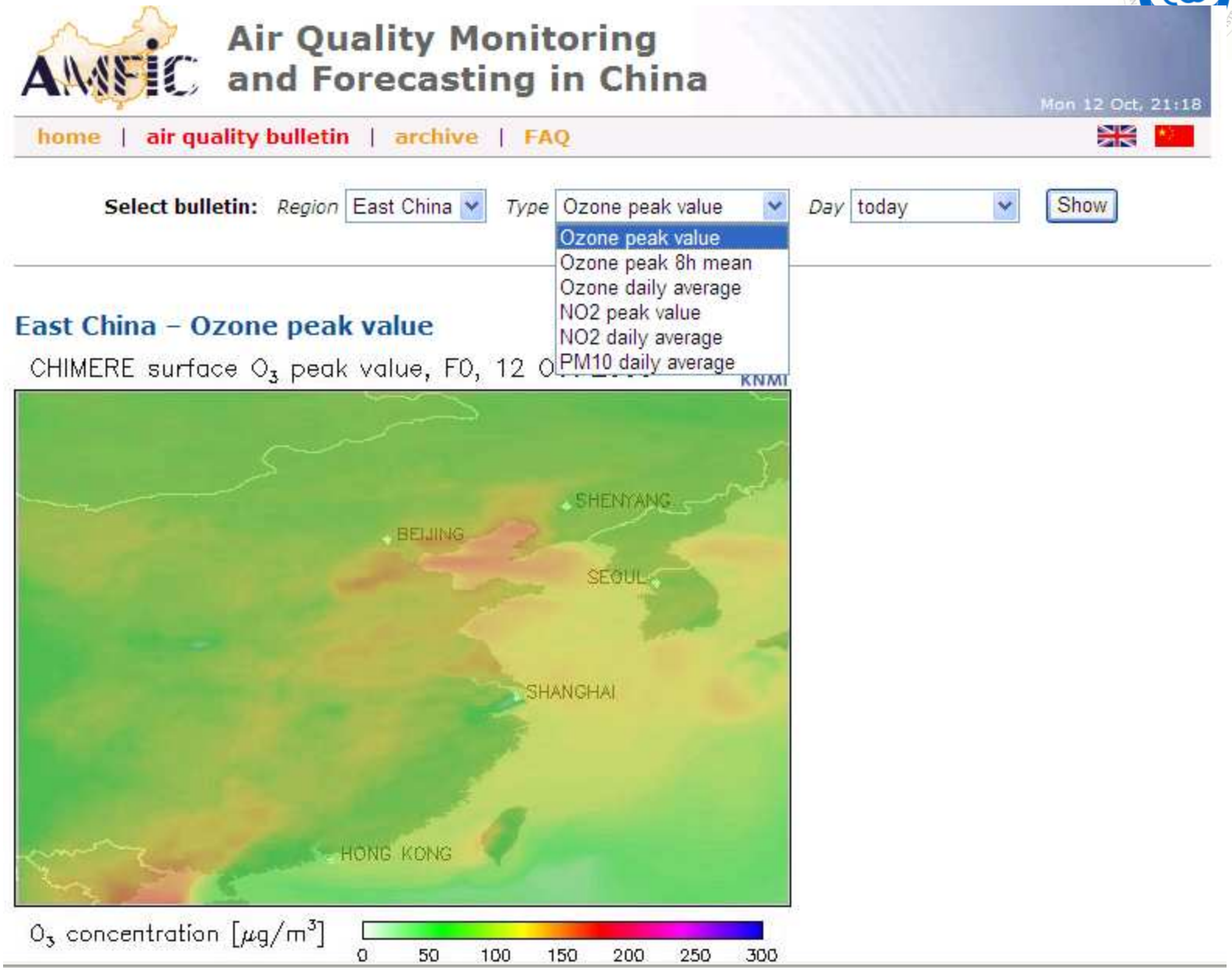
East China – Ozone peak

CHIMERE surface O_3 peak 12 Oct 2009 KNMI



O_3 concentration [$\mu g/m^3$]

0 50 100 150 200 250 300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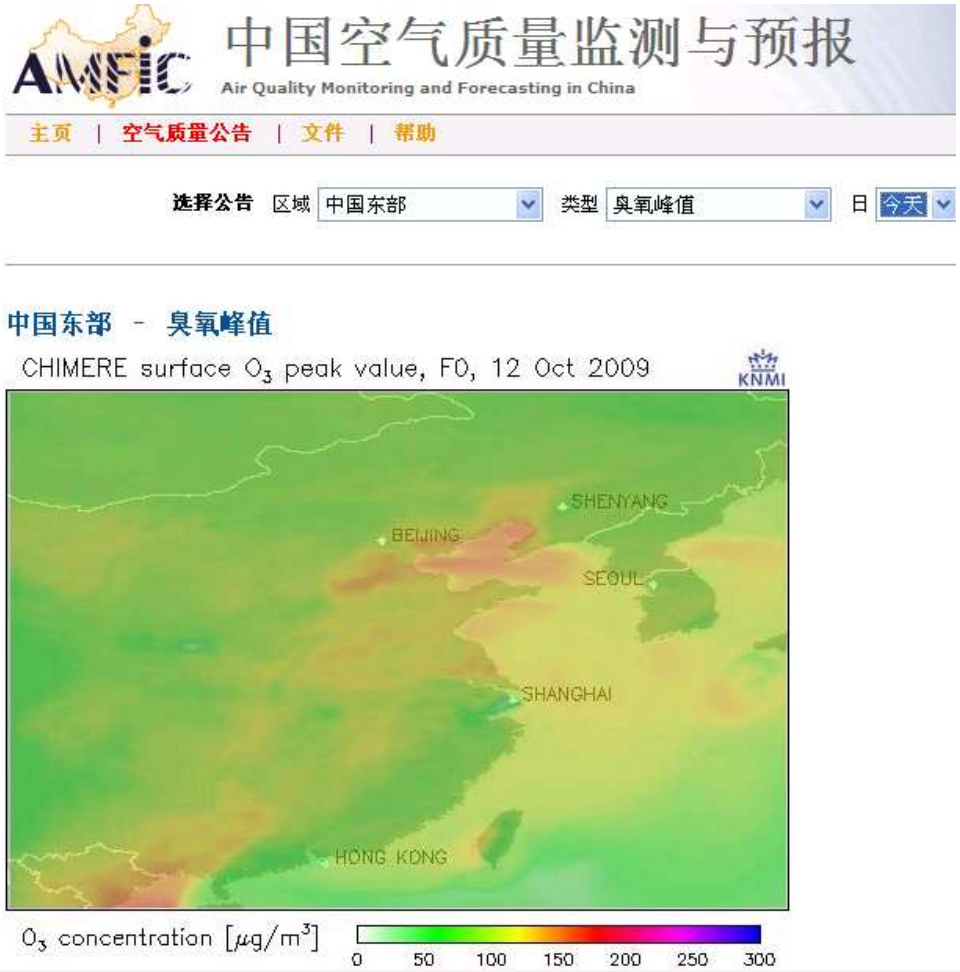
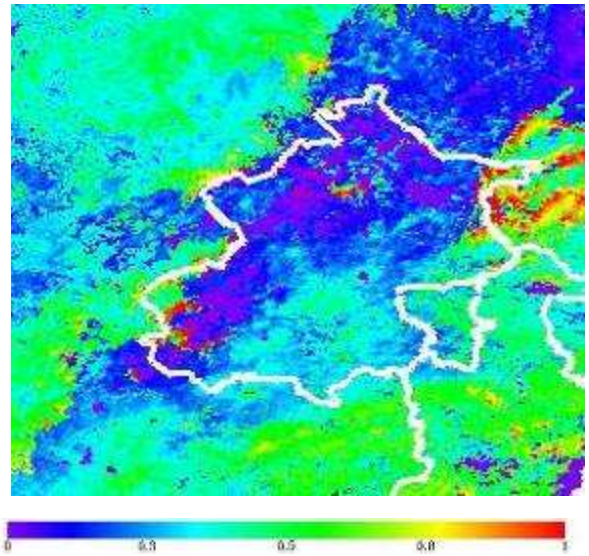
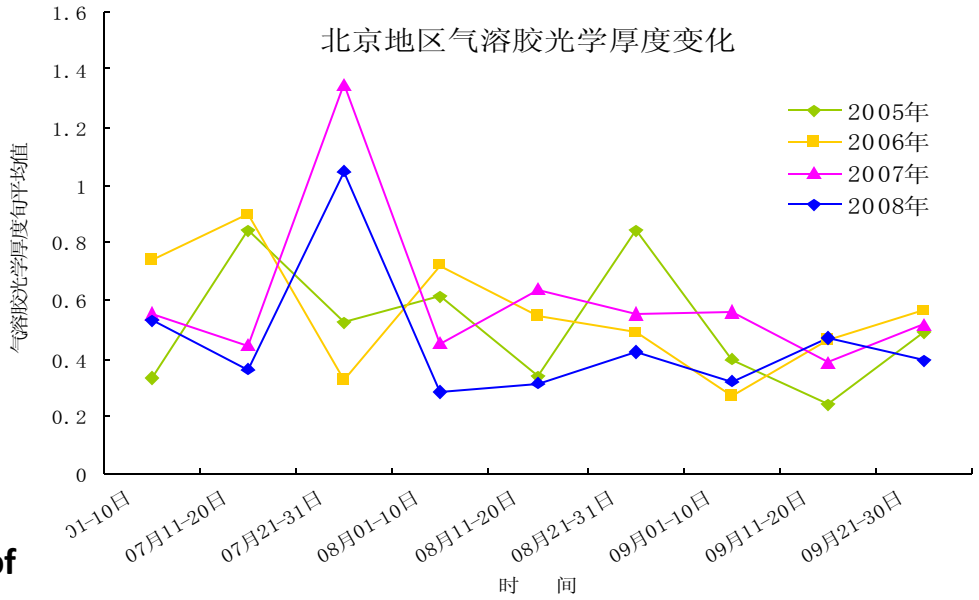
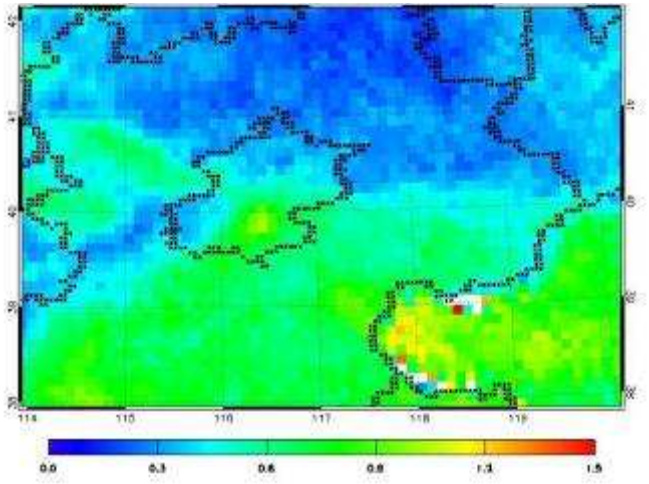
Ozone peak value
Ozone peak 8h mean
Ozone daily average
NO2 peak value
NO2 daily average
PM10 daily average
East China – Ozone peak value
CHIMERE surface O3 peak value, F0, 12
KNMI
SHENYANG
BEIJING
SEOUL
SHANGHAI
HONG KONG
O3 concentration [μg/m3]
0 50 100 150 200 250 300


中国空气质量监测与预报
Air Quality Monitoring and Forecasting in China
主页 | 空气质量公告 | 文件 | 帮助
选择公告 区域 中国东部 类型 臭氧峰值 日 今天
中国东部 - 臭氧峰值
CHIMERE surface O_3 peak value, F0, 12 Oct 2009
KNMI
SHENYANG
BEIJING
SEOUL
SHANGHAI
HONG KONG
O_3 concentration [$\mu g/m^3$]
0 50 100 150 200 250 300



Aerosol optical depth on the first ten days of August, 2008 from MERSI/FY-3A





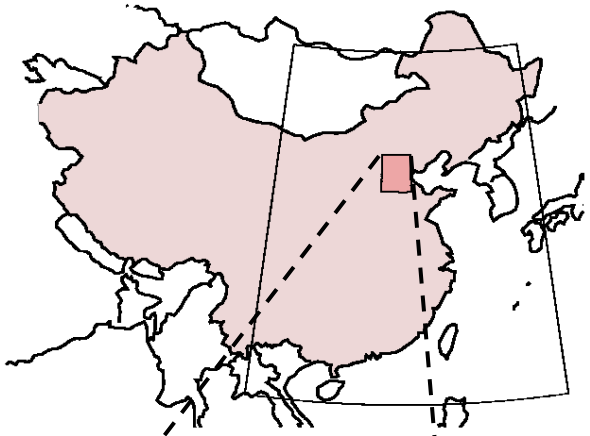
Aerosol optical depth on August averaged from 2005-2008 by MODIS/EOS

Histroy data from MODIS, and 2008 data from MERSI/FY-3A

AOD Monthly Average (2005～2008) over Beijing Area

	2005	2006	2007	2008	4-year averag
July	0.5137	0.6850	0.6081	0.7012	0.6300
Aug	0.6161	0.5408	0.5657	0.3722	0.5375
sept	0.4005	0.4358	0.5179	0.3992	0.4408

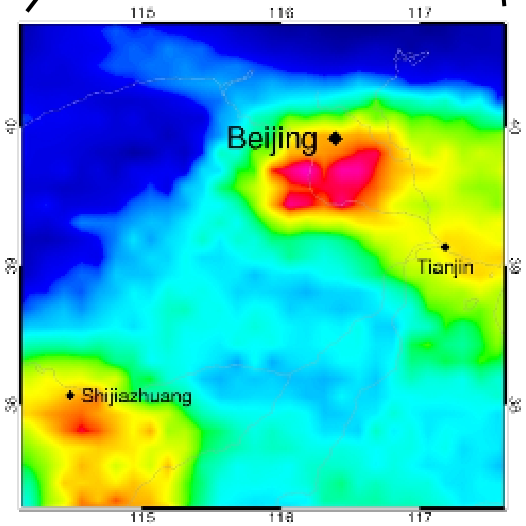
30% AOD decrement means the traffic control policy cleans the atmosphere effectively



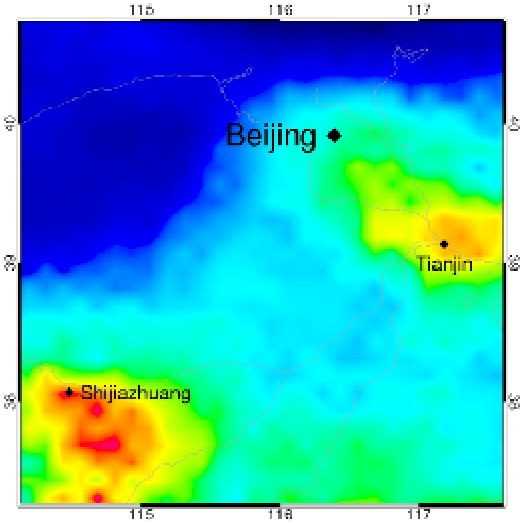
NO_2 reductions detected during 2008 Olympic Games

Mijling et al., Geophys. Res. Lett. (2009)

GOME-2, 2007



GOME-2, 2008

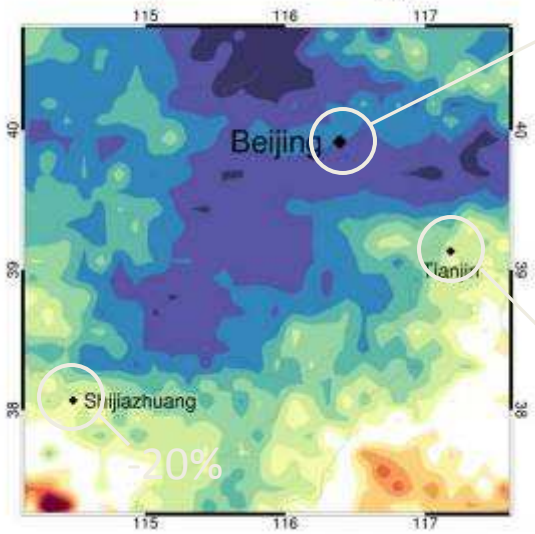


NO_2 [10^{15} molec/cm^2]

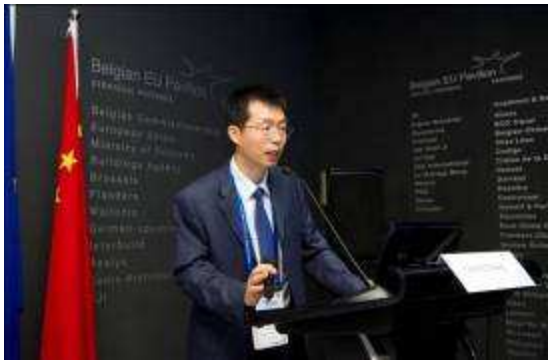
0 50

NO_2 reductions

GOME-2 observations against CHIMERE simulations



-75% 75%



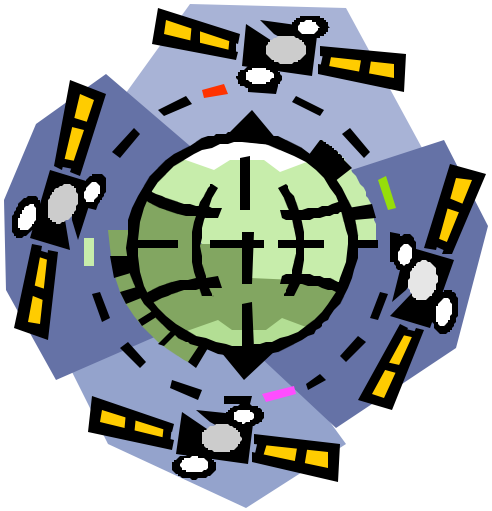
- Dr. Peng Zhang, National Satellite Meteorological Center, China Meteorological Administration (AMFIC - Air Quality Monitoring and Forecasting in China – project partner)

On the AMFIC project, its results (air quality forecasts for cities such as Shanghai, Beijing and Shenyang), and the experience of China-EU space research cooperation

Powerpoint presentation [14 MB]

4. Summary

- Good platform for cooperation: MOST-ESA bilateral cooperation
- Common research interest: Air Quality, Earth Care
- Deep communication and discussion among the scientists
- Some knowledge about the European System: such as budget, audit



Thank you!