



Status of the ILAS-II Algorithm and Data Set

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(NIES)**



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- » **Project status**



History

► ILAS

▶ Instrument	1989 - 1994
▶ Launch by ADEOS	Aug. 17, 1996
▶ Data system	1990 -
▶ Operation	Nov.1996 - June 1997

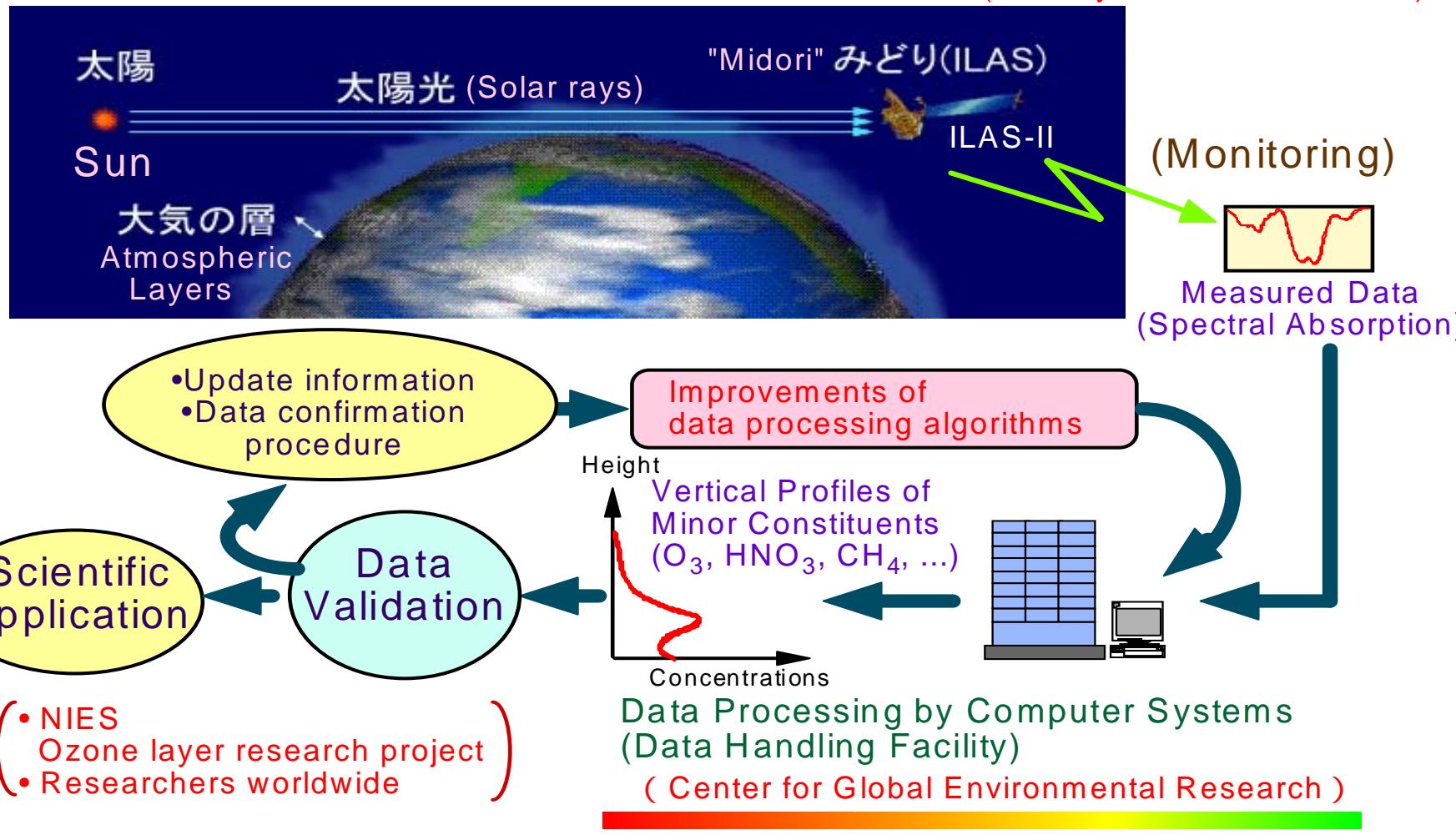
► ILAS-II

▶ Instrument	1994 - 2000
▶ Data system	1995 -
▶ Launch by ADEOS-II	Dec. 14, 2002
▶ Operation	Apr. 10, 2003 -



ILAS/ILAS-II Project Scheme

ILAS and ILAS-II instruments (Ministry of the Environment)



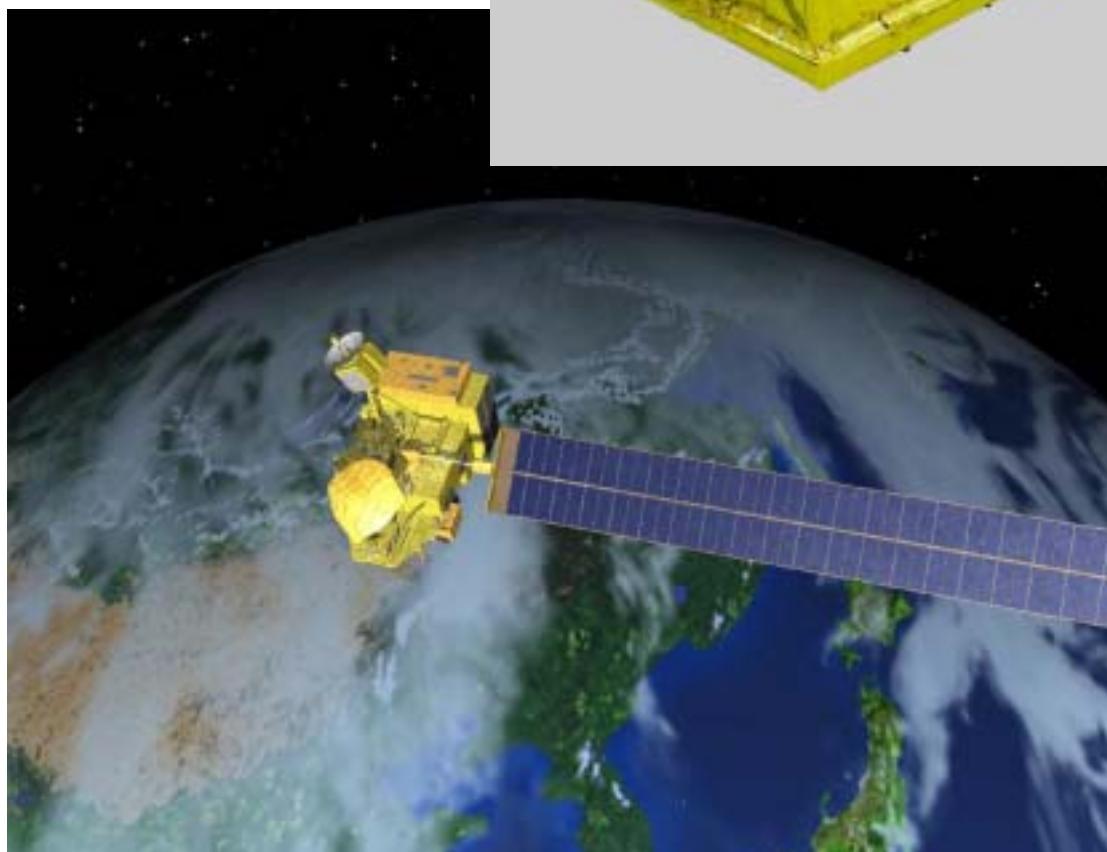
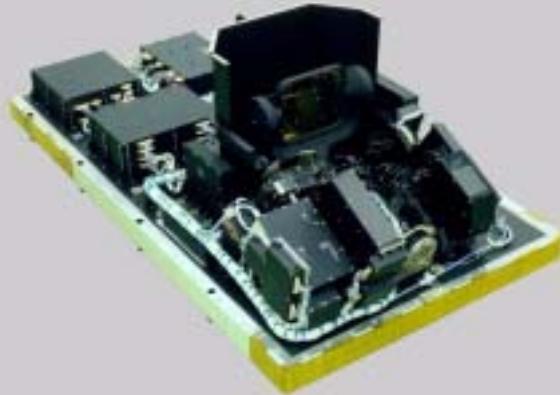


Roles of NIES

- » **Support for instrument designing and manufacturing**
- » **Validation experiment planning and implementation**
- » **Development of data system and its operation**
- » **Scientific analysis using satellite data**
- » **Science Team coordination**



ILAS-II & ADEOS-II





H-IIA No.4 Launch (*Dec. 14, 2002*)

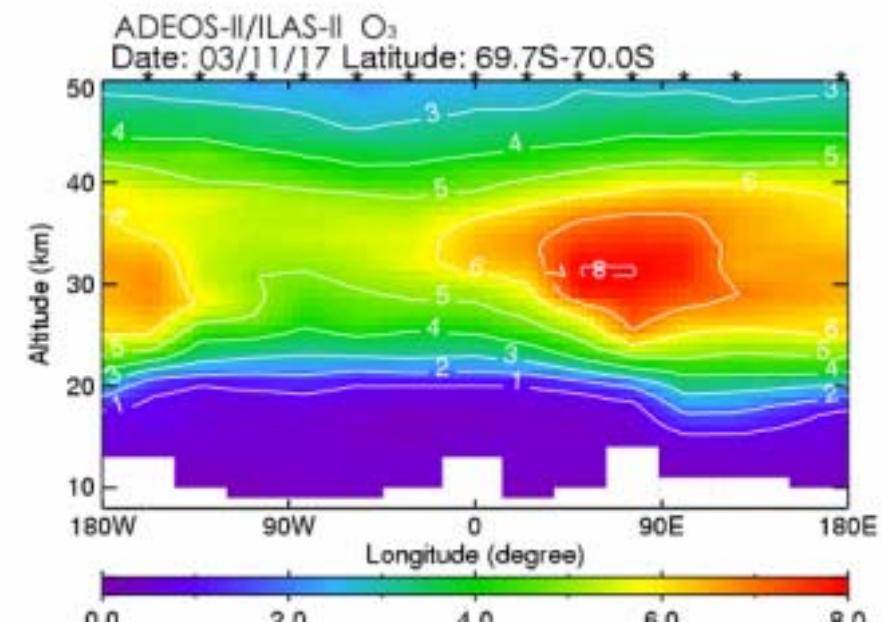
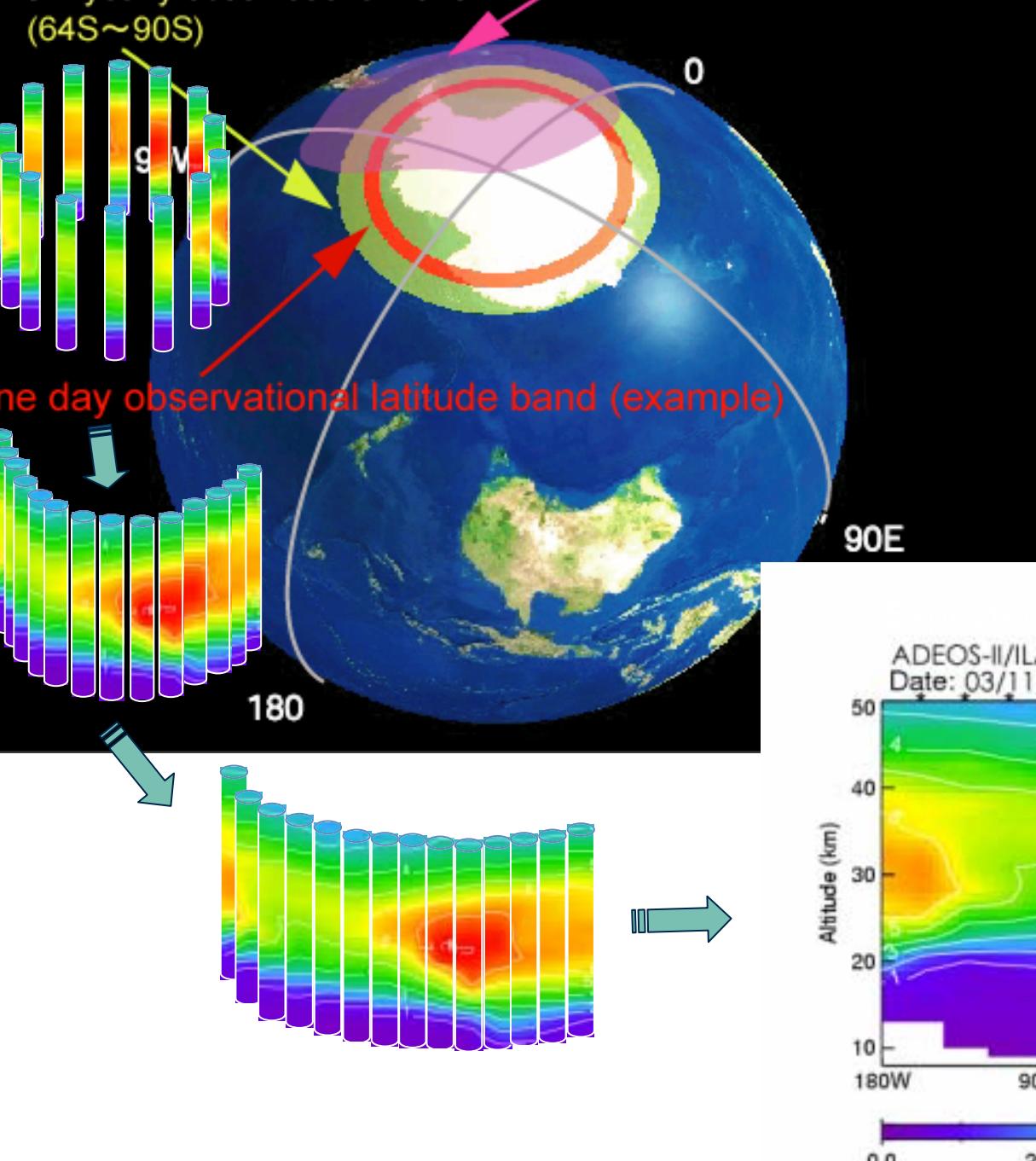


(Photo by NASDA)



ILAS-II

- ▶ Principle: Solar occultation
- ▶ Main components: Infrared and visible grating spectrometers
- ▶ Launch and life time
 - ▶ December 14, 2002
 - ▶ 3 - 5 years
- ▶ Target parameters: same as ILAS + ClONO₂
- ▶ Latitudinal coverage: High latitudes (same as ILAS)
- ▶ Altitude range: [cloud top - ~60 km]
- ▶ Precision and accuracy: Better than ILAS

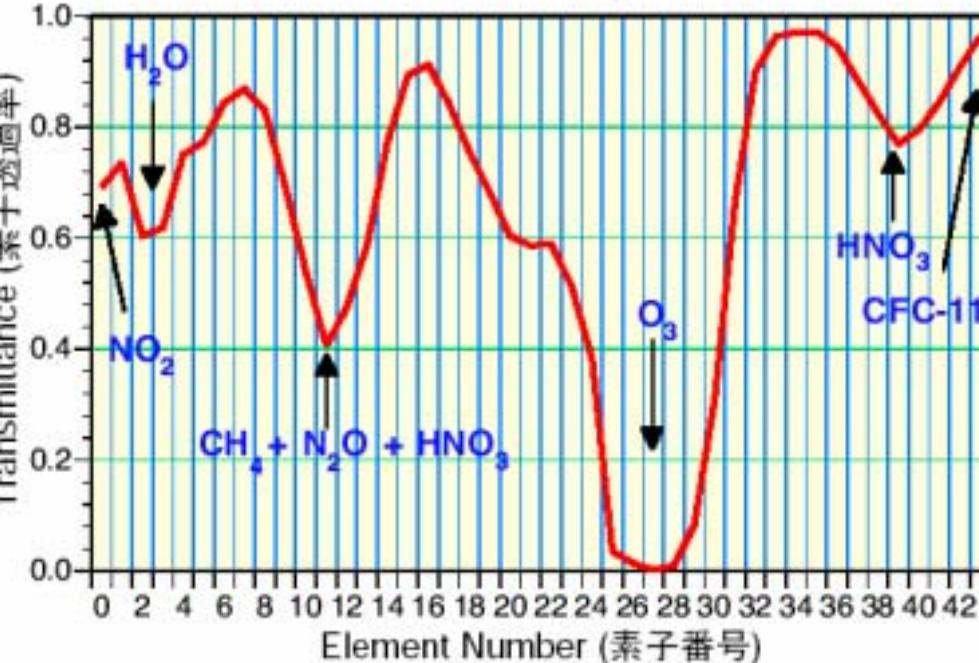


New Items on ILAS-II

- Additional Infrared 2 Channels
 - Short-wave Infrared ($3.0 \sim 5.7\mu\text{m}$)
 - ClONO₂ ($778.2 \sim 782.4 \text{ cm}^{-1}$, $12.8 \mu\text{m}$)
- Solar Disc Scan in Outer Space
- Improvement on Vertical Resolution
 - IFOV : 2 km 1 km
- Archived Instrument House Keeping Data with Level 0 Data
- Data Transmission with Relay Satellite
 - Short Time Delay for Level 0 Data Acquisition

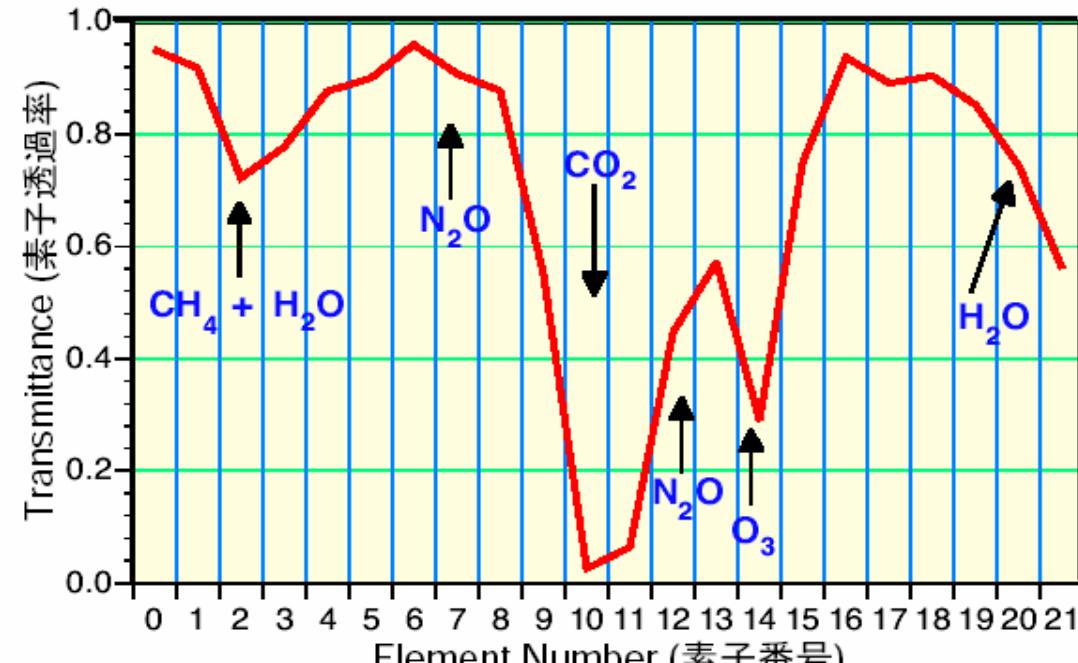
ILAS-II Spectrometers

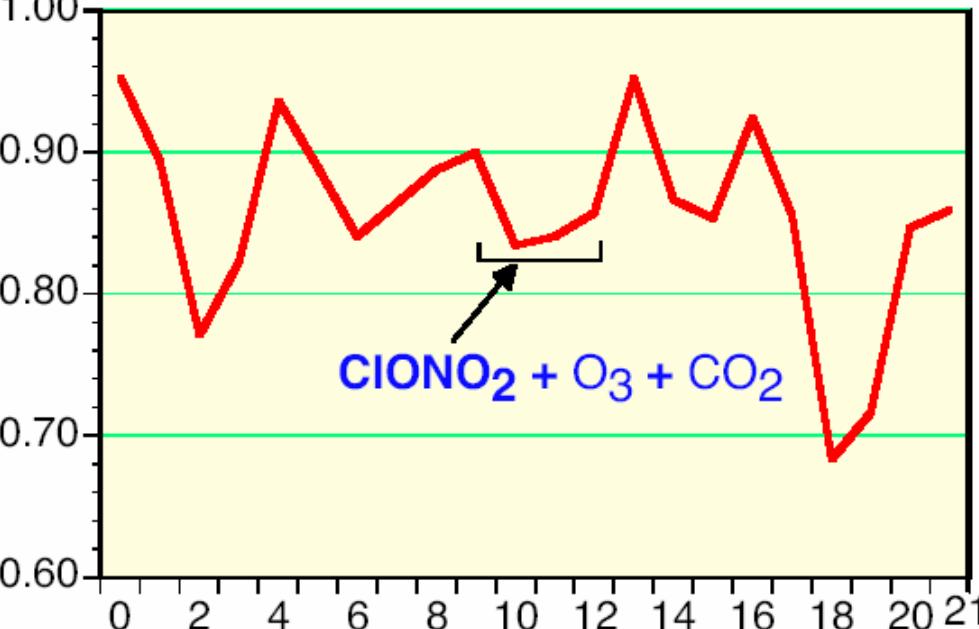
- Channel 1: $6.21 \sim 11.76 \mu\text{m}$ ($1,610 \sim 850 \text{ cm}^{-1}$)
 - O₃, HNO₃, CH₄, N₂O, H₂O, NO₂, CFC-11, CFC-12
 - Multi-array pyro-electric detector (**44 elements**)
- Channel 2: $3.0 \sim 5.7 \mu\text{m}$ ($3,333 \sim 1,750 \text{ cm}^{-1}$)
 - Aerosol, H₂O, CH₄, NO₂, N₂O, O₃, CO₂ (->P)
 - Multi-array pyro-electric detector (**22 elements**)
- Channel 3: $12.78 \sim 12.85 \mu\text{m}$ ($782.4 \sim 778.2 \text{ cm}^{-1}$)
 - ClONO₂, [Echelle grating spectrometer]
 - Multi-array pyro-electric detector (**22 elements**)
- Channel 4: $753 \sim 784 \text{ nm}$ ($13,280 \sim 12,755 \text{ cm}^{-1}$)
 - Temperature, Pressure, Aerosol extinction coefficients
 - Photo-diode array detector (**1,024 elements**)



← Ch.1 Theoretical
transmittance spectra
at a tangent altitude = 20 km

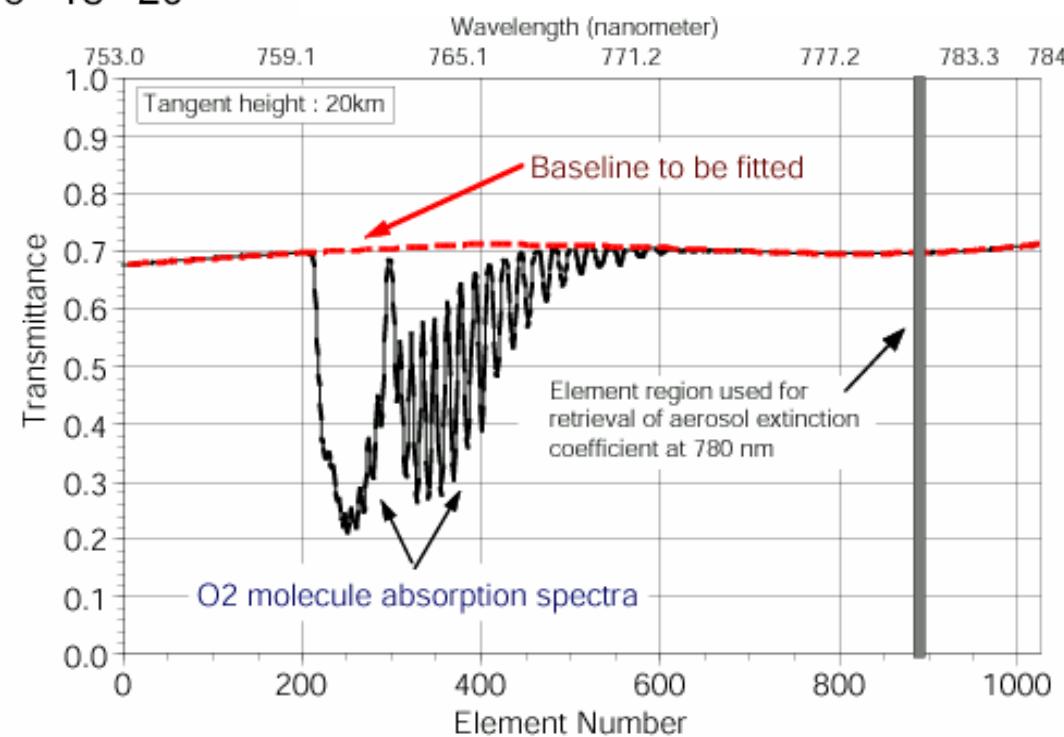
Ch.2 Theoretical
transmittance spectra →
at a tangent altitude = 20 km





◀ Ch.3 Theoretical transmittance spectra at a tangent altitude = 20 km

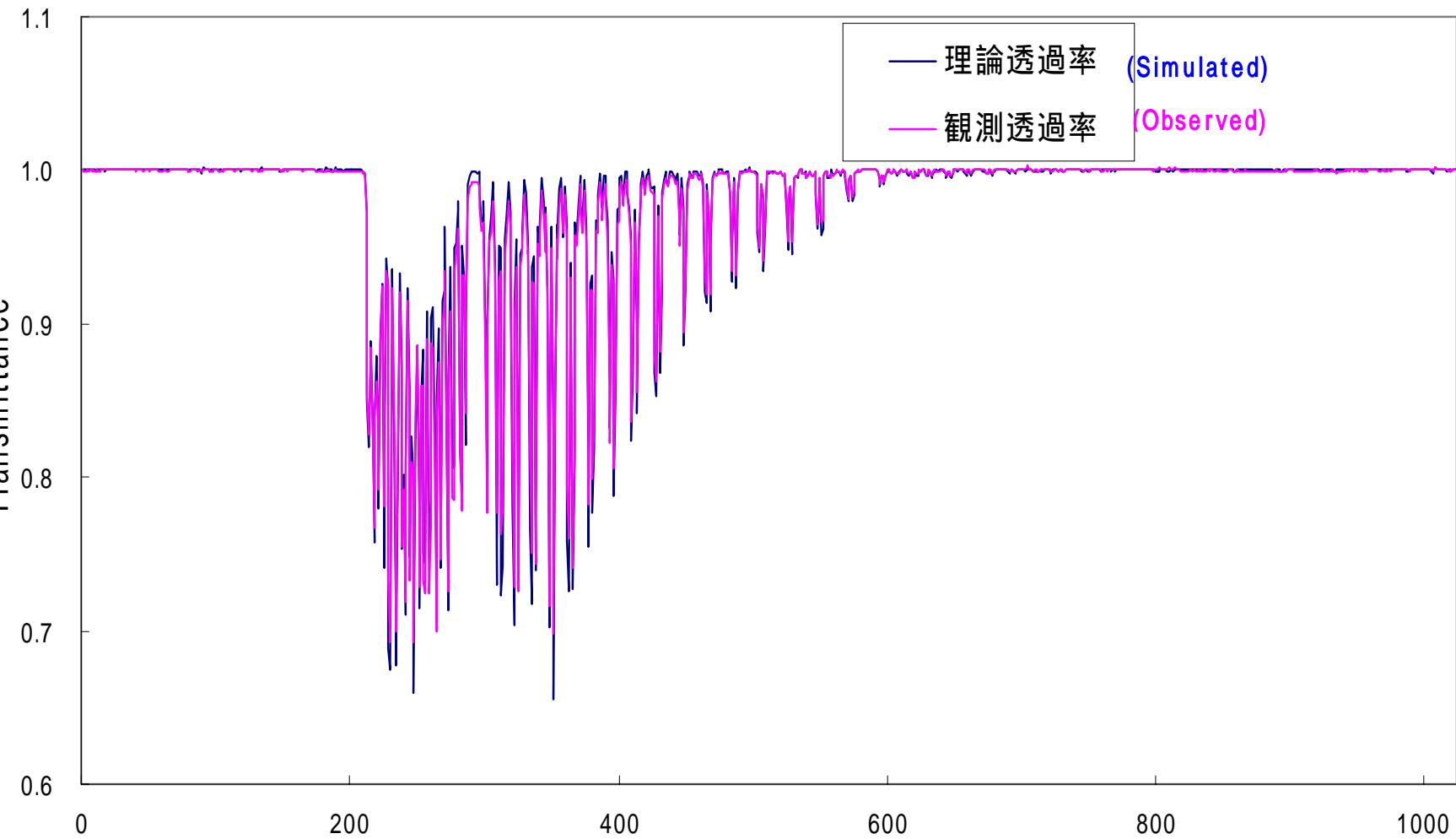
Ch.4 Theoretical transmittance spectra →
at a tangent altitude = 20 km

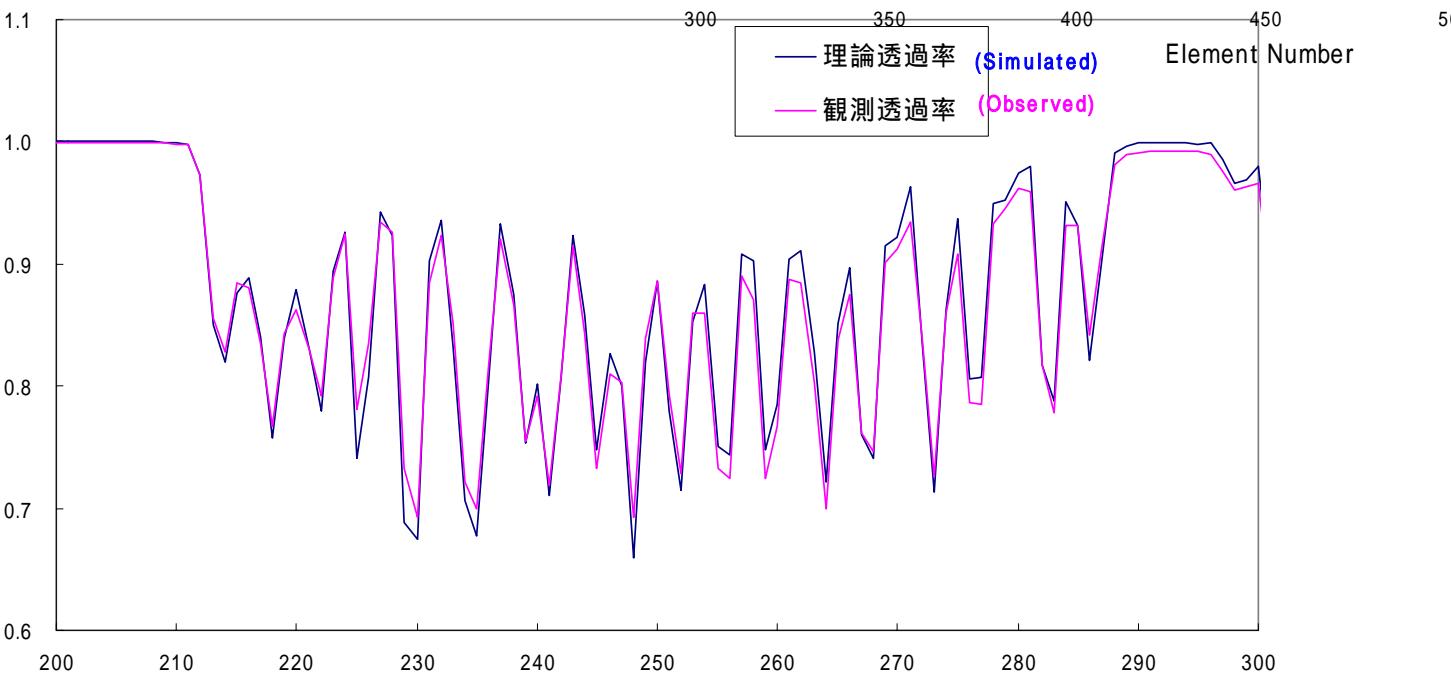
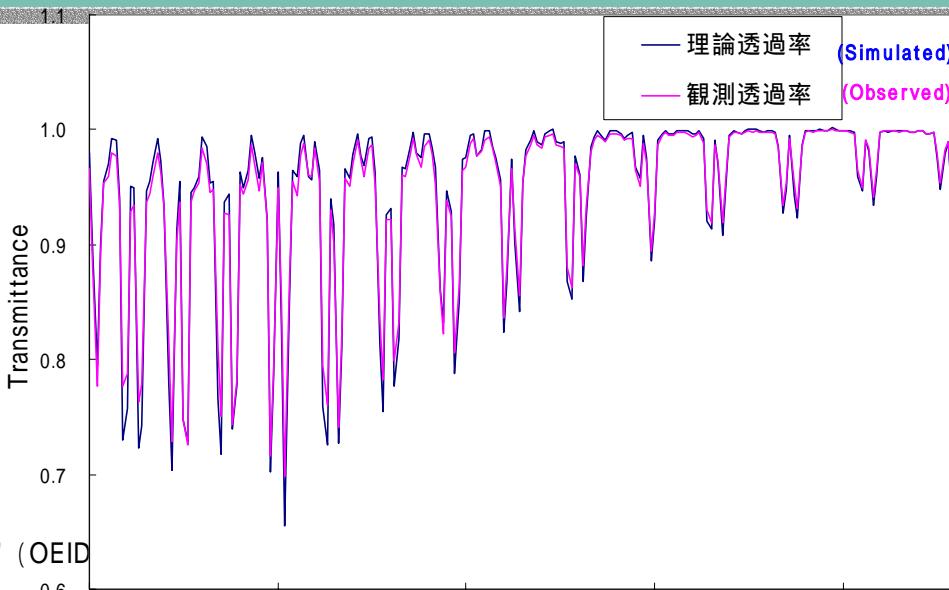




O₂-A band Transmittance Spectra

Level 1 data comparison (OEID 20030122381, shift = -0.24608nm)







Sun-edge sensor problem & lower edge detection

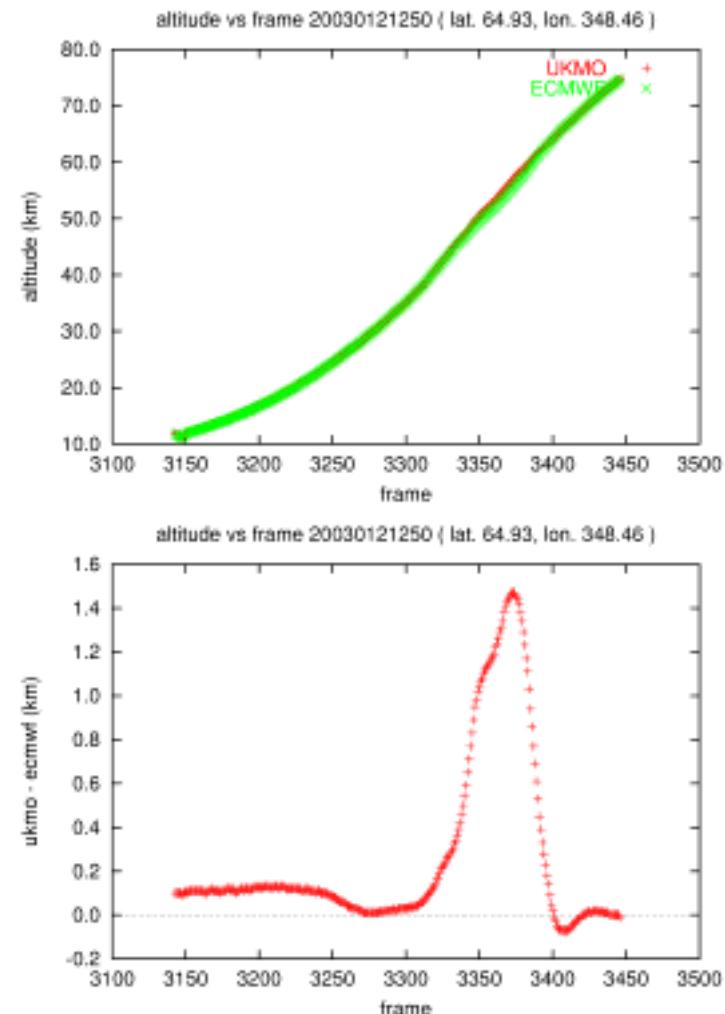
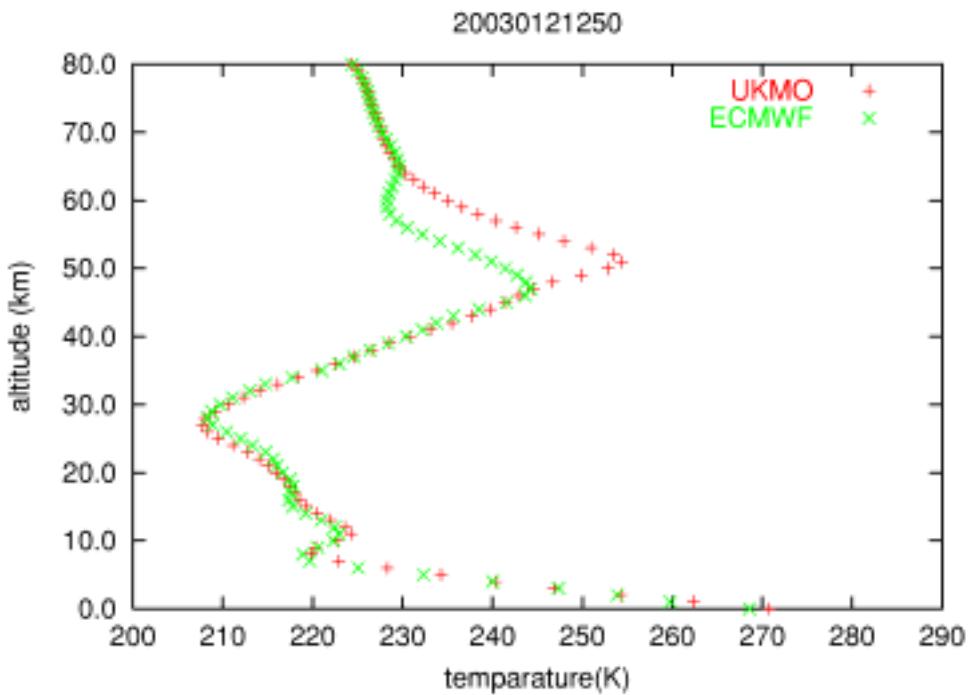
Shape of the solar disc signal has been distorted.
We are investigating a way to determine a tangent
height by detecting a lower edge of the Sun.



Ambiguity of the Tangent Height Determination (VIS-1 Area Matching)

► UKMO vs ECMWF (+ CIRA)

(North, Jan. 21, 2003)

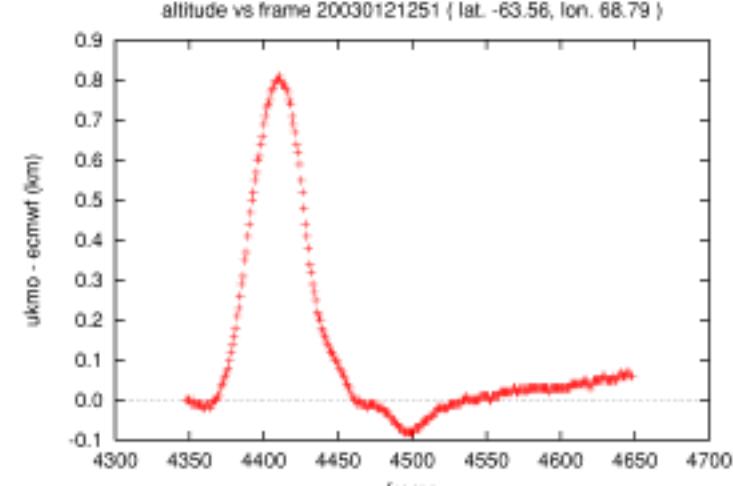
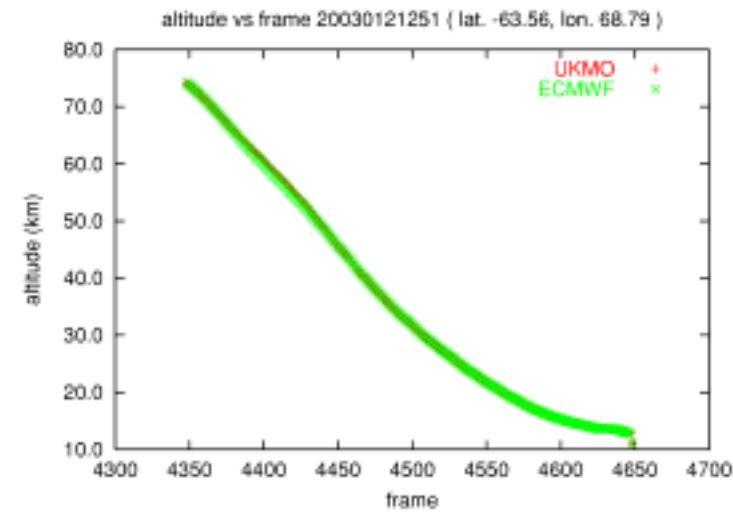
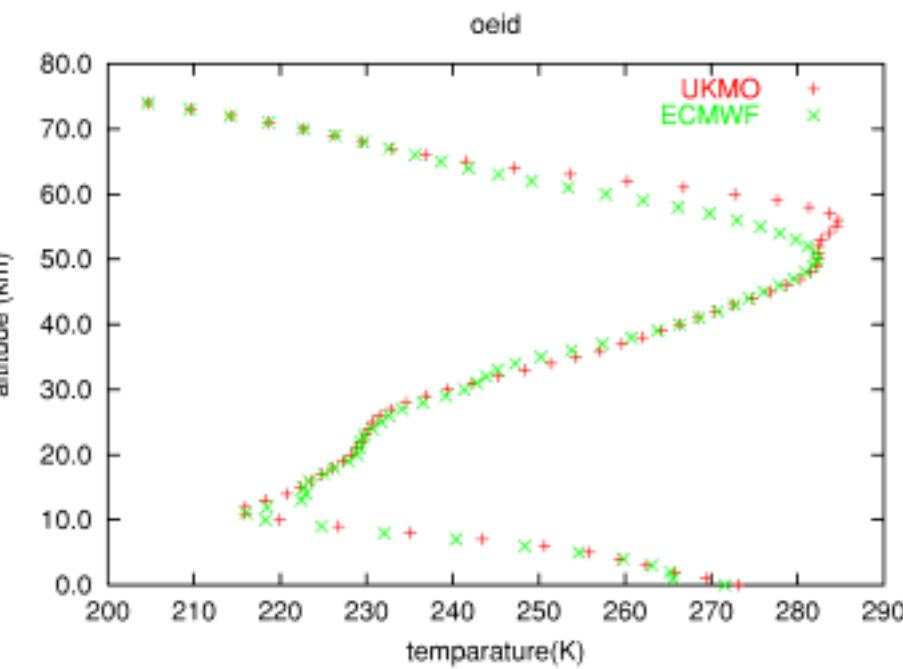




Ambiguity of the Tangent Height Determination (VIS-1 Area Matching)

► UKMO vs ECMWF (+ CIRA)

(South, Jan. 21, 2003)





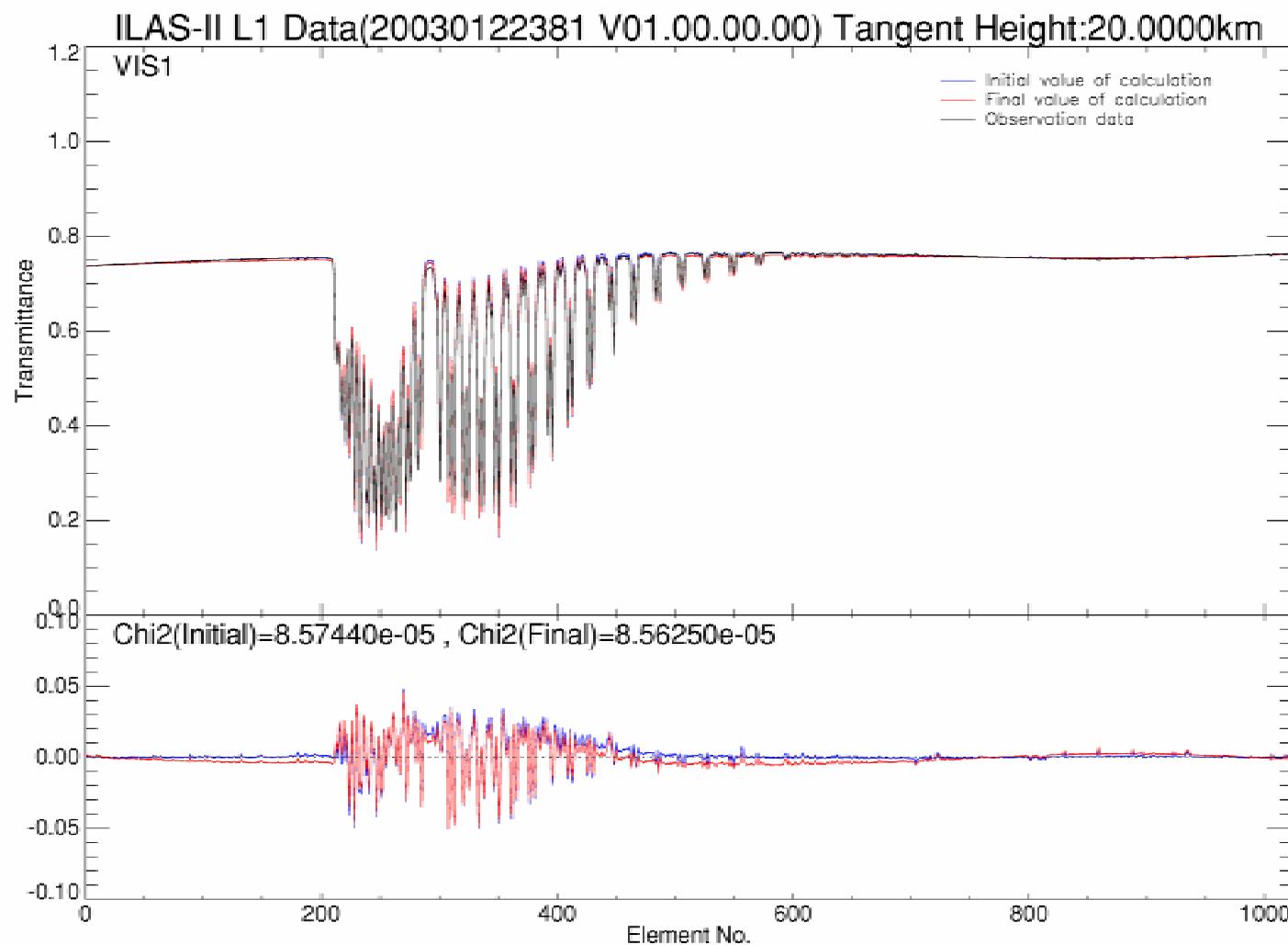
Ambiguity of the Tangent Height Determination (VIS-1 Area Matching)

- » Large ambiguity in upper atmosphere (> 40 km)
 - » At conj. [UKMO or ECMWF] + CIRA
- » Now investigating a tangent height determination method by using lower edges of the sun



p/T retrieval status

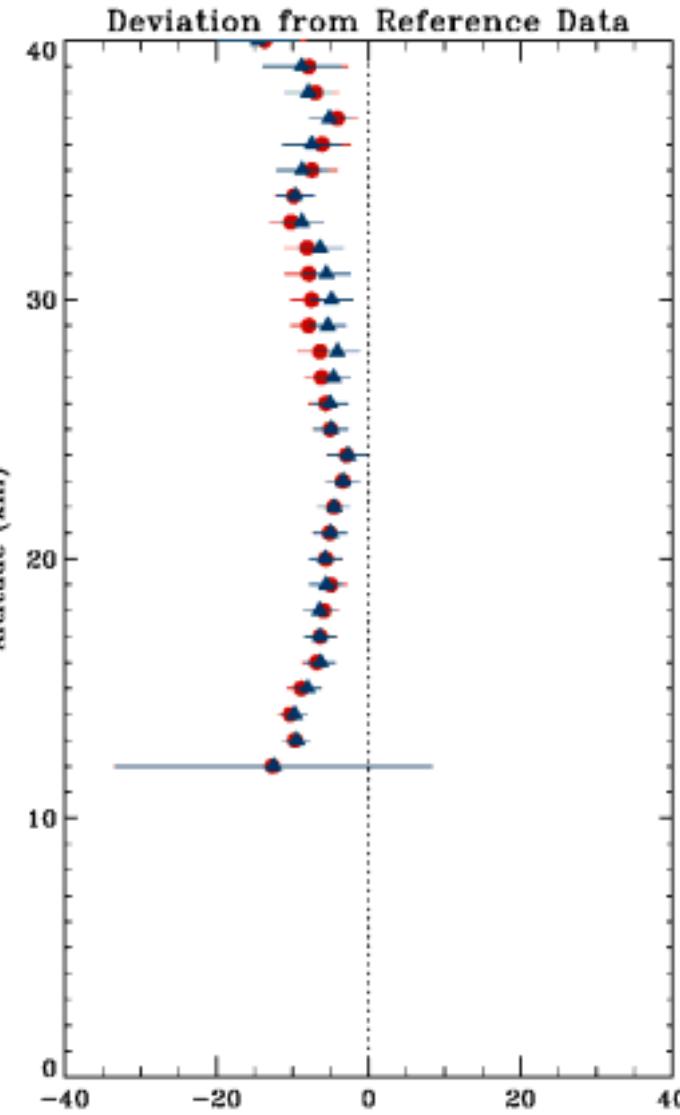
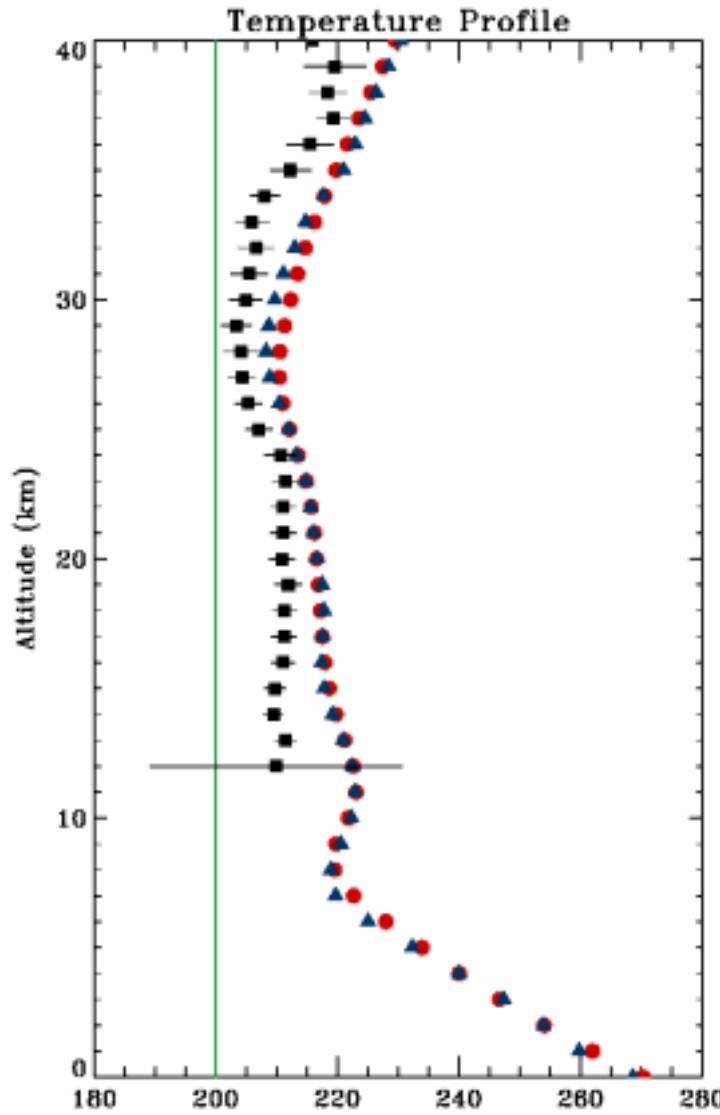
2003/02/27 19:01



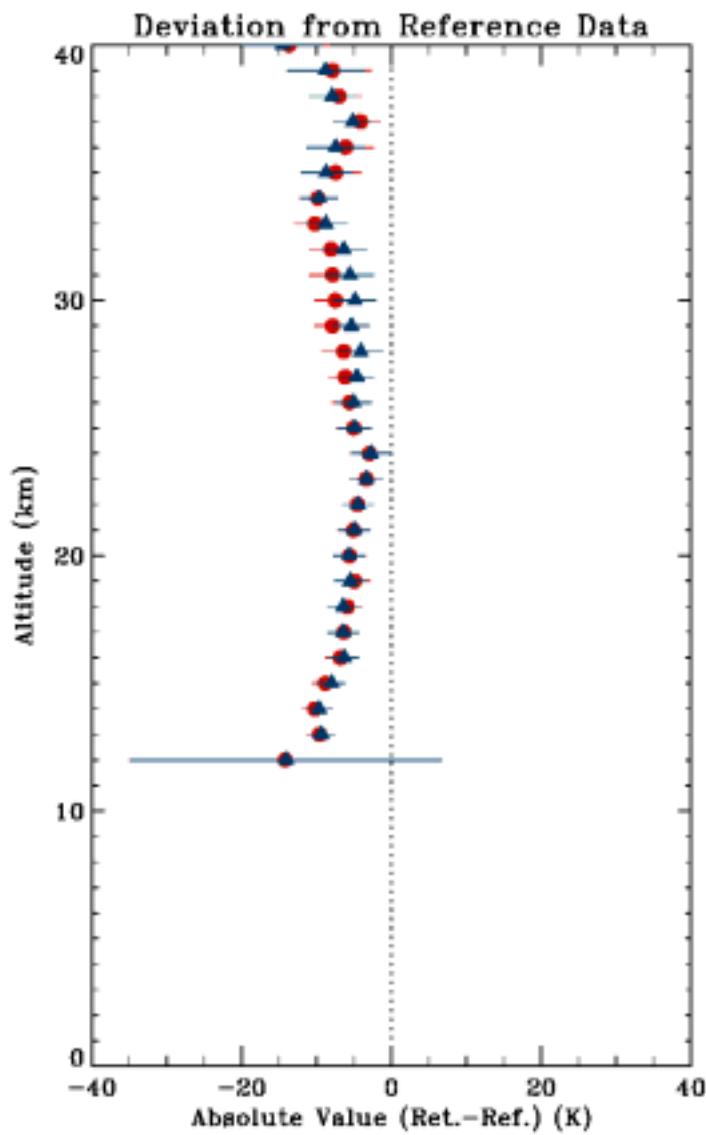
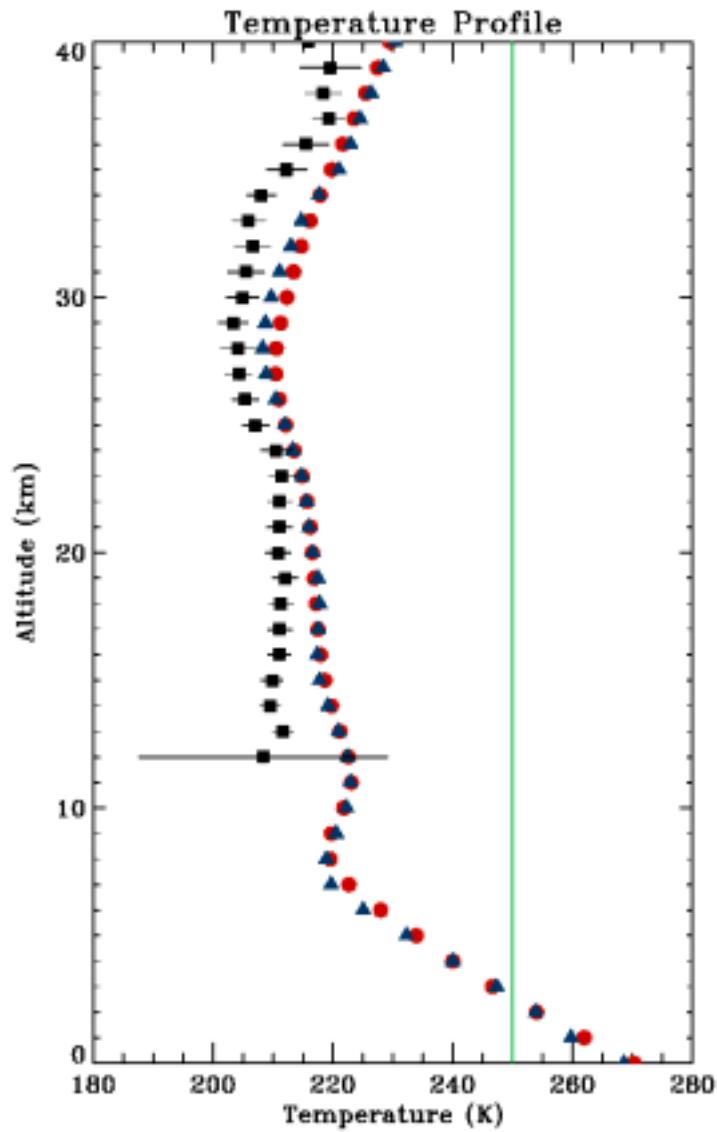


Example of p/T retrieval

Almost no initial value dependency (Initial: 200 K)

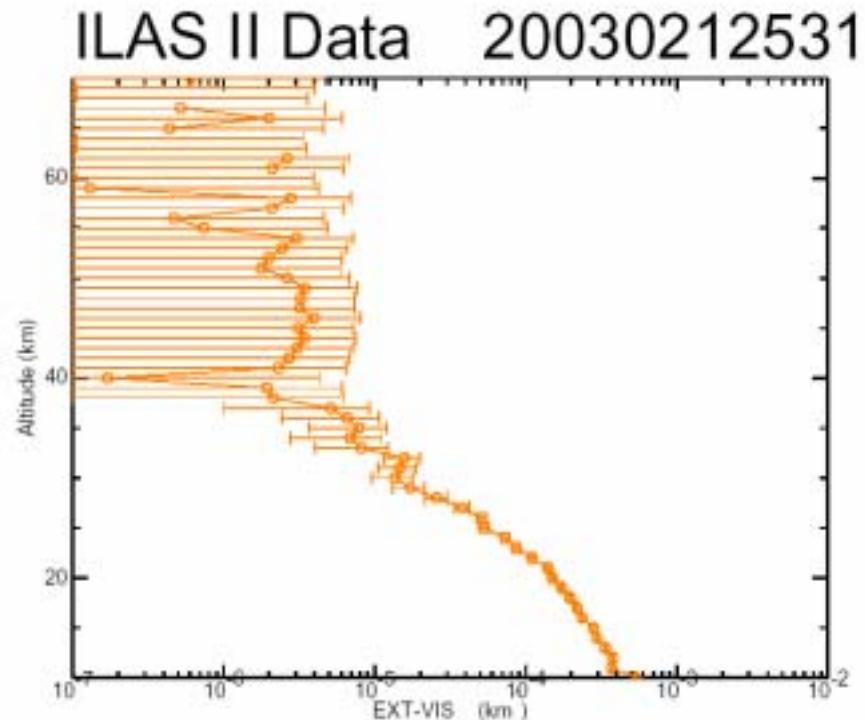
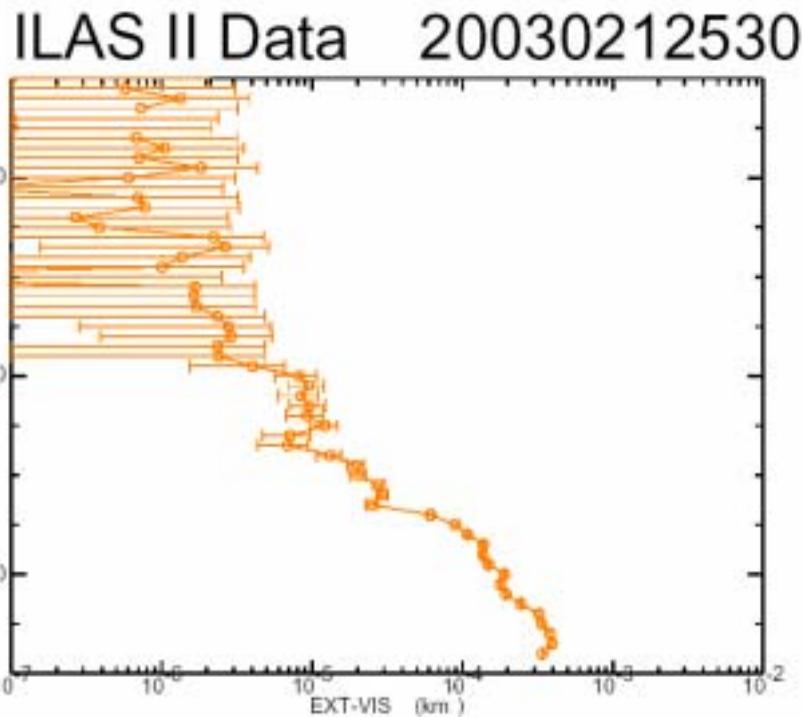


Almost no initial value dependency (Initial: 250 K)

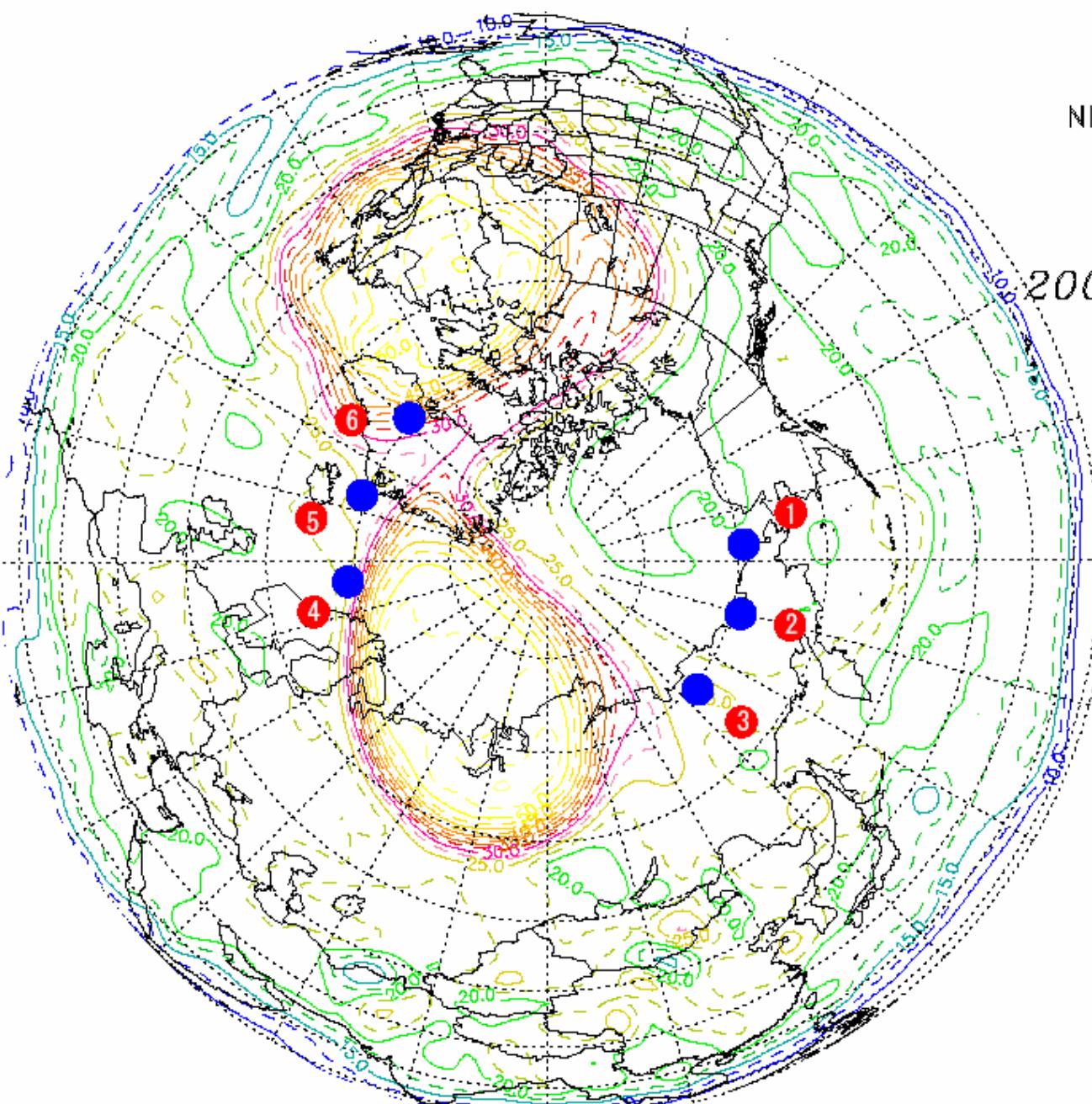


Aerosol retrieval (at 780 nm) (tentative)

Problem : without considering the Sun limb darkening effect



ILAS-II and SAGE-III Observation points



NIES STRAS

Potential Vorticity
($10^{-6} \text{ m}^2 \text{s}^{-1} \text{kg}^{-1} \text{K}$)

2003 01 21 00 (00.)
 $\theta=475(\text{K})$

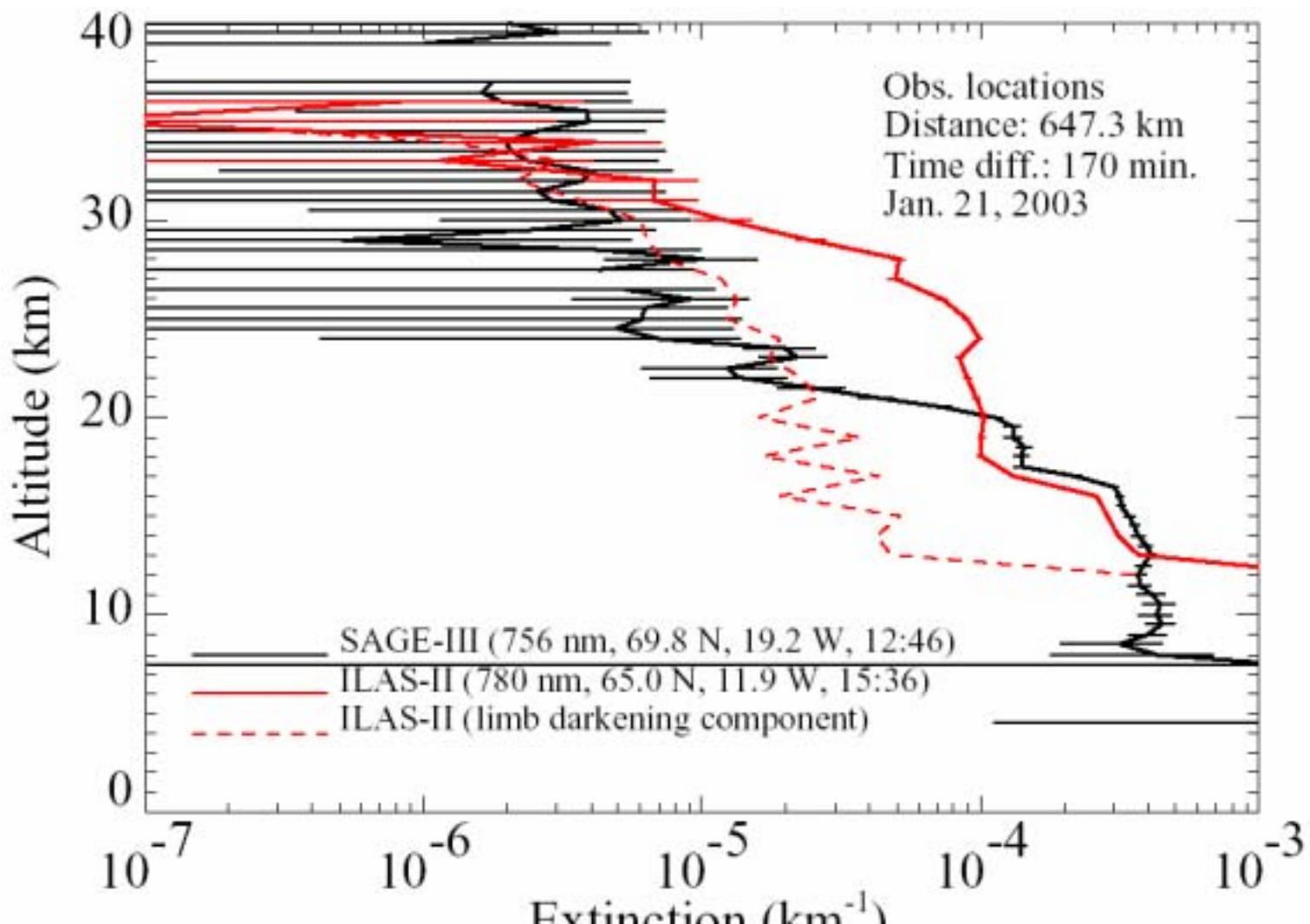
● ILAS-II Observation points

ILAS-II OEID:	Time (UT)
1:20030121170	2003/01/21 2:08
2:20030121180	2003/01/21 3:49
3:20030121190	2003/01/21 5:30
4:20030121240	2003/01/21 13:55
5:20030121250	2003/01/21 15:36
6:20030121260	2003/01/21 17:17

● SAGE-III Observation points

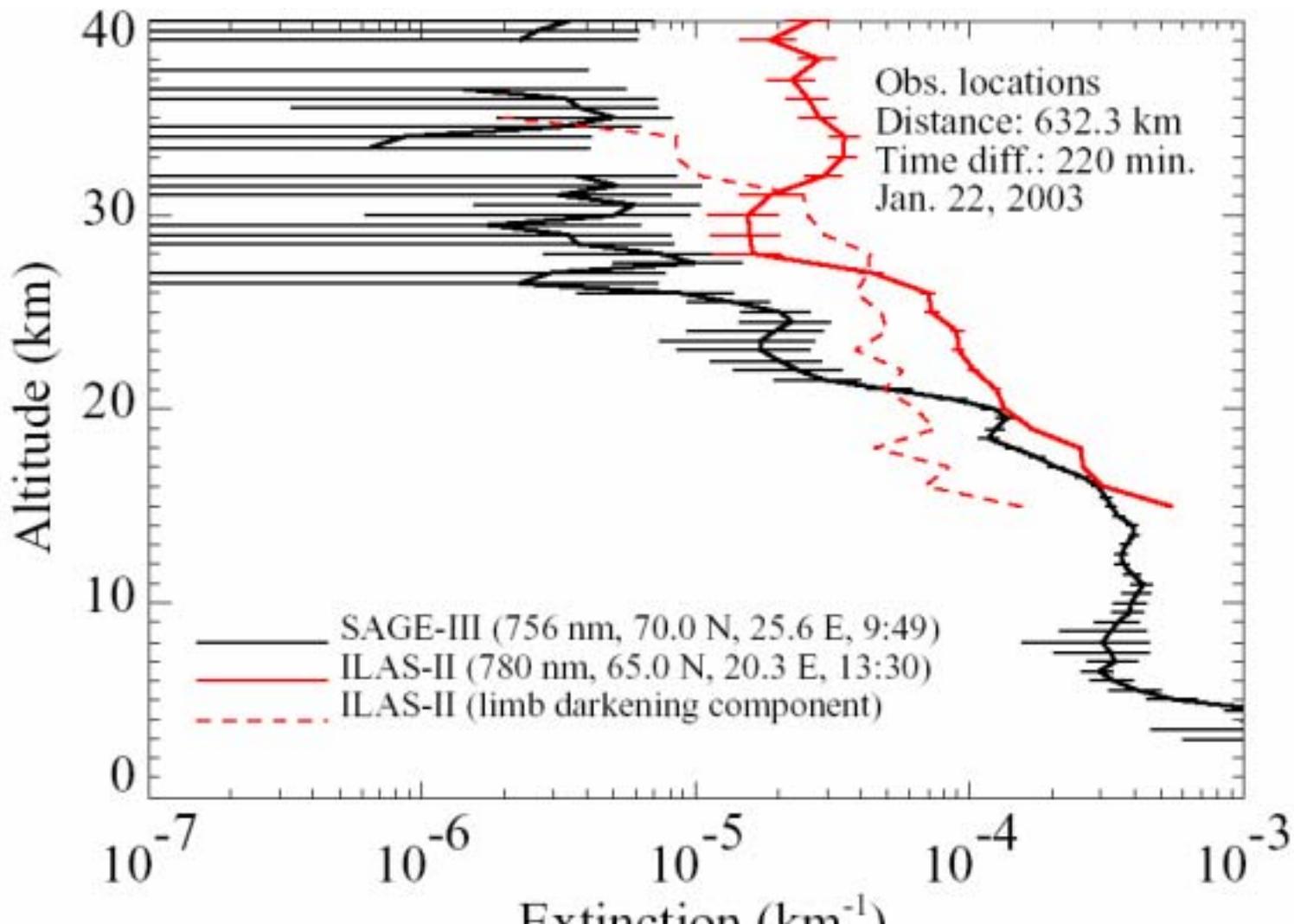


ILAS-II & SAGE-III initial aerosol data comparison (1) (very tentative!)





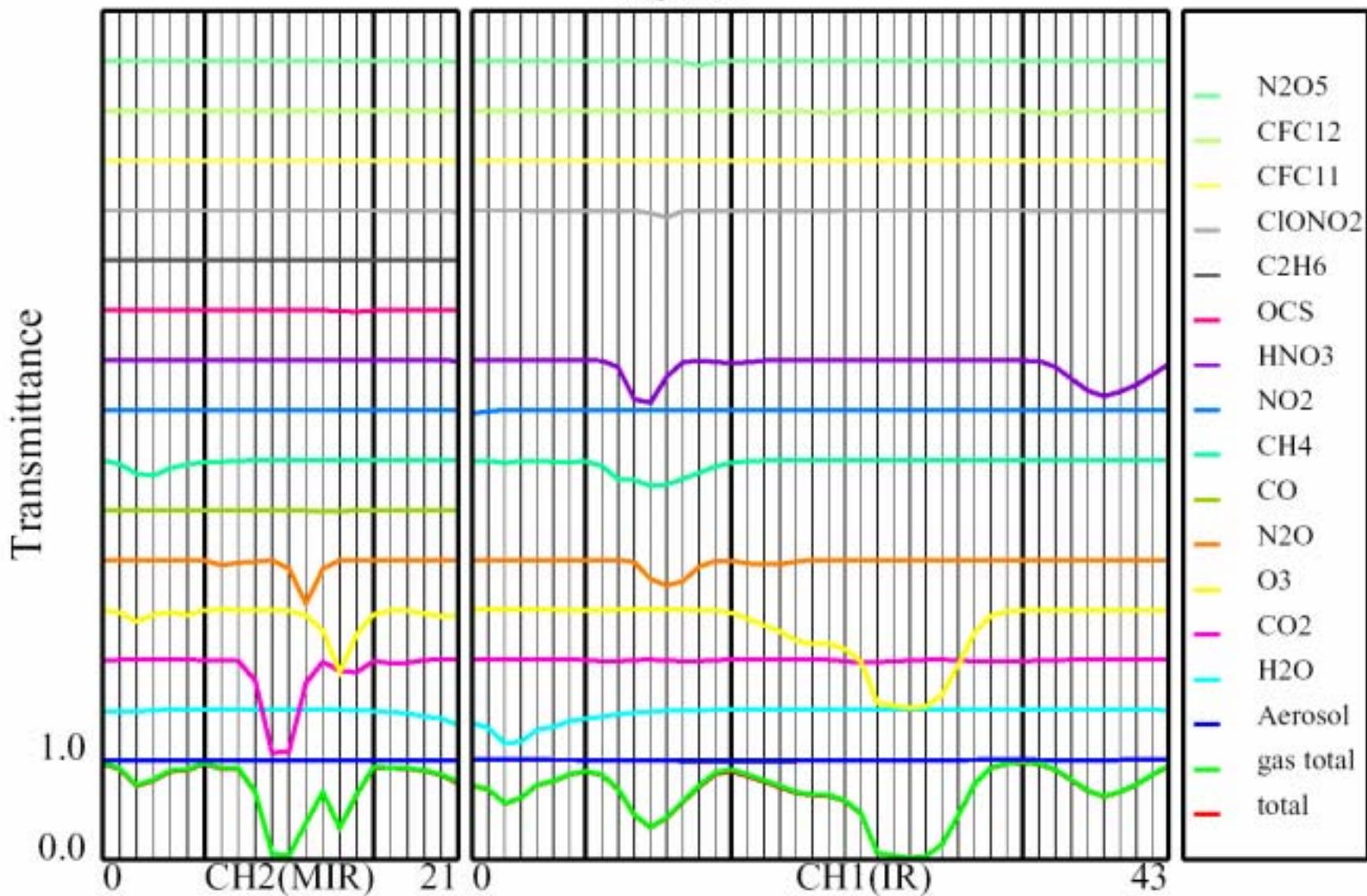
ILAS-II & SAGE-III initial aerosol data comparison (2) (very tentative!)





TLAS-II TR channels spectral coverage

20km

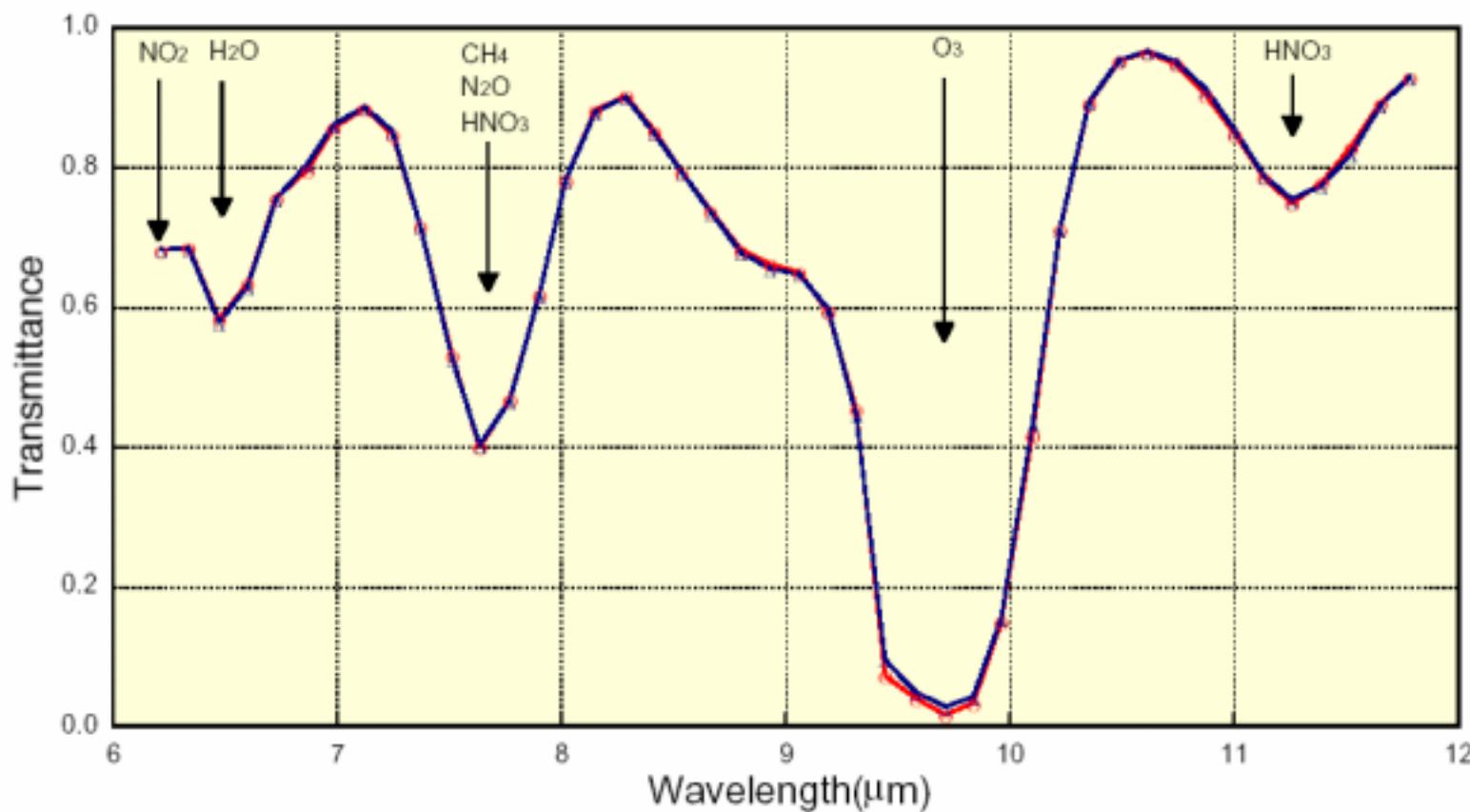


IR ch.1 spectral fitting status

Atmospheric transmittance(Infrared Spectrometer)

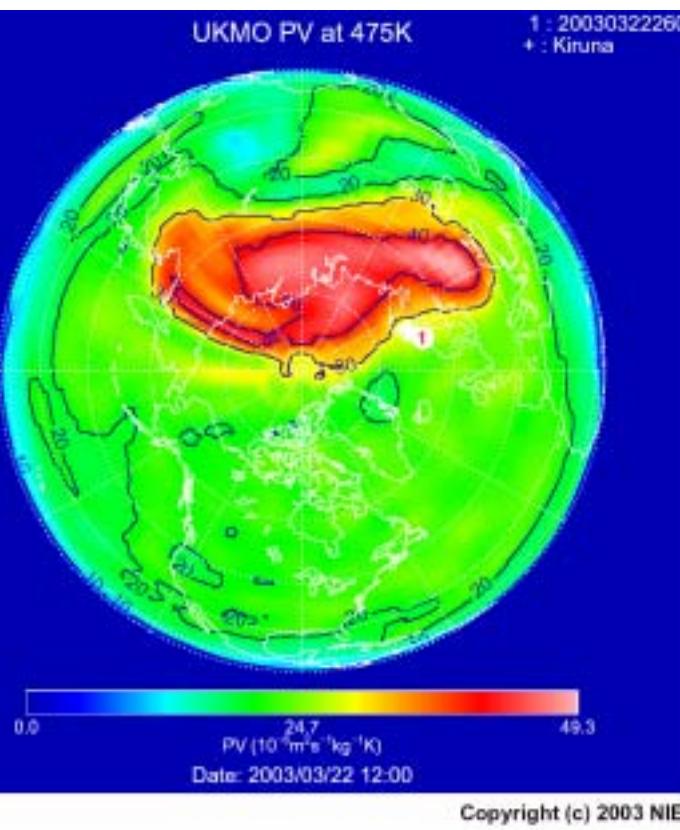
Location 64.1S 50.4E
Height 20km
Time 2003.1.22 18:52(UT)

Observed value
Calculated value





Level 2 Example Ozone



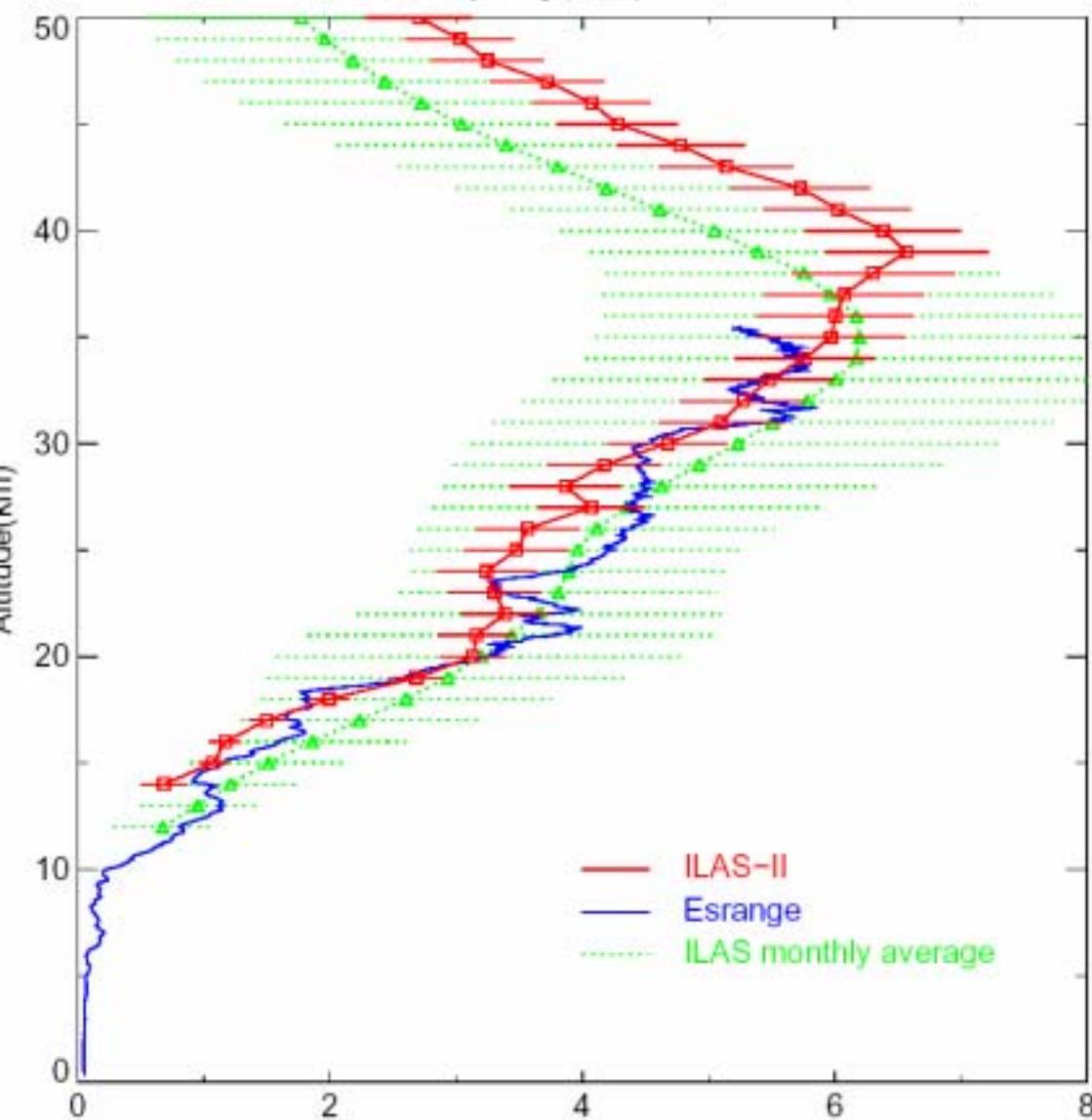
O₃ (ILAS-II and Esrange)

ILAS-II : 65.61N 15.17 2003.3.22 17:13:29(UT) (OEID : 20030322260)

Esrange : 67.89N 21.08E 2003.3.22 17:26:20(UT)

(Distance : 362km)

ILAS monthly average(1997.3)



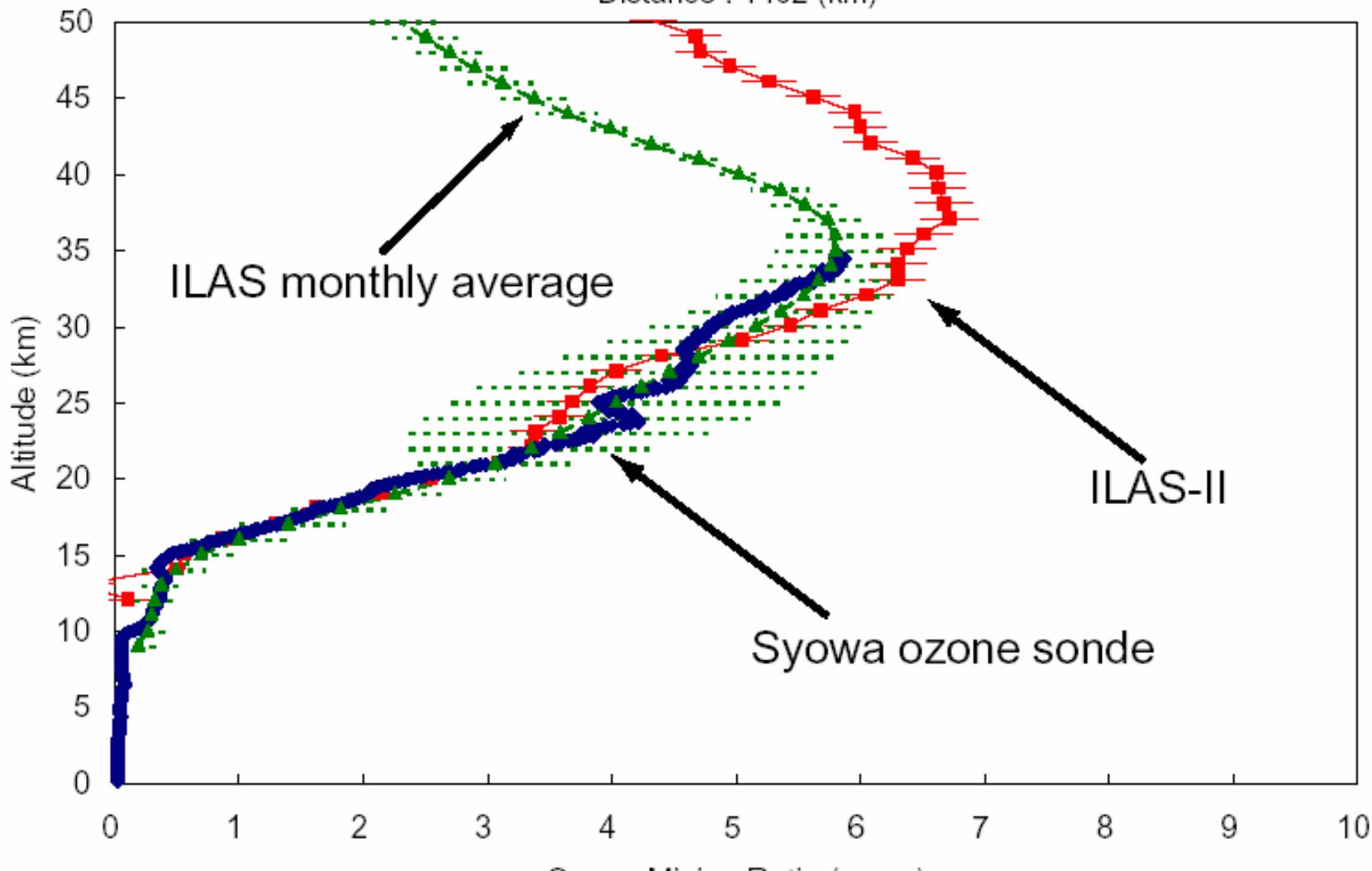


Ozone Mixing Ratio

ILAS-II Time 2003/01/21 16:45 (UTC) Location 63.55 S 68.76 E (OEID : 20030121251)

Syowa Time 2003/01/20 14:10 (UTC) Location 69.00 S 39.58 E

Distance : 1402 (km)





IR channel error bar calculation

- ▶ At present, only internal error has been considered.
 - ▶ VIS: fitting residuals + 100% signal trend stability
 - ▶ IR: fitting residuals
- ▶ Error bar in ILAS-II products seems larger than those in ILAS, because of large spectral fitting residuals.

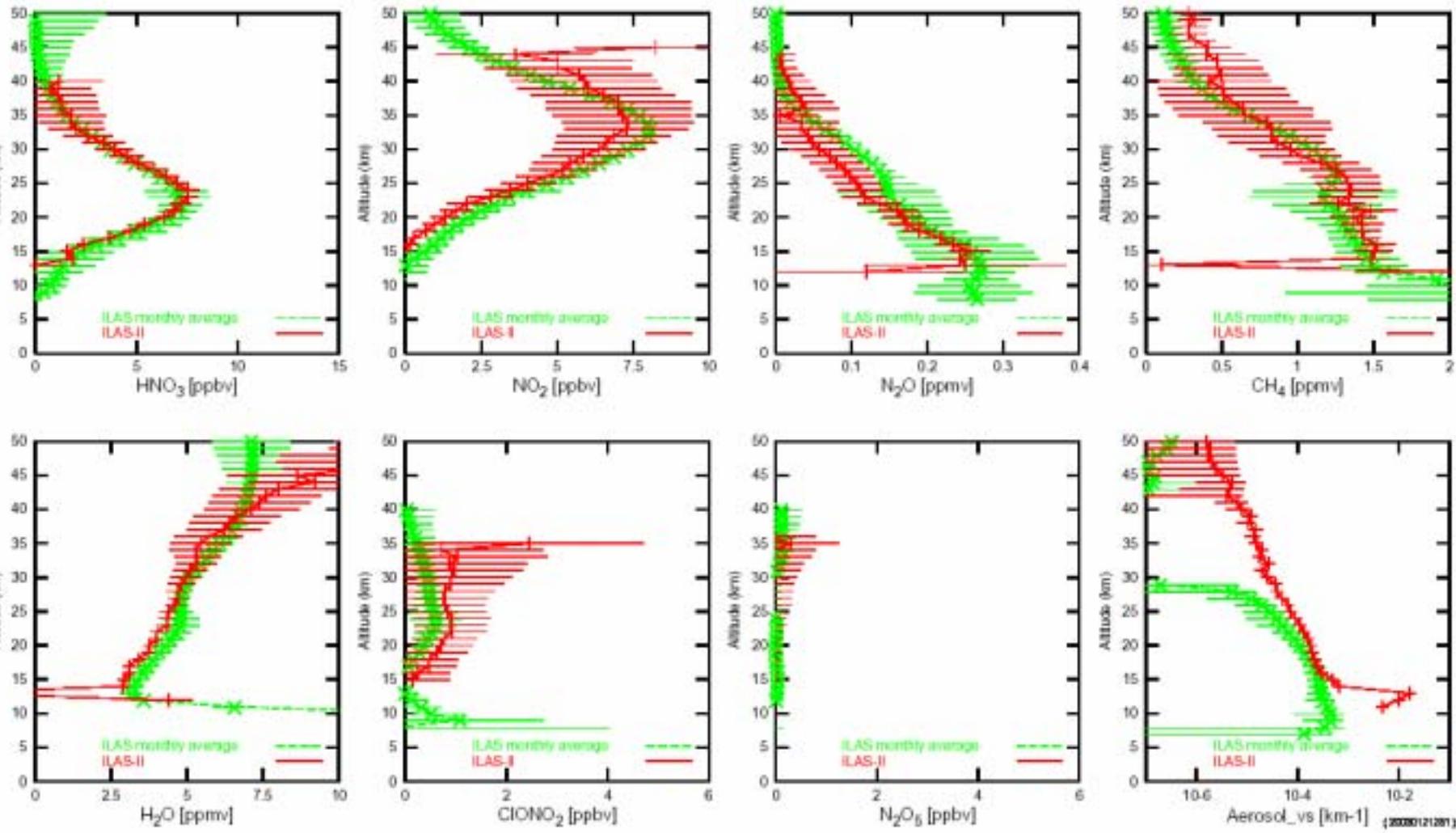


Example of other gas retrieval

Time : 2003.01.21 16:44:48

Location : 63.55 S 68.76 E

Unverified!





ILAS-II project status

ILAS-II Project Organization and Staff

- » Project Leader: Yasuhiro Sasano (NIES)
- » Sub Project Leader: Hirokazu Kobayashi (NIES)
- » Project Staff Scientists: Hideaki Nakajima (NIES)
 - » Takafumi Sugita (NIES)
 - » Tatsuya Yokota (NIES)
 - » Hiroshi Kanzawa (NIES)
- » Project Manager: Hiroshi Ono (MOE)
- » Assistant Project Manager: Takeo Ishigaki (MEI)
- » Manufacturers
 - » Instrument: Matsushita Electric Industry (Panasonic)
 - » Computer System: IBM
 - » Operational Data Processing System: Fujitsu FIP
 - » Data Handling Facility Operation: Fujitsu FIP
 - » Operation Manager: Takeo Togami (FIP)
- » Project Office Secretariat: Sei-ichi Shinoki (JWA)
 - » Yoshihiro Wachi (MRI)



ILAS-II Data Acquisition Status

ILAS-II Planned and Received Data

as of 2004.5.1

Observation Mode	Period (2003 yr)		Observed Data	Received Data	Rate (%)
Initial Check Out	Jan. 20-22, Feb. 8		39	39	100%
Early Turn-On	Feb.12, 15, 22, 25		28	28	100%
System Total 1	Mar. 18-19		113	104	92%
System Total 2	Apr. 2-9		226	226	100%
Routine operation	Apr. 10-30		599	569	95%
Total			1005	966	96%



ILAS-II project status (*cont.*)

ILAS-II Science Activities

- ▶ Joint Research Announcement (MOE, NASDA, NASA, CNES)
- ▶ Announcement issued February 1999
- ▶ 31 proposals accepted September 1999
- ▶ Algorithm research ----- 5
- ▶ Calibration/Validation ---- 14
- ▶ Sciences ----- 12
- ▶ Science Team Meeting
- ▶ 1st Science Team Meeting December 1999
- ▶ 2nd STM March 2001
- ▶ 3rd Domestic STM February 2002
- ▶ 4th STM March 2002
- ▶ 5th Domestic STM March 2003



ILAS-II project status (*cont.*)

► *ILAS-II Science Team members (1/2)*

- Thomas Blumenstock Institute for Meteorology and Climate Research (IMK), Germany
- Greg. E. Bodeker National Institute of Water and Atmospheric Research, NZ
- Claude Camy-Peyret LPMA/CNRS, France
- Derek M. Cunnold Georgia Institute of Technology, USA
- Michael Y. Danilin Atmospheric and Environmental Research, Inc., USA
- Annmarie Eldering UCLA Department of Atmospheric Sciences, USA
- Andreas Engel University of Frankfurt, Germany
- Masashi Fukabori Meteorological Research Institute, Japan
- Hartwig Gernhardt Alfred Wegener Institute for Polar and Marine Research, Germany
- Sachiko Hayashida Nara Women's University, Japan
- David G. Johnson NASA Langley Research Center, USA
- Yutaka Kondo University of Tokyo, Japan
- Thomas P. Kurosu Smithsonian Astrophysical Observatory (SAO), USA
- Kwang-Mog Lee Kyungpook National University, Korea
- Franck Lefevre Service d'Aeronomie du CNRS, France
- Steven T. Massie National Center for Atmospheric Research (NCAR), USA
- Yutaka Matsumi Nagoya University, Japan
- W. A. Matthews National Institute of Water and Atmospheric Research, NZ



ILAS-II project status (*cont.*)

► ***ILAS-II Science Team members (2/2)***

- ▶ Yasuhiro Murayama Communications Research Laboratory (CRL), Japan
- ▶ Frank J. Murcray University of Denver, USA
- ▶ Hideaki Nakane National Institute for Environmental Studies (NIES), JP
- ▶ Liwen Pan National Center for Atmospheric Research (NCAR), USA
- ▶ Jae H. Park NASA Langley Research Center, USA
- ▶ C. E. Randall University of Colorado, USA
- ▶ Kaoru Sato National Institute of Polar Research, Japan
- ▶ Cornelius Schiller Institute fur Chemie und Dynamik der Geosphare, Germany
- ▶ Masato Shiotani Kyoto University, Japan
- ▶ Jim. J. Sloan University of Waterloo, Canada
- ▶ Larry W. Thomason NASA Langley Research Center, USA
- ▶ Geoffrey Toon Jet Propulsion Laboratory, USA
- ▶ Gerald Wetzel Institute fur Meteorologie und Klimaforschung (IMK), Germany



Late proposal to ILAS-II Science Team

- ▶ Late proposal will be accepted for ILAS-II project
 - ▶ Validation experiment
 - ▶ Algorithm development/improvement
 - ▶ Scientific data application
- ▶ Announcement will be shown in the ILAS-II Web site around mid-July



END