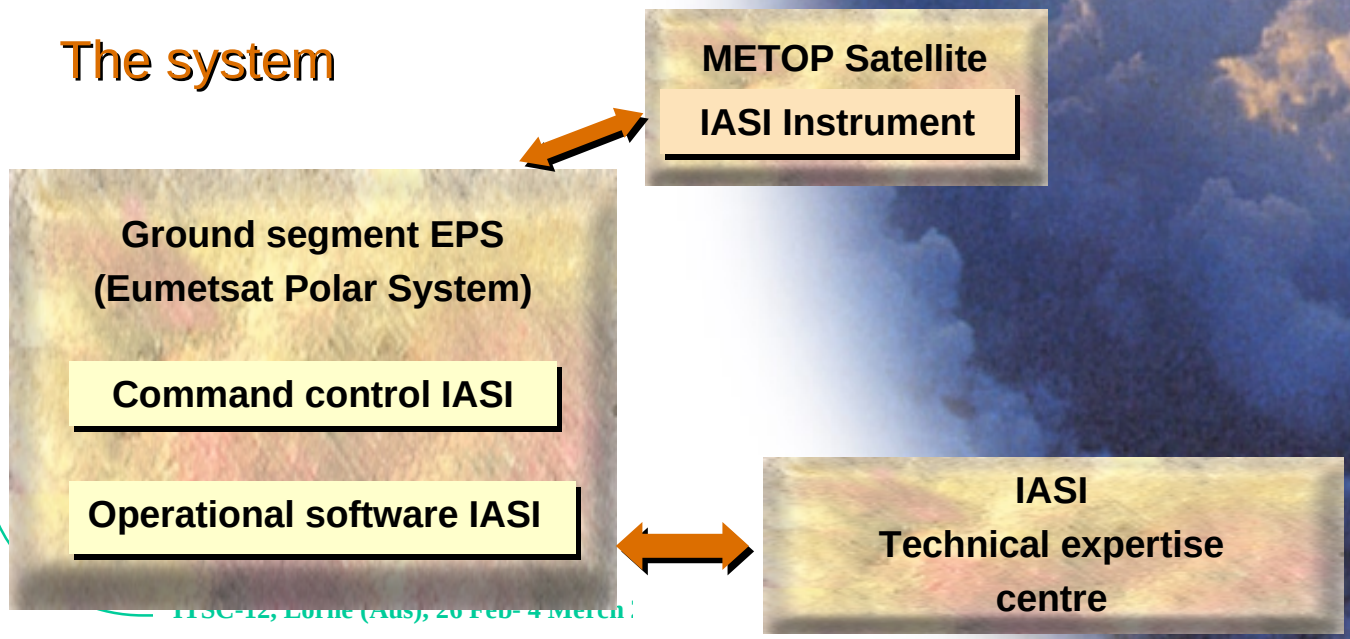
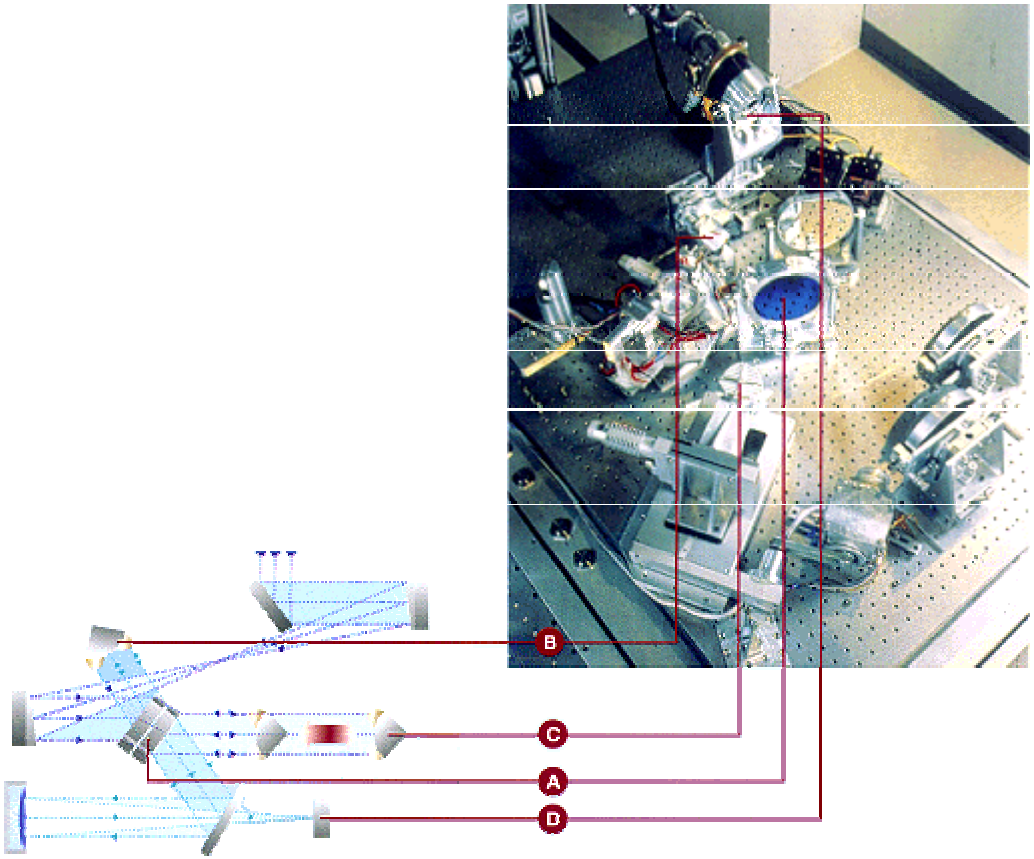
IASI
Main objectives of mission

Geophysical variables	Vertical resolution	Horizontal sampling	Accuracy
Température profile	1 km (low troposphere)	25 km (cloud free)	1 K (cloud free)
Humidity profile	1-2 km (low troposphere)	25 km (cloud free)	10 % (cloud free)
Ozone total amount	Content integrated	25 km (cloud free)	5 % (cloud free)
CO, CH_4,N_2O	Content integrated	100 km	10 % (cloud free)

The system



The Instrument

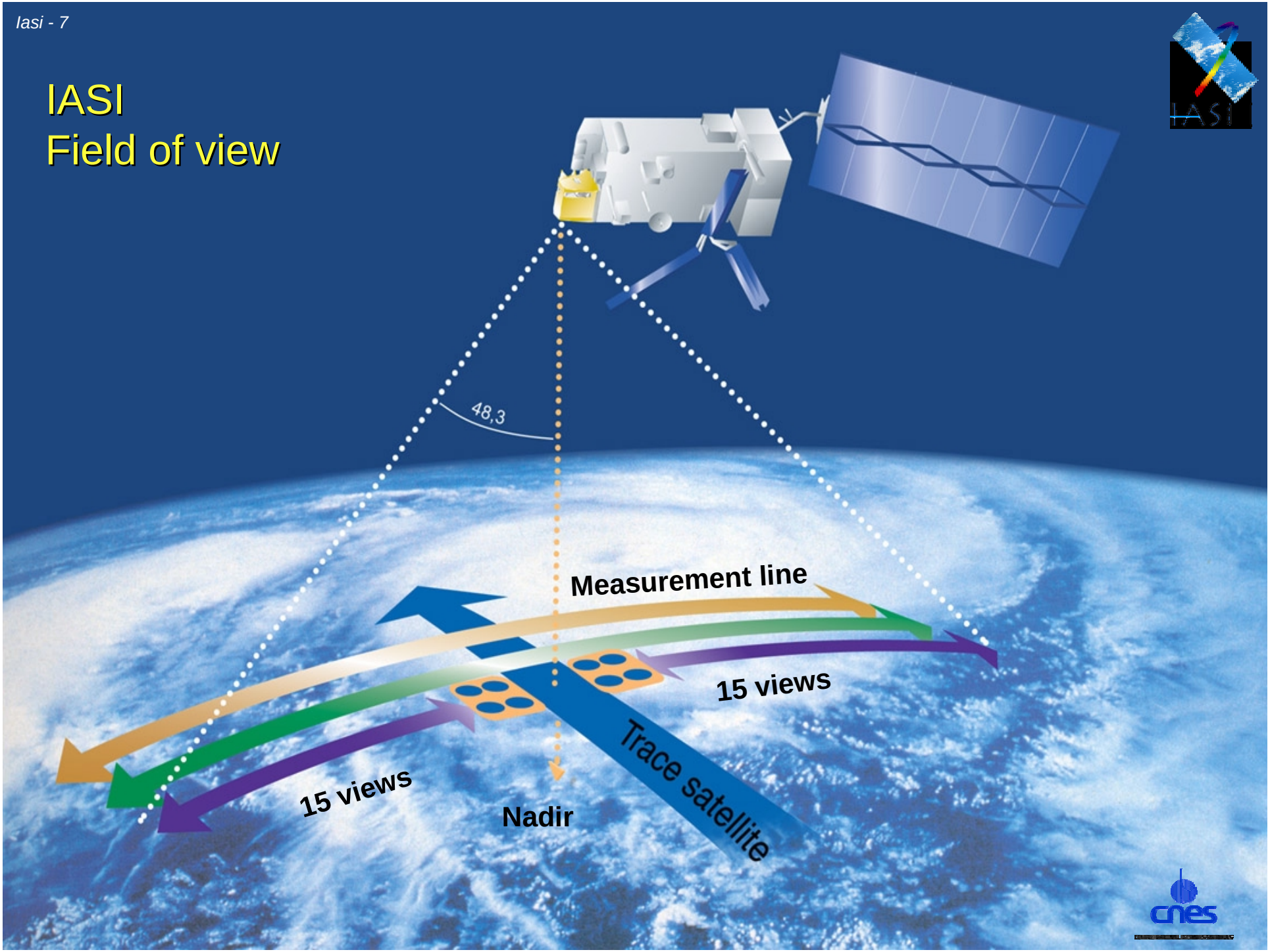


It includes an integrated Imager (1 km resolution to coregister IASI and AVHRR)

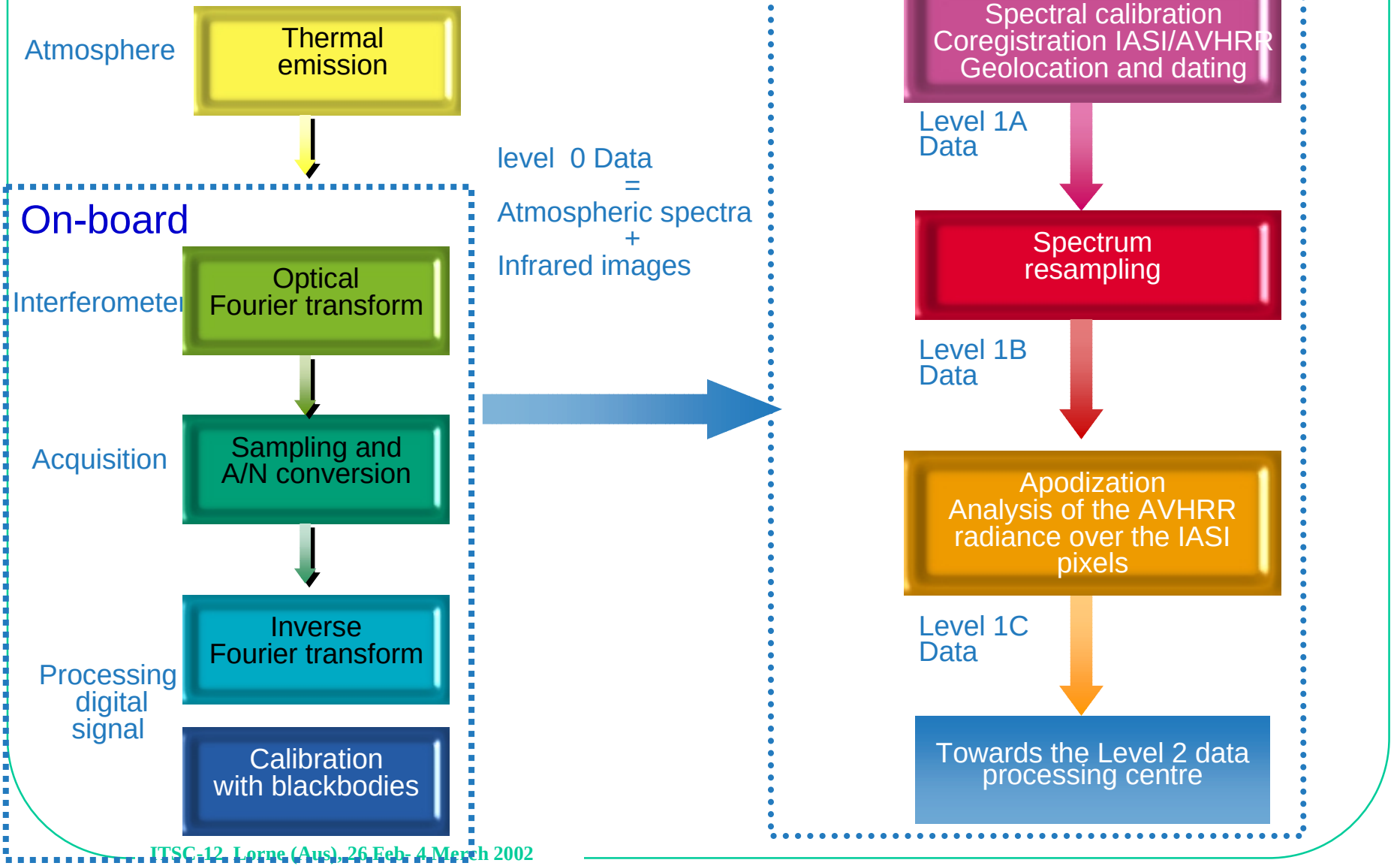
IASI
Main characteristics...

Pixel diameter	12 km au nadir
Sample	25 km au nadir
Field of view	± 50°
Spectral range	645 to 2 760 cm^{-1}
Spectral resolution	0.35 to 0.5 cm^{-1}
Radiometric resolution	0.25 to 0.5 K
Lifetime	5 years
Data rate	1.5 megabits per second

IASI
Field of view



IASI Data processing



IASI Program status

- IASI = Instrument + Operational software (level1) + Technical Expertise Center

Instrument :In phase C/D

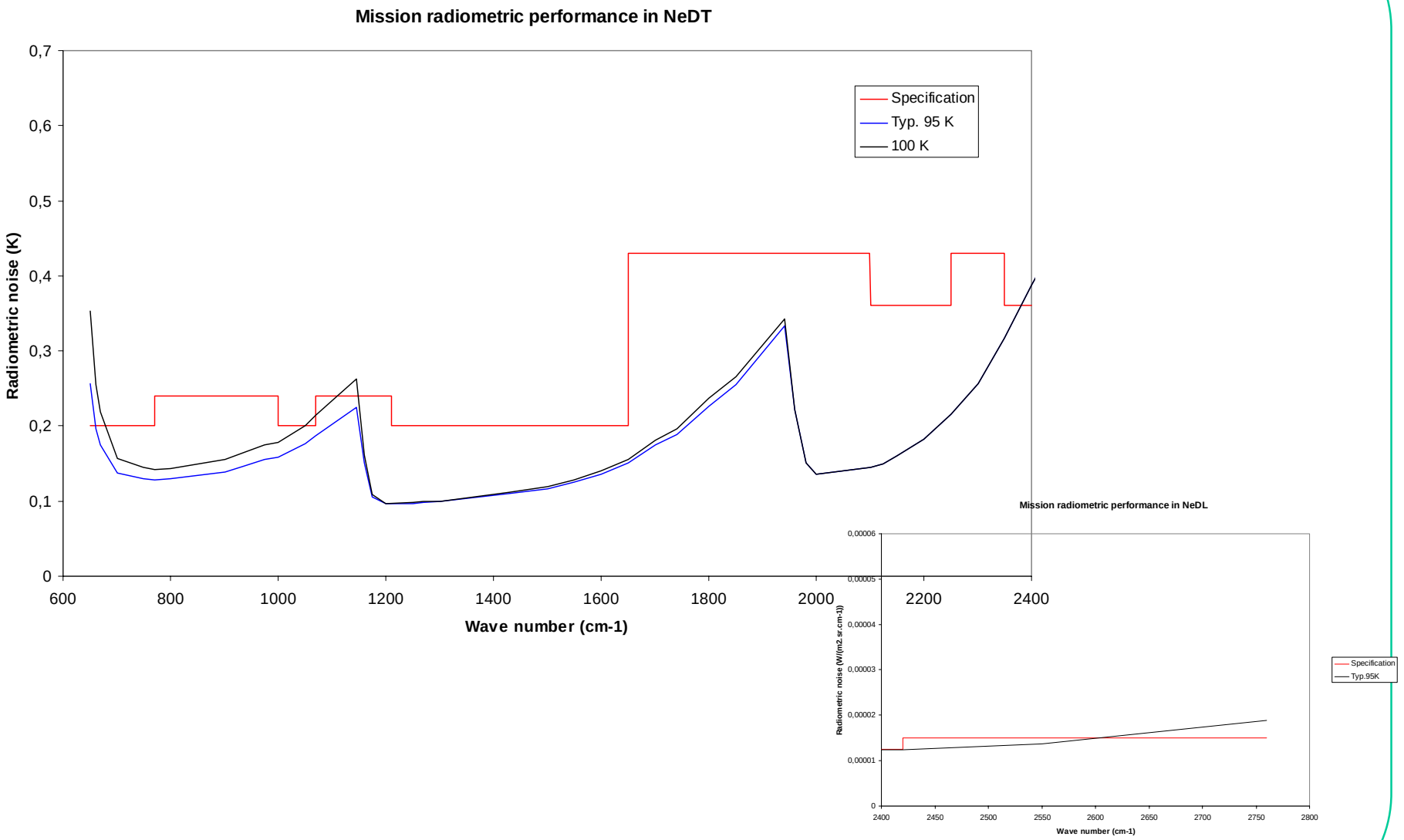
All subsystems delivered and characterized (CDR 03/02)

Delivery of FM1, FM2 in 2002.

Then Integration on METOP

- Ground segment
  - Level1 OPS Phase C/D : 02/2002 to 07/2003
  - TEC Phase C/D : 08/2002 to 12/2003
- Metop 1 : Launch still planned mid 2005

Most recent performances



IASI Sounding Science working Group

- Set up by CNES and EUMETSAT in 1995 with objective of providing the scientific preparation for the IASI mission.
  - Advise on Scientific requirements of IASI mission, system, instrument and ground processing (requirements for EPS GS)
  - Review progress of selcted Investigations
  - Give recommandations on future work.
- Research subsidized by Eumetsat and CNES

ISSWG

PIs :		Co IS	
Camy-Peyret, C	LPMA/CNRS	Collard A.	The Met Office
Cayla, F.	CNES	De Fies, I	CNR/IAM Napoli
Rabier, F.	Meteo France,CNRM	Eyre, J.	The Met Office
Clerbaux, C	CNRS/SA	Jacon, M.	GSMA
Cunnold, D.	School Atmospheric Science	Jacquinet-Husson, N.	CNRS/LMD
Cuomo, V.	CNR/IMAA	Lavanant, L.	Meteo France, CMS
Goldberg, M.	NOAA/NESDIS	Lee,A.C.	The Met Office
Haigh, J.	Imperial College London	Matricardi, M.	ECMWF
Joiner, J.	NASA/GSFC	Mac Millin, L.	NOAA/NESDIS
Knuteson, R.	U. Wisconsin, Madison	Scott, N.	CNRS/LMD
Le Marshall, J	Bureau of Meteorology	Strow, L.	Physics Dpt, Baltimore
Perrin, A.	CNRS/LPPM	Trotsenko, A	Kurchatov Insitute
Pick, D.	The Met Office	Lubrano, A.	CNR/IAM Napoli
Rizzi, R.	Universita Bologna	Romano, F.	CNR/IMAAA Potenza
Saunders, R.W.	ECMWF	Manozzi, L.	Universita Bologna
Serio, C.	Universita Basilicata	Russell; J.	Imperial College Londo
Taylor, J.	The Met Office		
Uspensky, A.	RPA Roshydromet Planeta		

Science Plan

Research activities		First priority Issues
Radiative Transfer models	Atmospheric and surfaces variables	1) Land surface emissivity in IR windows 3) Evaluation of water vapor data from different sources. 4) Land skin temperature 5) Tracegas databases
	LBL models	X Updated spectroscopy X Validation of models, characterization of errors.
	Fast models	♦ Methods for fast and hyperfast calculations (Transmittances, jacobians, BT) ♦ Accuracy by comparison with LBL ♦ Intercomparison- Model errors. 1. Performances (Rapidity/accuracy).
	Others	5. Improvement of geophysical climatology 6. Jacobians for cloud conditions 7. Forward modelling in the MW
IASI Instrument and ingest processes	X Validation of instrument simulator X Instrument noise covariance matrix X Parameterization of ISRF	
Data preprocessing	X Cloud detection.	(1) Spectral signatures of clouds related to the cloud structure. (2) Application of HIRS/MSU to IASI/AMSU (3) Role of AVHRR (4) IASI alone algorithms ♦ Cloud detection algorithm.
	X Cloud analysis	(5) Methods for analyzing AVHRR radiances in the IASI pixel
	X Cloud clearing	♦ Intercomparison of existing methods ♦ Impact of cloud detection schemes on cloud clearing. (6) Development of operational algorithm
Retrieval of geophysical parameters		♦ Development and improvement of retrieval method. ♦ Synergistic use of other instruments ♦ Validation and testing in clear and cloudy conditions ♦ Intercomparison of different retrieval schemes. (spec with AIRS).
Monitoring and validation of IASI data/products	♦ Instrument performances. ♦ Data processing	♦ Monitoring of coregistration of IASI with imagers, IASI IPSF, quality of actual ISRF. ♦ Monitoring on ground processing

Applications	1) Operational Meteorology.	3) Extension of fast RTM to include tangent-linear and adjoint. 4) Impact studies (OSSE). 5) Optimal radiance subset for assimilation. 6) Monitoring IASI radiances and retrievals by use of NWP fields. 7) Impact of assimilation of retrievals versus radiance subsets in 3-D or 4-D VAR on analyses and forecast performances. (AIRS) 8) Use of window and low tropospheric channels over land. 9) Plan for assimilation of cloudy radiances in synergy with AMSU-A.
	2) Climate monitoring and global change.	X Global IR radiation budget determination. Effect of clouds and upper tropospheric humidity on budget. Indicators for spectral signature of global change. 10) Heating rate profiles from IASI radiances. 11) Cirrus properties *12) Generation of climatologies for WV, Total Ozone, CH4, N2O, Co and CFC + cloud parameters.* *13) Radiative forcing.* 14) *Aerosol properties.*
	3) Atmospheric chemistry	15) Information content for atmospheric chemistry (retrievable species, selection of relevant channels). 16) Sensitivity to noise, spectral resolution, cloudiness, temperature/surface X Use in conjunction with CTMs X Methods to study polar ozone destruction, tropo/stratosphere exchanges, biomass burning, etc.
Needs of direct read out users	Extension of AAPP	
Spectroscopy	1. Spectroscopic databases	X Validation and systematic intercomparison of existing databases for the stronger absorbers. Correction X Combination of existing and new data X Estimates for the spectroscopic errors
	2. WV continuum	X Laboratory and real atmosphere measurements X Improvement of parameterization and elaboration of new models
	3. Measurements and modelling of spectroscopic parameters	X H2O (weak lines positions and intensities, widths,temperature dependence, etc.): X CO2 : Validation of lines of isotopomers, new line shapes for 15 µm X O3 : temperature dependence of line widths. X Collision induced spectra.
	Others	X *Measurements and modelling for CH4, HNO3, CFCs, aerosols*

Spectroscopic Databases

- Exchanges with AIRS group
- Improvement of line characterization
  - H20 :Toth, VIRTEM
  - CO2 :VIRTEM
  - Minor gases
- Continuum : CKD models
- GNLN2 (Hitran 2000), GEISA/IASI2000 include most recent knowledge

LBL Intercomparison Exercice (Tjemkes et al)

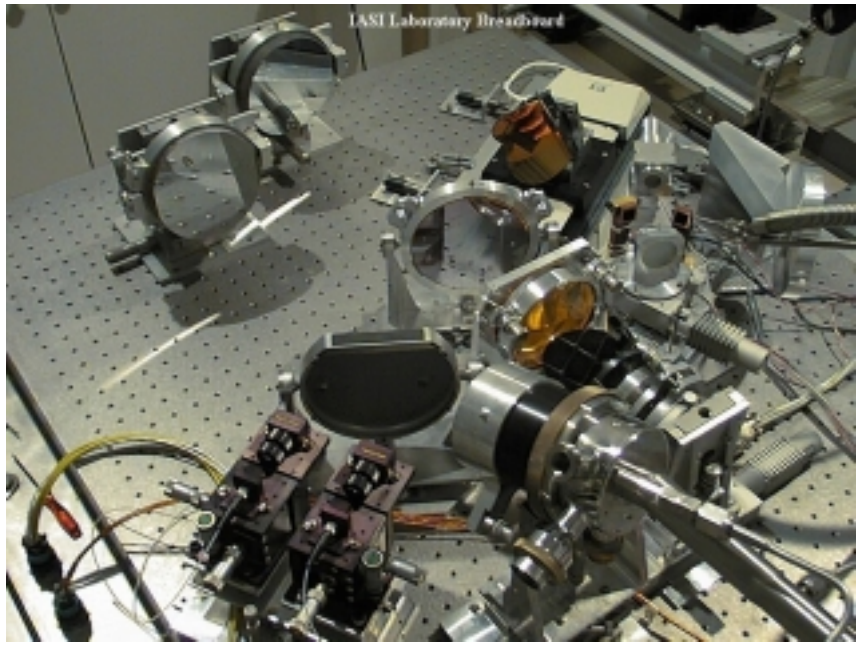
- Document Performance of current LbL RTMs by comparison with observations (ARIES, HIS) and themselves.
- Results available on www.eumetsat.de
  - good agreement in between models except in some specific regions where line mixing, or N2 continuum
  - No winner
  - Model errors for IASI now characterized.

Fast RTM

- 3 approaches:
  - RTIASI, LITMS-FRTM
  - 3R : direct radiances calculation
  - Neural network
- FIE : FRTM intercomparison exercice (Matricardi, Scott, Strow, McMillin, Trotsenko)
- FRTM must now include clouds

Simulators

- Groundbased breadboard
  - campaigns in 1998, 1999, 2002
- IASI balloon
  - campaign in 2001 and 2002 (planned for AIRS)
- ARIES
- HIS, AERI etc



Chemistry

Gas traces retrieval important topic of IASI :

- Affect Precision/accuracy of soundings
- Must be included to reproduce the full IASI spectra
- Retrieval is of a major interest for atmospheric chemistry and climate
- Can be used as tracers in 4D-Var assimilation.

IASI/METOP offers first operational long term monitoring

IASI gives acces to troposphere.

Potential confirmed for O3 (tropo and strato) , CO, CH_4 and likely for CO_2, and N_2O climatology