

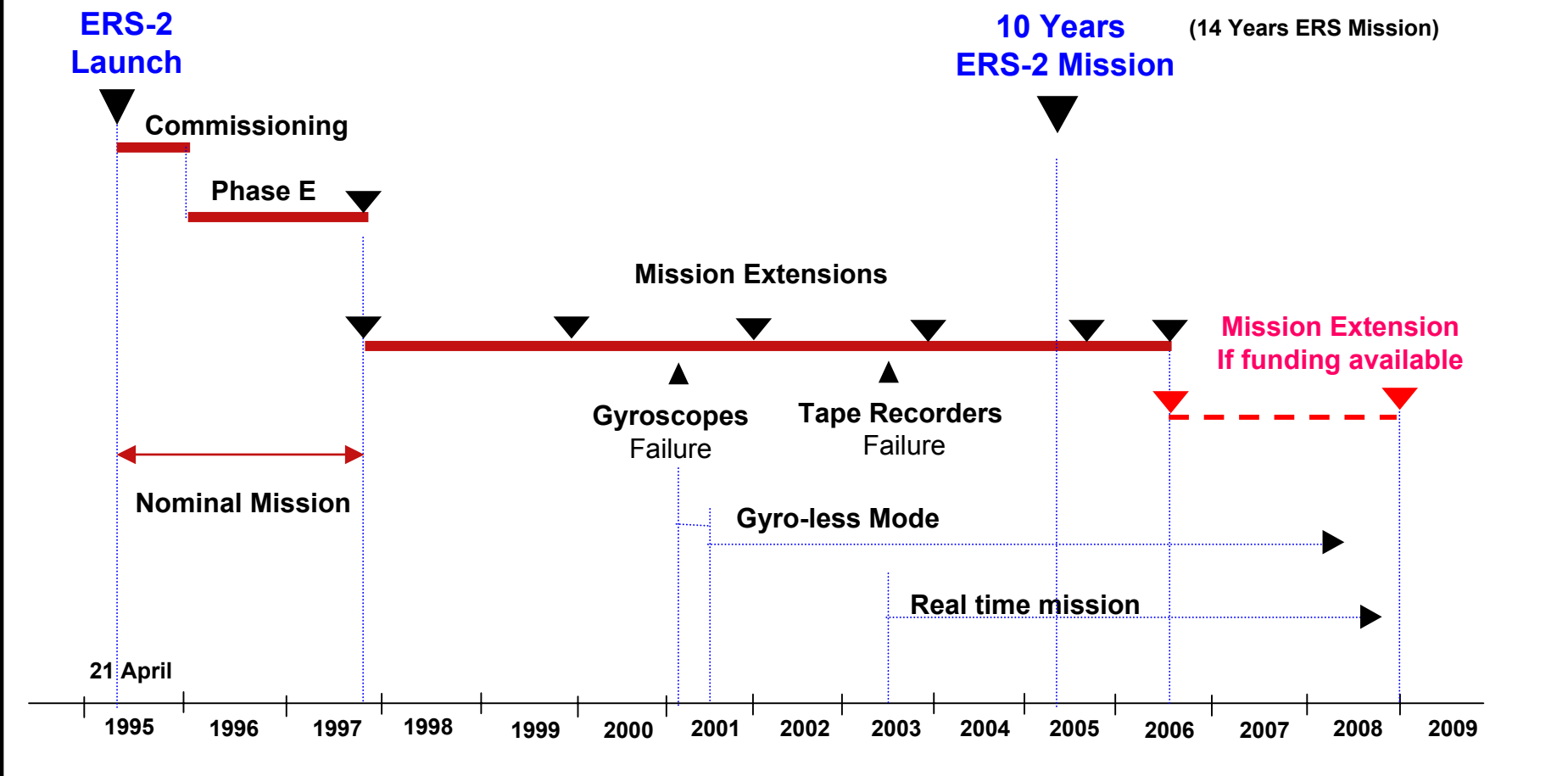
# ***General Overview of ERS-2 and GOME***

**A. Lefebvre, M. Canela, J. Callies & A. Hahne**

**ESA/ESTEC**

**ESTEC  
20 April 2005**

## ERS-2 Mission Phases and main Performance Events



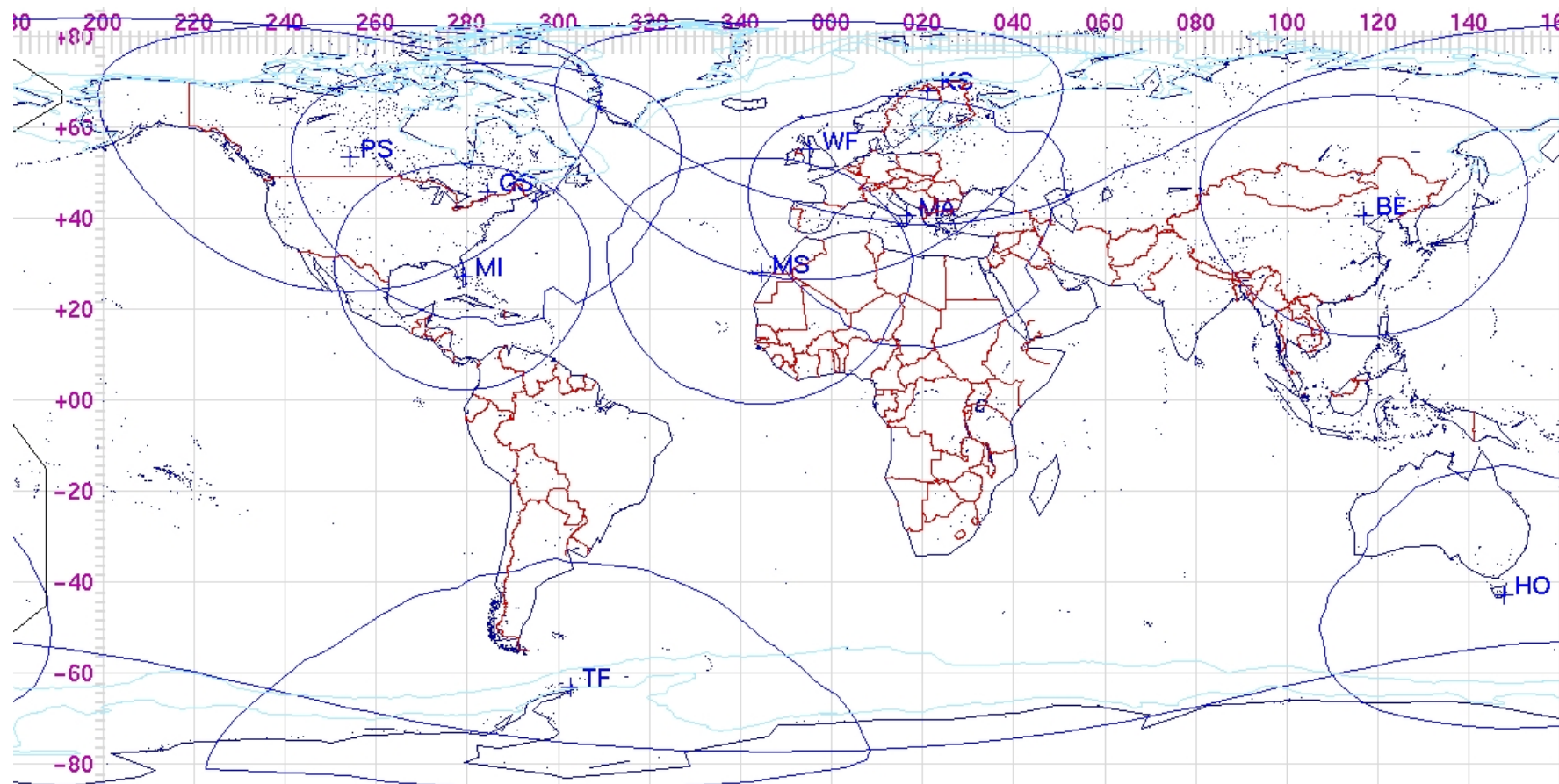
## ERS-2 Mission

- ERS-2 Launch: 21 April, 1995
- End of Nominal mission: 31 October, 1997
- Mission extended several times, to:  
1999, 2001, 2003, 2005
- Currently extended up to: 30 September, 2006
- Probable further extension: 30 September, 2008
- *The ERS User community is highly interested in the continuity of the mission*

## ERS-2 Mission - Major issues and solutions

- Gyroscopes failure
  - *December, 2000, January, 2001*
  - => **Gyro-less implementation: June, 2001**
- Tape recorders Failure (Low bit-rate mission affected)
  - *December, 2002, June, 2003*
  - => **Replaced by Real time station network**

## Real Time Station Network and Coverage



## ERS-2 PAYLOAD Performance

- All the instruments and ICU'S are:
  - . operating nominally,
  - . in their nominal side
  - . and slowly ageing.
- Few minor anomalies take place, mostly due to Single Event Upsets
- All the engineering parameters evolve very slowly and there is no evidence of serious degradation.

### **Instrum. / Perform.**

- **GOME:** **Excellent**
- **SAR:** **Excellent**
- **SCAT:** **Excellent**
- **RA-2:** **Excellent**
- **MWR:** **Excellent**
- **ATSR-2:** **Excellent**
- **PRARE:** **Excellent**

## ERS-2 Platform Performance

- Fuel (hydrazine):

*Very low consumption (15-20 Kg/year). Total mass available: 200 Kg.*

- Attitude and Orbit Control: *Operating in Gyro-less since June 2001.*

*The performance of the Digital Sensors, Reaction Wheels, actuators and thrusters is outstanding.*

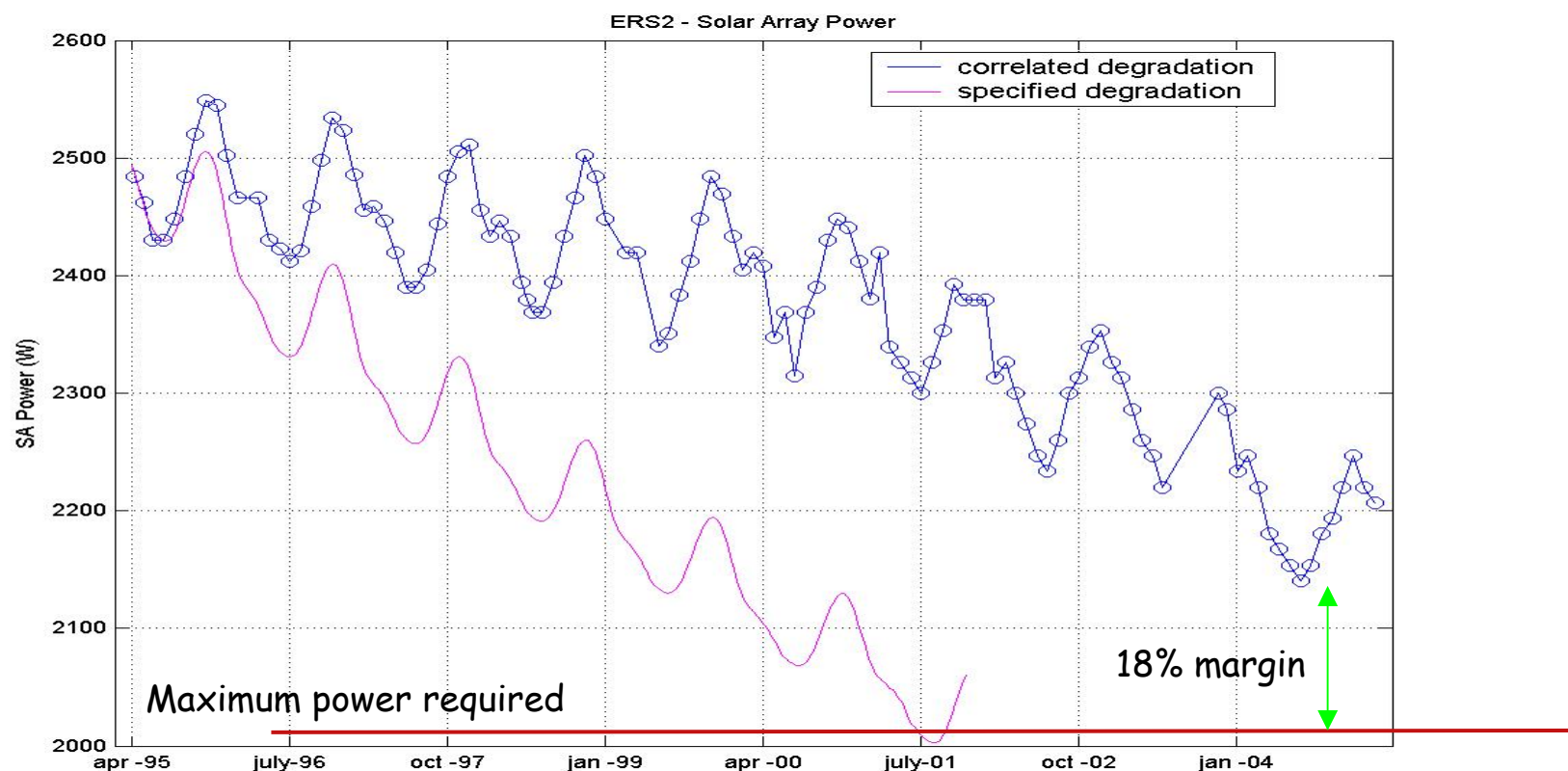
- Power Subsystem: *(the most sensible subsystem)*

*The Solar Array delivers a level of power much higher than the maximum required and the panel degradation is much smaller than specified.*

*The Battery charge/discharge cycles are almost at the same levels as after launch. The depth of discharge is far from the maximum limits.*



# Evolution of the Solar Array (most sensible satellite S/S)





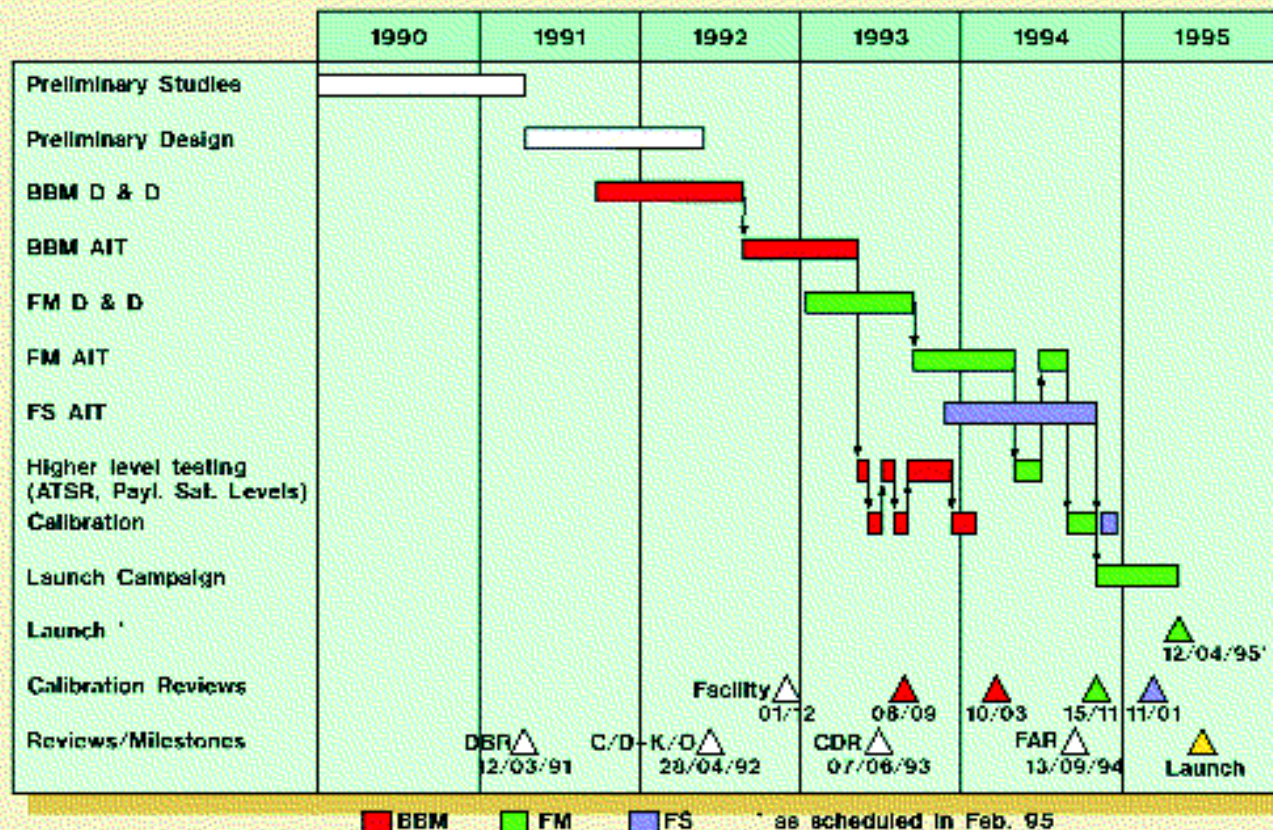
## ERS-2 PERFORMANCE - CONCLUSIONS

### ***After Ten Years In Orbit:***

- ***ERS-2 Performance is OUTSTANDING:***
  - ***The satellite is smoothly ageing***
  - ***The Payload is operating nominally***  
***and providing high quality scientific data***
  - ***The Platform can support the operations for some more years.***
- ***The User community is interested in extending the ERS mission***
- ***It is possible and worth to continue the ERS-2 Mission***

1991 –  
1995

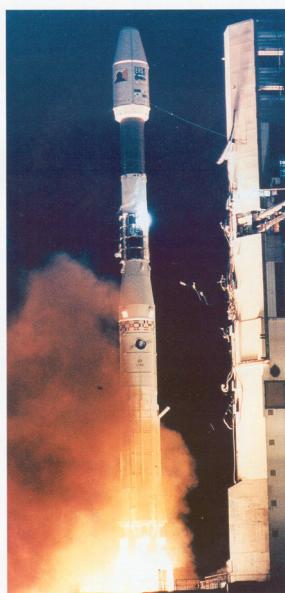
GOME  
phase  
C/D



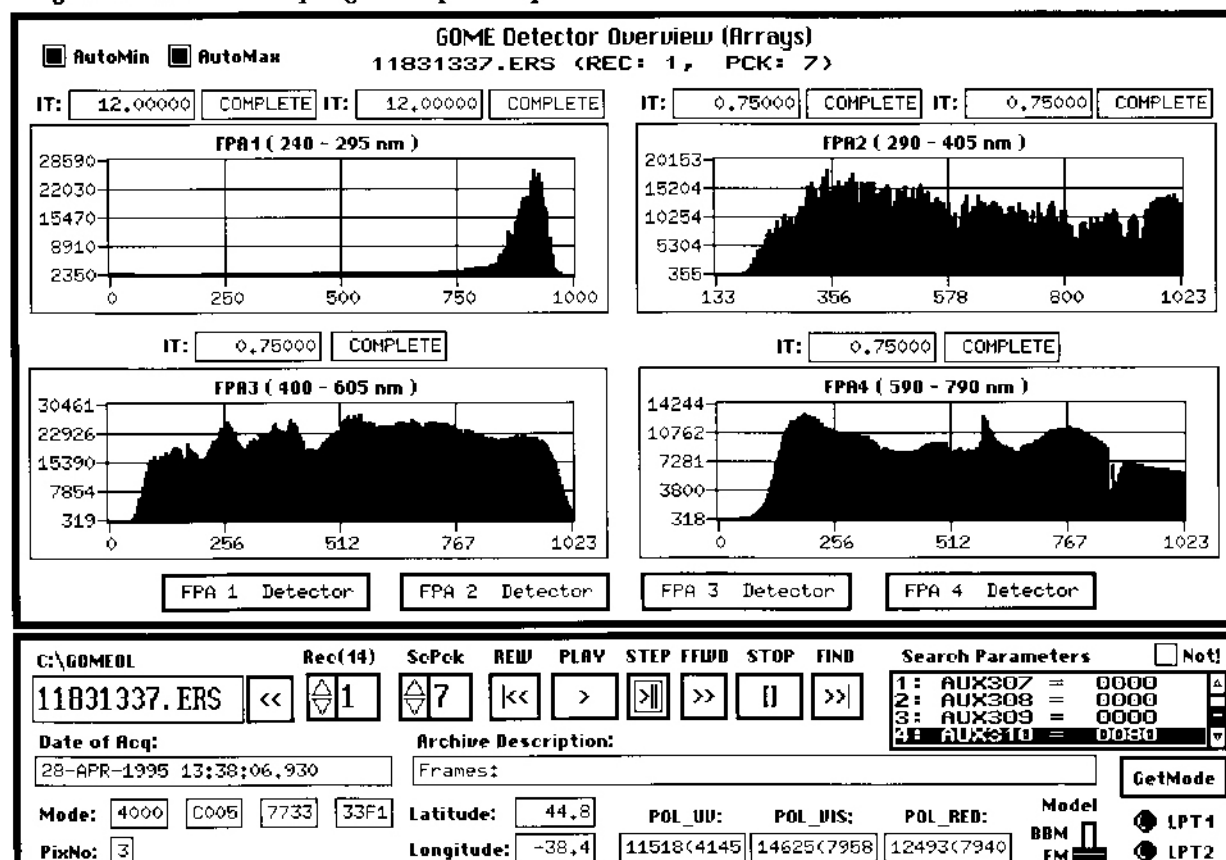


## 21 April 1995 Launch of ERS-2 on Ariane 72

- *First data from the spectrometer*
- 28.4.1995 13:38



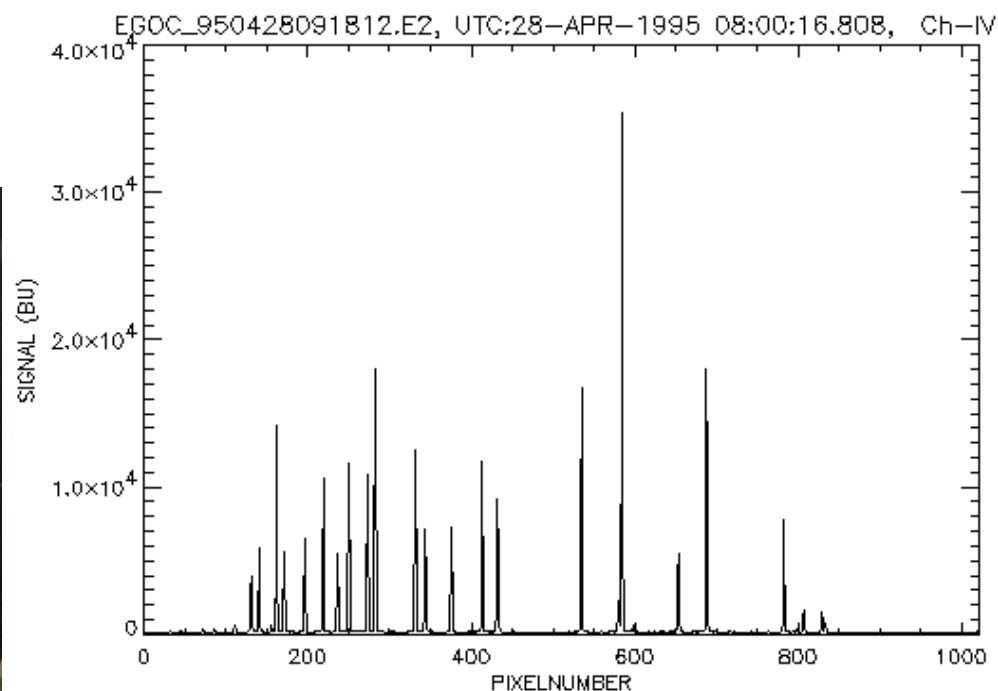
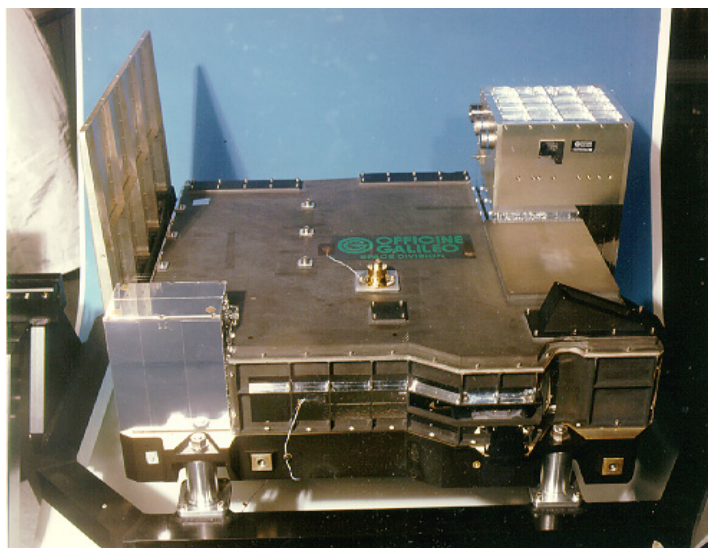
System File Display Dump Help





## 1995 Launch of ERS-2 on Ariane IV

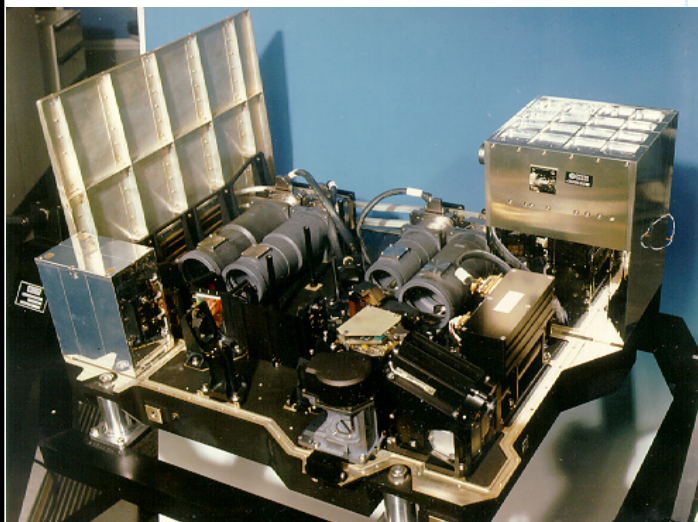
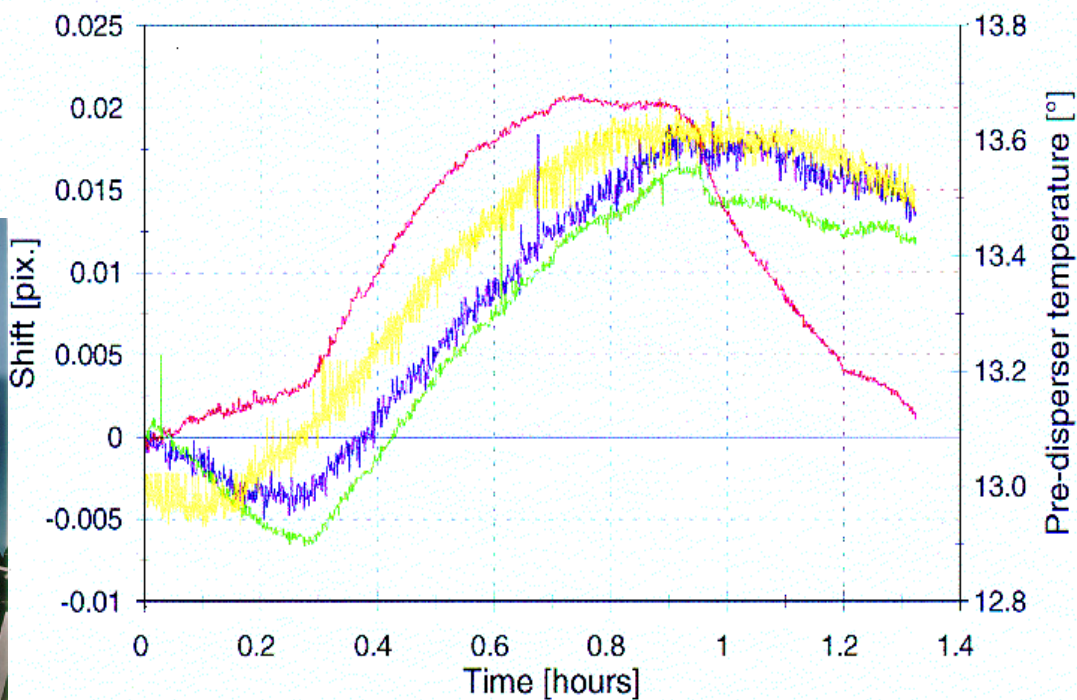
- *First data from the HCL lamp :*



## First data from the In-orbit Temperature variation

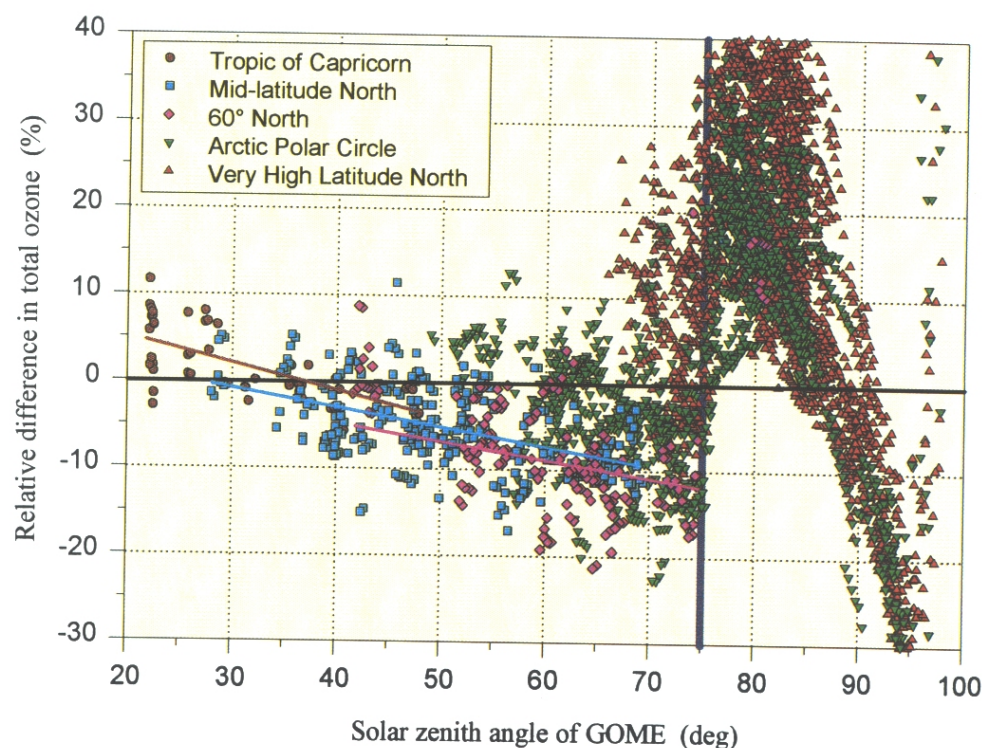
Line shift TL\_1\_5 12-05-1995

Channel 1



## Status of the Ozone product:

- *Results presented at the Validation workshop trigger The setup of a Tiger Team To improve the data processing*



**Figure 1-b** Relative differences  $((\text{GOME}-\text{SAOZ})/\text{SAOZ}, \text{ in per cent})$  between the GOME and SAOZ total ozone, as a function of the GOME solar zenith angle. SAOZ sites are grouped into five latitude belts.



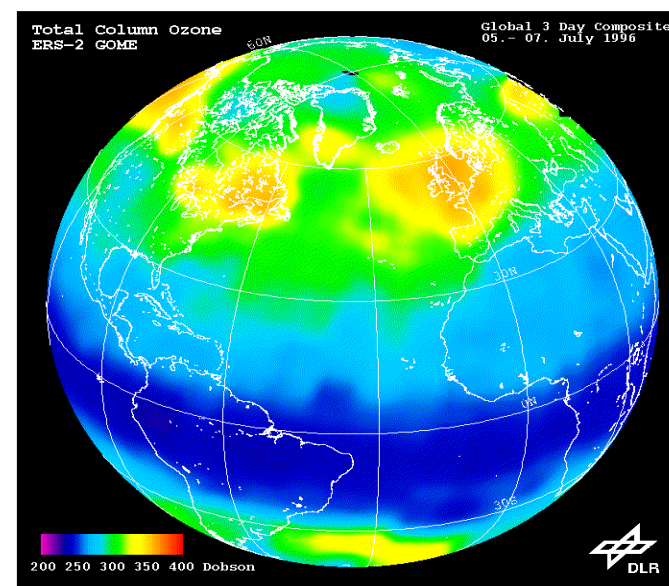
## 1996

- **Implementation of the co-adding patch to overcome the saturation at 1.5s**

- August 25 - 27, 29 - 31,



First operational GOME Total Column Ozone Product

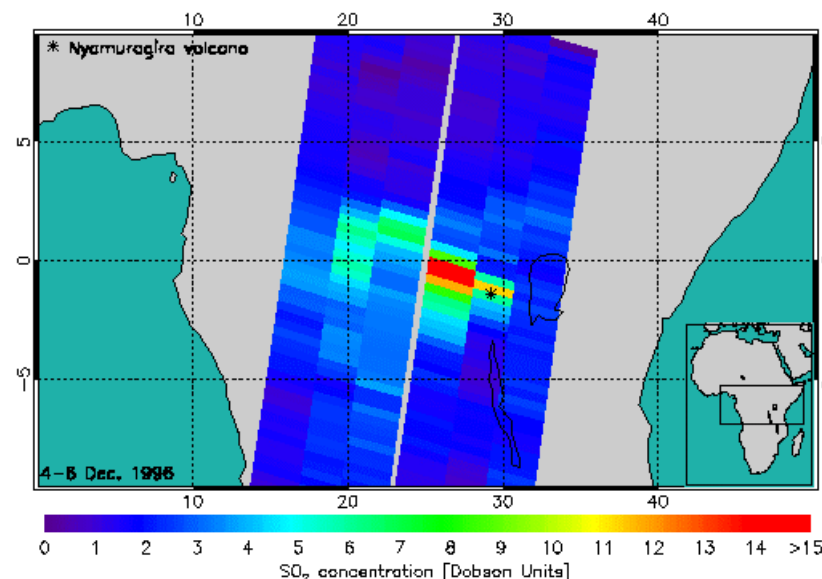
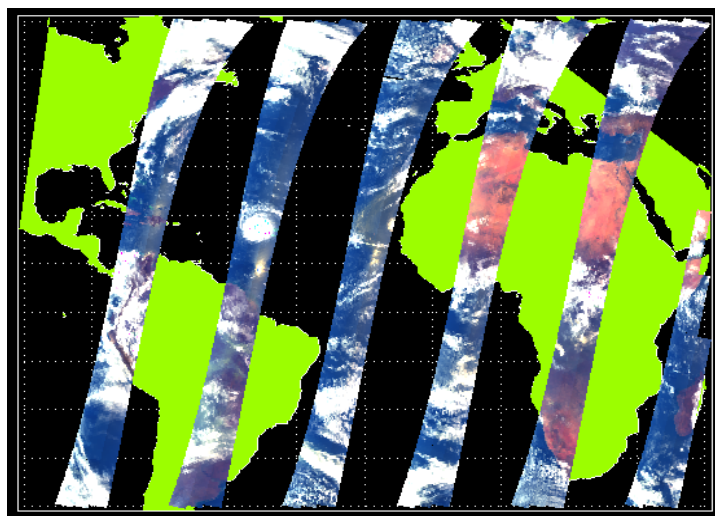


- **20 July 1996 official release of the level 1 and level 2 product**



## 1997

- *3<sup>rd</sup> ERS Symposium in Florence with the first GOME session*
- *Ozone profiles, NO<sub>2</sub> and SO<sub>2</sub>, BrO and OCIO are retrieved*
- *Since June 1997 13 narrow swaths (240Km) are executed every 10 days*
- *Since 10.11.97 HCL lamp ignites sometimes in Low Voltage Mode*



## 1998

- 3 years in orbit
- Bit flip caused an anomaly in the on-board RAM, which rendered the channel 3 data useless for almost 2 months
- 7 LVM occurrences of the HCL lamp
- Daily usage of HCL is reduced by 50%



### Three years in orbit

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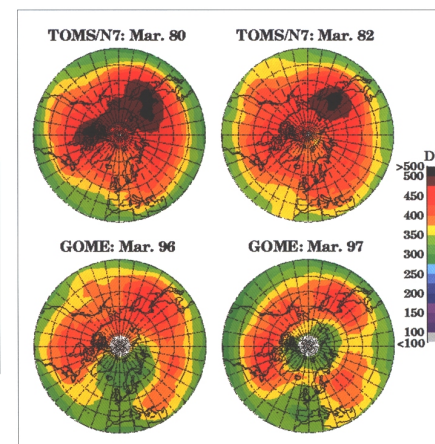
Launched on 21 April 1995 on-board of ERS-2, the Global Ozone Monitoring Experiment (GOME) has been operating for three years in-orbit. The first three months were used for the commissioning of the experiment. Since 20 July 1995, GOME has acquired more than 20 million of spectra, which have been processed to about 260 Gb of level 1 data and 15 Gb of level 2 data. However, by far more important than these huge numbers, are the scientific achievements of GOME.

Arctic March total ozone (monthly means) observed in 1980 and 1982 by TOMS/Nimbus (top) and in 1996 and 1997 by GOME, clearly show the decline in polar total ozone in spring. (Courtesy of IFE Bremen)

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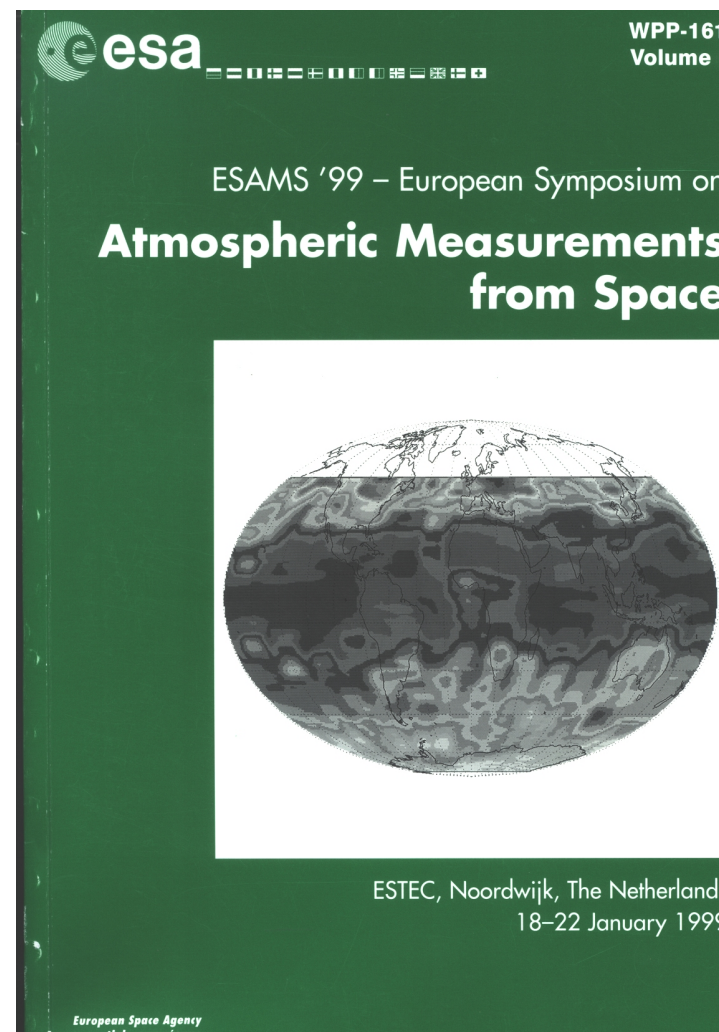
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European Space Agency  
Agence spatiale européenne



## 1999

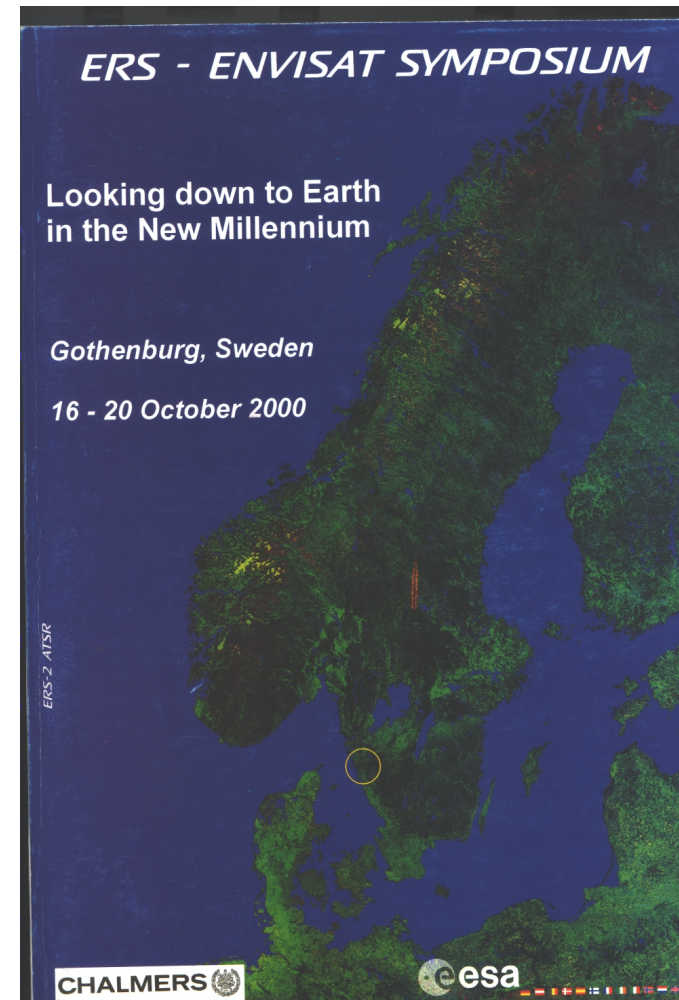
- ***ESAMS conference in ESTEC***
- ***An other bitflip caused problems with some of the data from Dec. 1998 to March 1999***
- ***Scan mirror performance is slightly degrading due to build up of lubrication walls at the end of the 240 km swath. The feature disappears when the large swath is operated.***
- ***8 occurrences of the LVM mode***





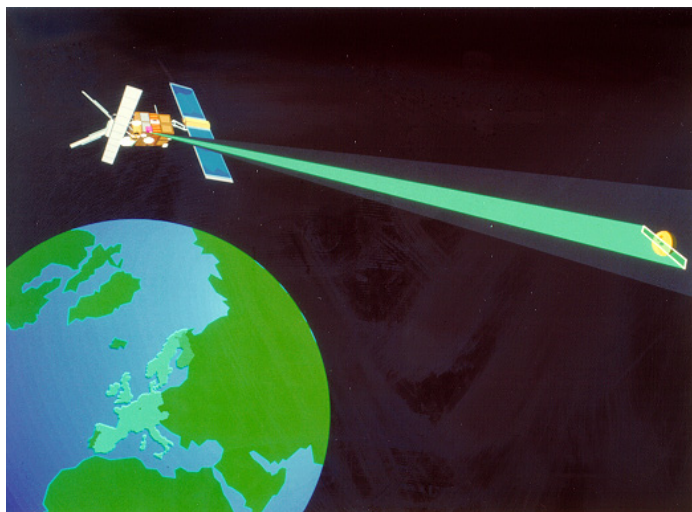
## 2000

- *ERS- Envisat Symposium in Gothenburg*
- *Every 10 days automatic reset of the on-board S/W to prevent longer influence of single event upsets*



## 2001

- *Gyroless piloting of the satellite*
- *No moon calibrations anymore, due to reduced pointing*

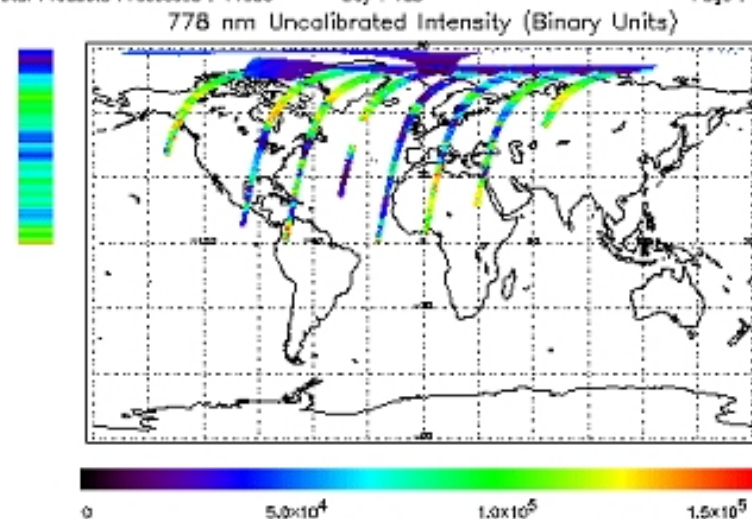


## 2003

- *On 22 June 2003 redundant ERS- tape recorder fails*

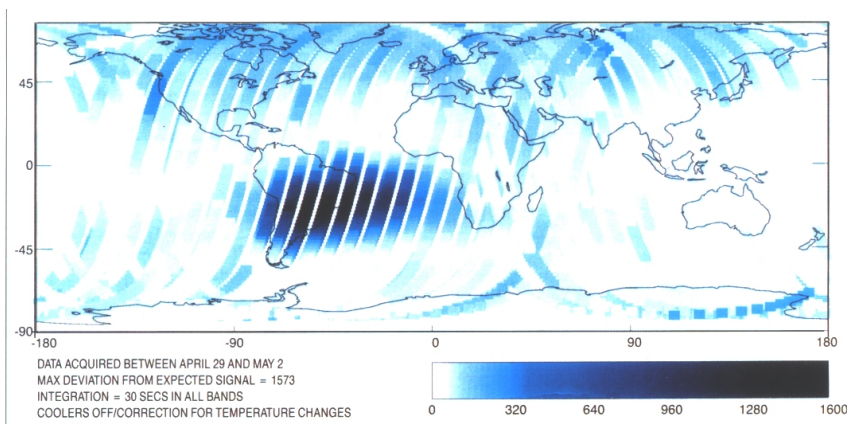
First Product : 14-APR-2005 23:50:51.628 : ORBIT : 52203.1517  
 Last Product : 15-APR-2005 23:27:13.917 : ORBIT : 52217.2312  
 Total Products Processed : 14953 Day : 105

Page : 21



## 2004

- *Envisat symposium in Salzburg*
- *Monthly calibration is changed to quarterly calibration*




**ENVISAT/ERS Symposium**  
 6-10 September 2004

The 2004 ENVISAT & ERS Symposium was held in **Salzburg - Austria** from 6 to 10 September 2004.

The 2004 ENVISAT & ERS Symposium provided a forum for investigators to present results of on-going research project activities and assess the development of applications and services.

ESA would like to thank the many scientists and users presenting at the conference, and would like to remind them that the final date for submission of the full paper is 30th of September.

For more information, please go to the Symposium web page