# EUMETSAT Polar and GEO Programmes and Services

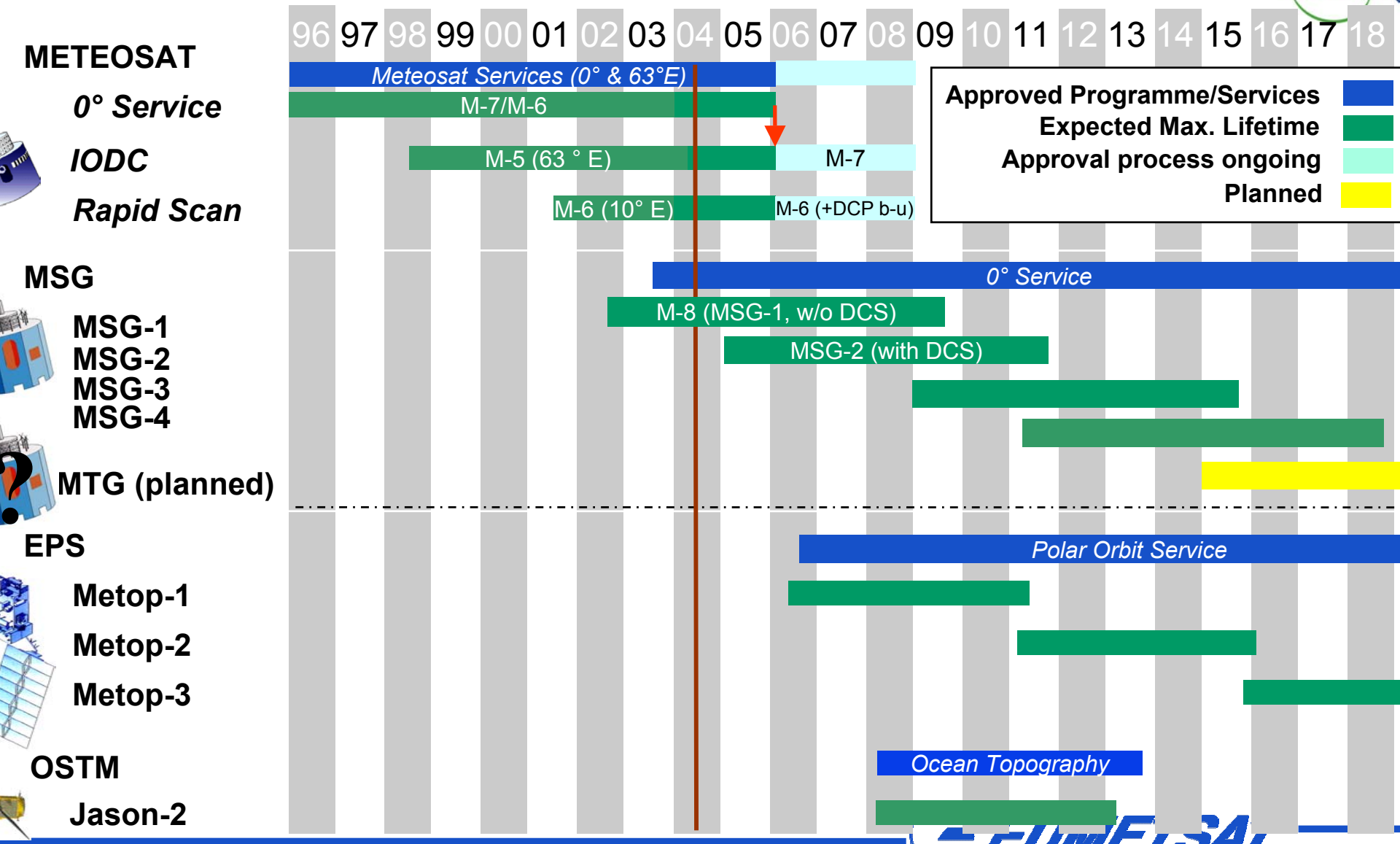
**Ken Ashworth**

**EUMETSAT Representative to NOAA, Washington**

# EUMETSAT Highlights

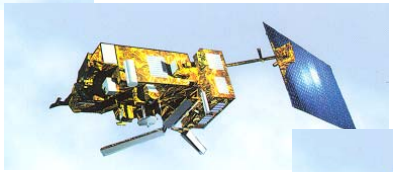
- Overview of EUMETSAT Programmes
- EUMETSAT Polar System, part of IJPS
- EUMETSAT ATOVS Re-transmission Service (EARS), EUMETCast
- Jason-2 Ocean Surface Topography Mission

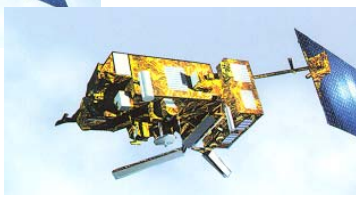
# Overview Of EUMETSAT Programmes



# EPS Programme Overview

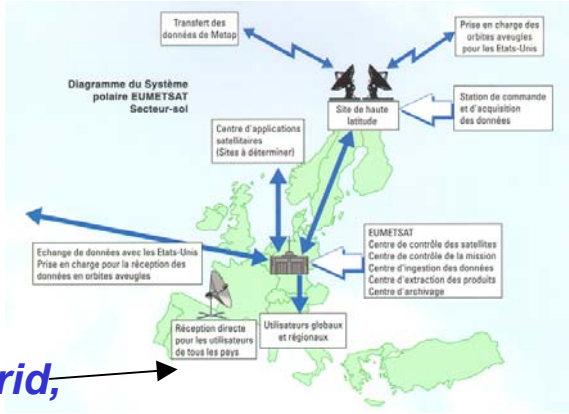
3 Launch services (Soyuz)





3 Metop satellites

*Svalbard Polar Station*




EPS Ground Segment including SAFs

*Madrid, Back Up Control Centre*

3 LEOP services (ESA/ESOC)

14 years of operation

# EPS Programme Overview

**Launch of 1st Metop ("A"): April 2006**

- **following programmatic review, April 2006 specified to launcher authority (Starsem) from original Oct - Dec 2005 window. Agreed by EUMETSAT Council 02-03Dec2004**

**Critical path:**

- **Ground Segment-> Integration, Verification &Validation-> Launch campaign-> launch**

**Sub-Critical path:**

- **Space segment -> IASI**

# EUMETSAT Polar System (EPS): Metop Satellites

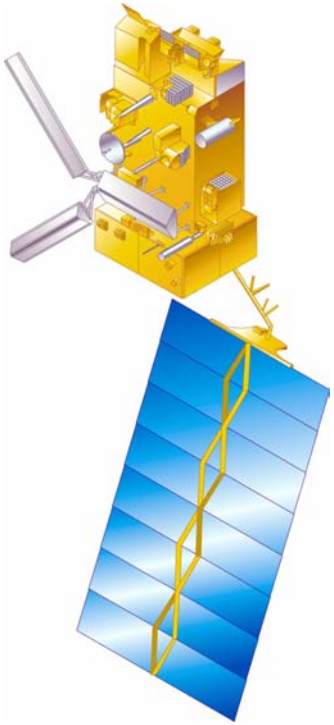
**Launch of 1st Metop: METOP A April 2006**

**All weather/advanced operational temperature/moisture sounding: AMSU-A, MHS, HIRS-4, IASI, GRAS**

**Global visible/IR 1 km resolution imager: AVHRR-3**

**Ocean surface wind vectors: ASCAT**

**Ozone monitoring: GOME-2**

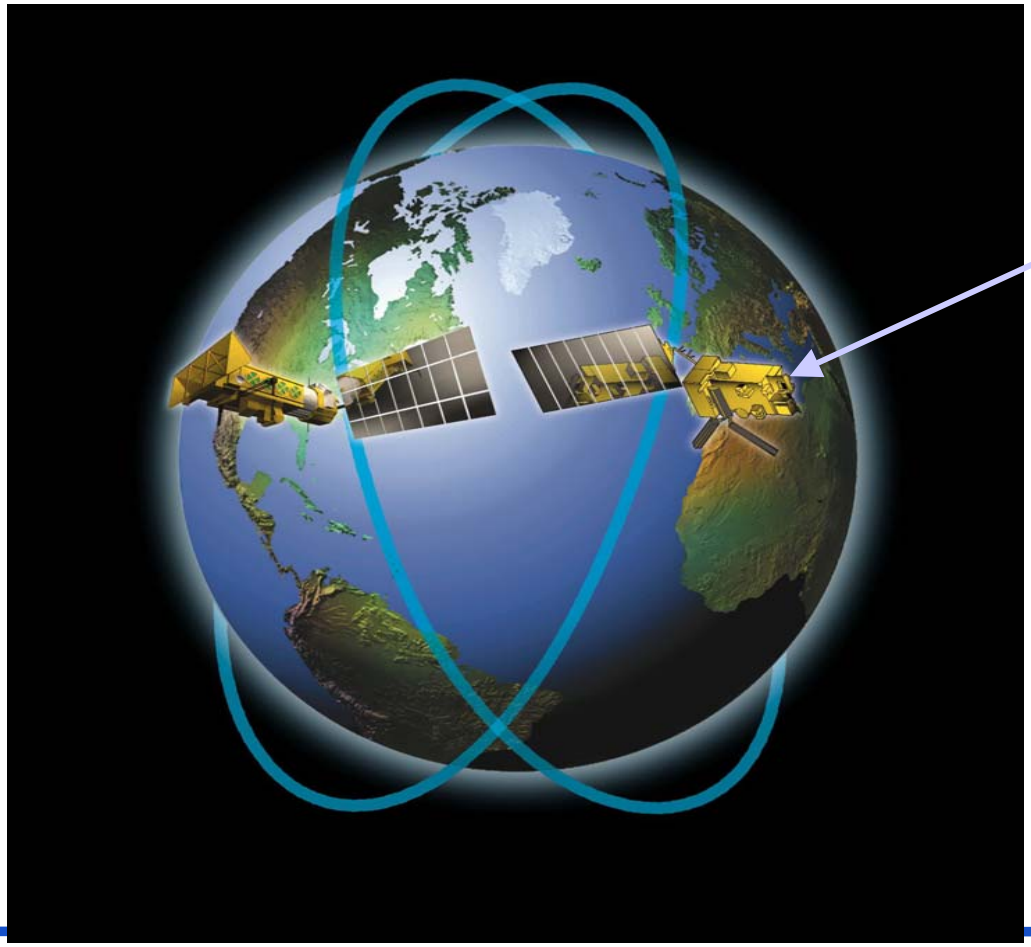


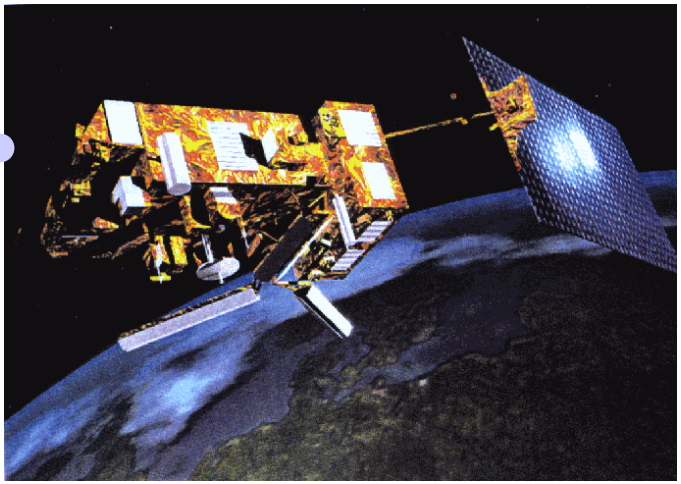
# The Metop Satellite

Metop 1 mechanical tests

- Design based on heritage of SPOT-5 & ENVISAT
- 5-year nominal lifetime
- Nominal launch intervals of 4.5 years (6-month overlap)
- Dimensions: 6.3 m x 3.4 m x 3.4 m (launch configuration)
- Launch mass: 4100 kg (instruments: 900Kg)
- Solar array: 11.3 m (length), 3800 W (instruments: 1100W)
- Data flow: 3500 kbps
- Sun Synchronous LEO orbit:
  - 820 km altitude
  - 09.30 MLST (descending)
  - Pointing:< 0.1° typical
- Double compatibility with Soyuz ST & Ariane 5

# The EUMETSAT Polar System (EPS): within Initial Joint Polar System (IJPS)





**The (3) Metop satellites form the Space segment of the EPS system**

EUMETSAT

# IJPS Partnership

The Initial Joint Polar System Partnership:

- EPS comprises 2 Metop satellites, POES NOAA N & N´
- EUMETSAT provides dedicated mid-morning orbit sounder
- NOAA N/N' & Metop share common instruments: AVHRR, HIRS, MHS, AMSU-A, SEM, ARGOS, S&R

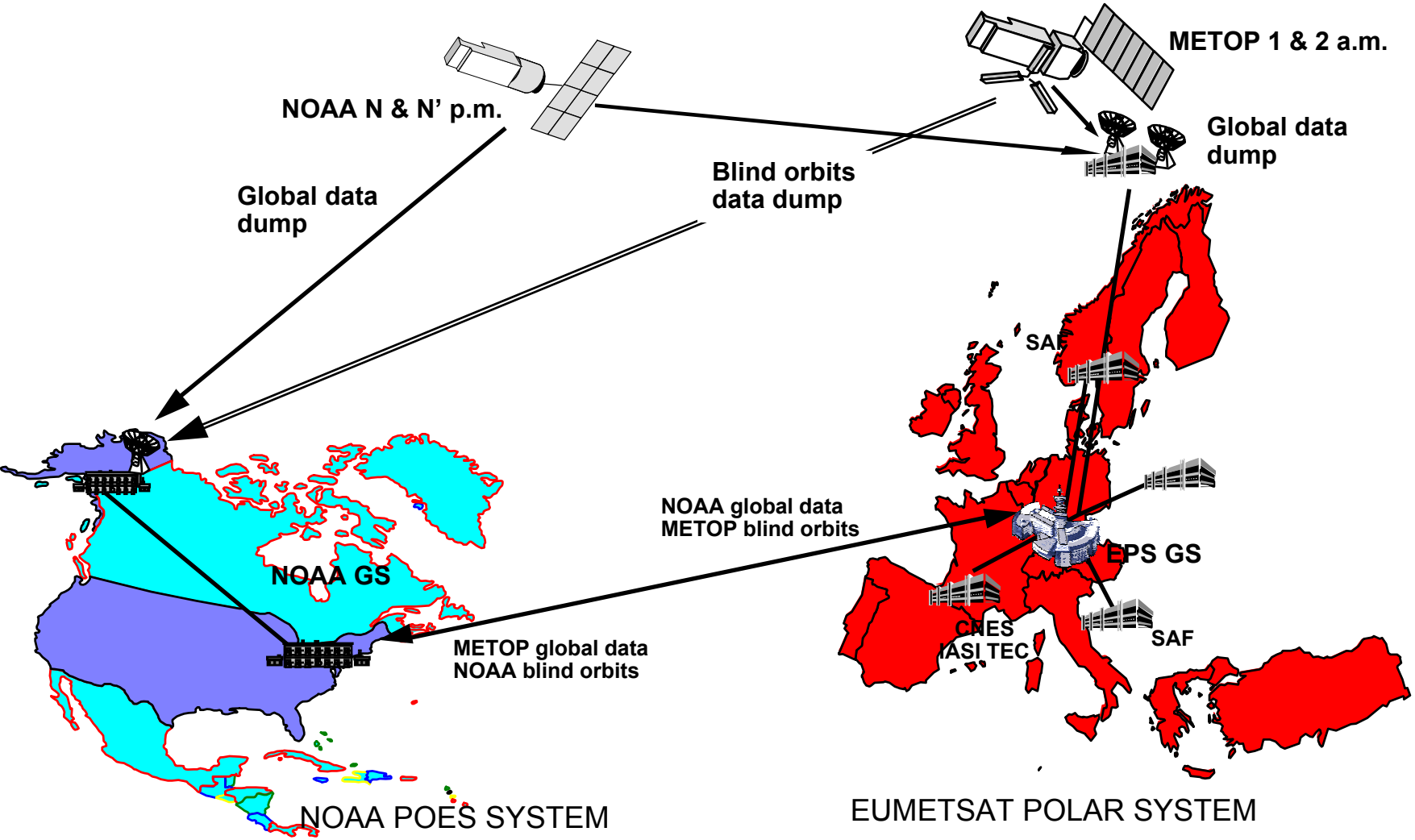
- Mission Data Exchange
- Cross support for blind orbits
- Mutual support in case of contingency
- Support in the development of products

# Future Joint Polar System Partnership

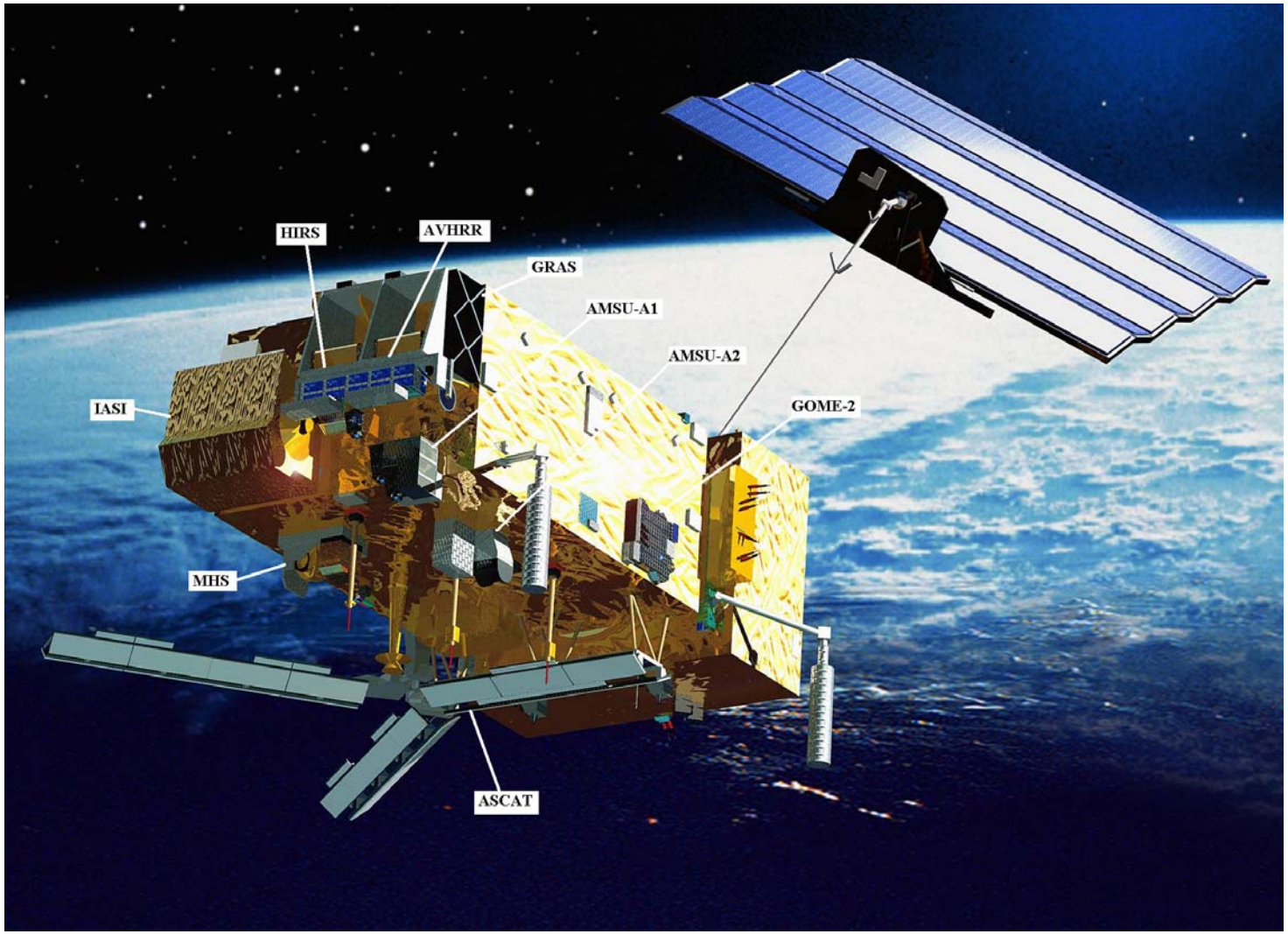
## Joint Transition Activity Agreement

- signed in June 2003
- covers NOAA delivery of US instruments for Metop-3 and exchange of Metop-3/NPOESS data
- Future activities leading to a Joint Polar System 2018+ timeframe
- amendment being signed to cover mutually agreed NOAA-N' recovery strategy

# EPS within IJPS



# The METOP Satellite



# Metop Payloads

- 13 instruments (innovative in GREEN)
  - Visible/IR imager (AVHRR/3);
  - Microwave sounders (MHS, AMSU-A1/2 and GRAS)
  - IR sounders: HIRS (not on M-3) and IASI
  - UV sounder (GOME-2)
  - C-band dual swath scatterometer (ASCAT)
  - Data Collection (A-DCS-3 ARGOS)
  - S&R transponders (2) (not on M-3)
  - Space Environment Monitor (not on M-3)
- 2 direct broadcast capabilities:
  - A-High Resolution Picture Transmission (A-HRPT)
  - Low Resolution Picture Transmission (LRPT) at 137 MHz

# IASI instrument developed by CNES/EUMETSAT

IASI PFM Instrument on PLM 2 at ESTEC

**Mission Objectives:**

- Temperature profile: 1K/1km (lower troposphere)
- Relative Humidity: 10%/1 km (lower troposphere)
- Trace gases: $O_3$ low resolution profile, $CH_4$, CO columns

**Main Characteristics: Michelson interferometer**

- High spectral resolution (0.25 $cm^{-1}$ unapodized)
- Spectral range: 3.4 to 15.5 µm
- Radiometric resolution < 0.2 K (NeDT), accuracy < 0.5 K
- Horizontal resolution/sampling: 12km/25km
- Wide swath (2200km) scanning synchronised with AMSU-A
- Built-in imager for co-registration with AVHRR

# Metop Instruments

**MHS:** Instruments delivered
Agreed NOAA N' recovery strategy.

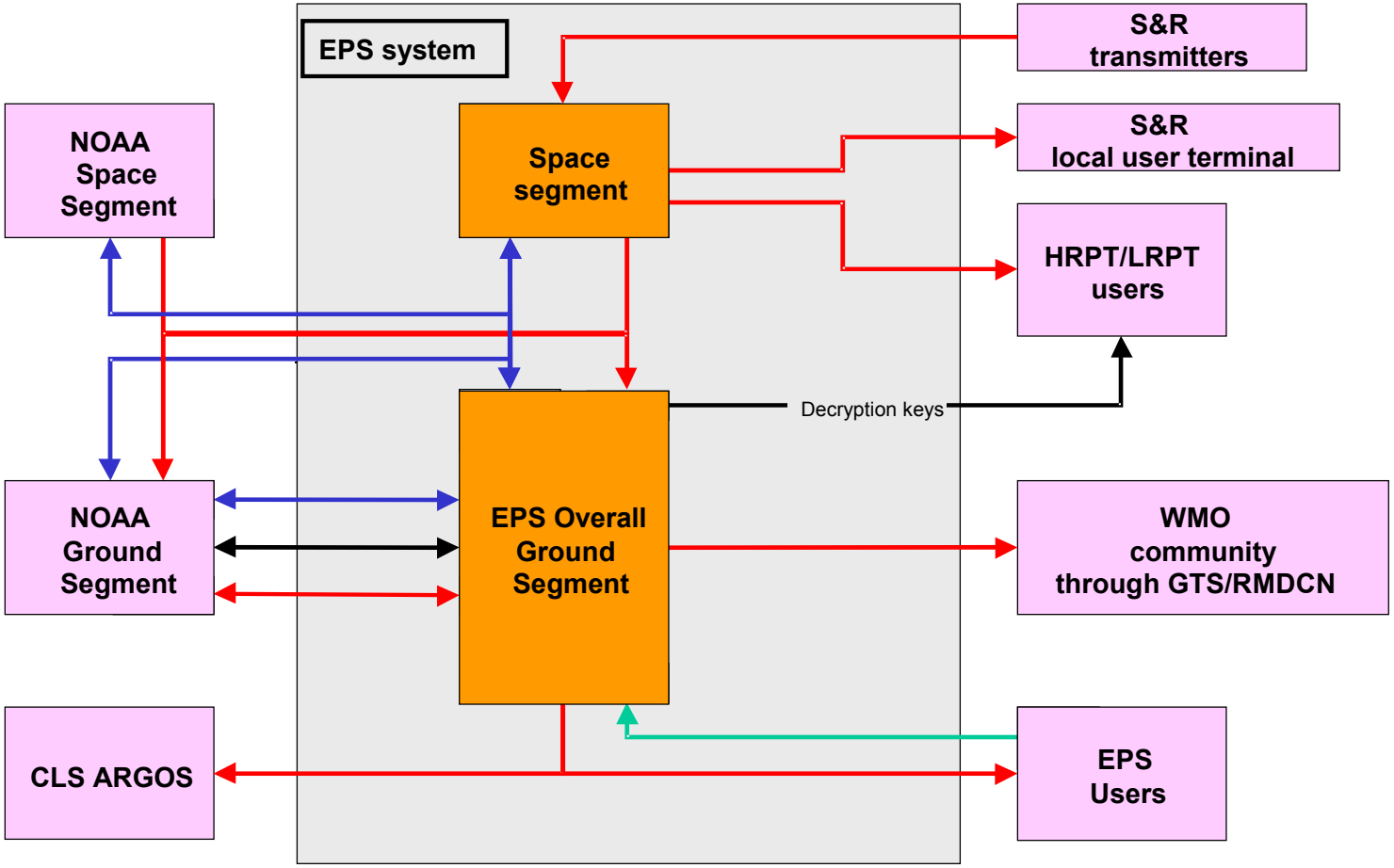
**IASI:** Detector problems solved, Delta Qualification Review planned for October.

**GOME-2:** No major issues.

**ASCAT:** Anomalies found and under investigation, major concern from Metop-1 FAR.

**GRAS:** No major issues.

# The Overall Ground Segment within EPS




EPS elements
EPS external entities
Mission data links
User access links
TTC links
Other data

# EPS Product Services

**CGS baseline products include:**

- **All level 1 Products from all NOAA & Metop sensors**
- **Selected Level 2 Products: Temperature/Moisture Profiles, Cloud Products...**

**Variety of services/level 2 products from 7 SAFs:**

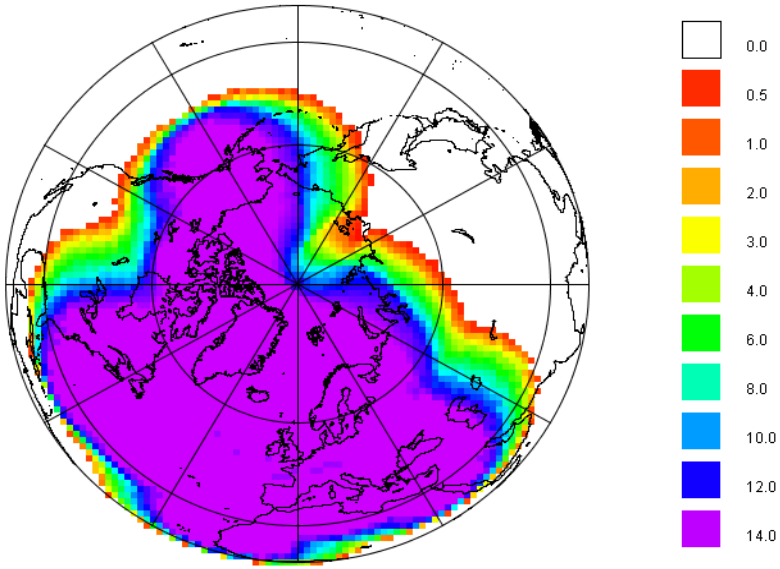
- **Ocean & Sea Ice**
- **Support to nowcasting & VSRF (SW Packages)**
- **Ozone Monitoring**
- **GRAS Meteorology**
- **Climate Monitoring**
- **Land Surface Analysis**
- **Numerical Weather Prediction (NWP)**

# EUMETSAT Support to NOAA

**EUMETSAT supported NOAA in the relevant NOAA N' recovery options:**

- **Cooperative agreement obtained with NOAA on mutual recovery strategy - cost neutral**
- **MHS FM2, had initial nominal functionality, EUMETSAT to conduct re-acceptance tests on MHS FM2, delivery to NOAA November 2005**
  - **funding approval obtained at EUMETSAT Council 56 03Dec2004**
- **NOAA to provide flight ready AVHRR, AMSU-A for Metop-3, supporting/ maintaining AMSU-A from 2010 to mid 2015**

# EUMETSAT Services: EARS




The ATOVS retransmission service

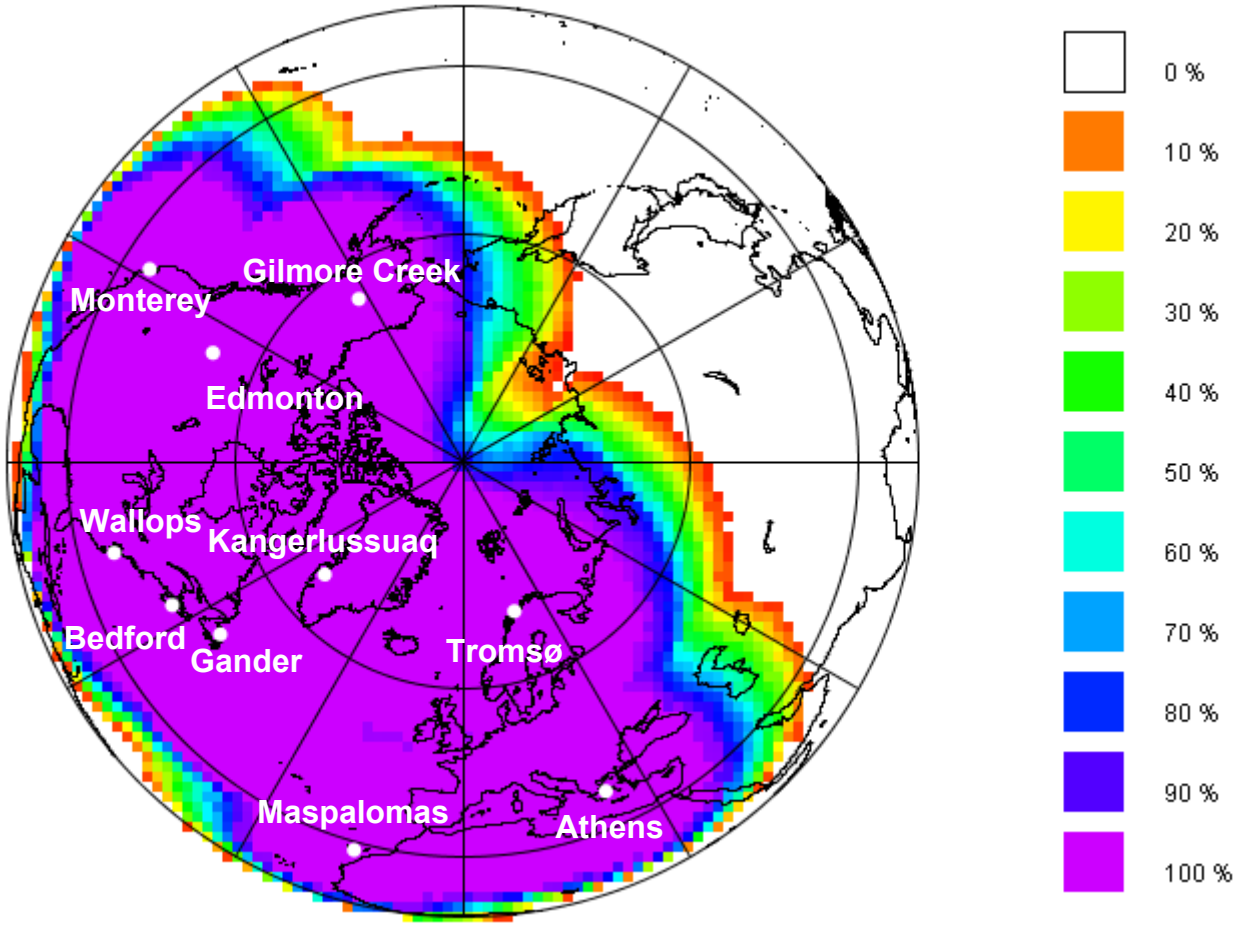
- Acquisition of local ATOVS data from the NOAA satellites
- Pre-processing of the data and dissemination of the raw and pre-processed data via EUMETSAT to the users

10 Stations operational since December 2003.

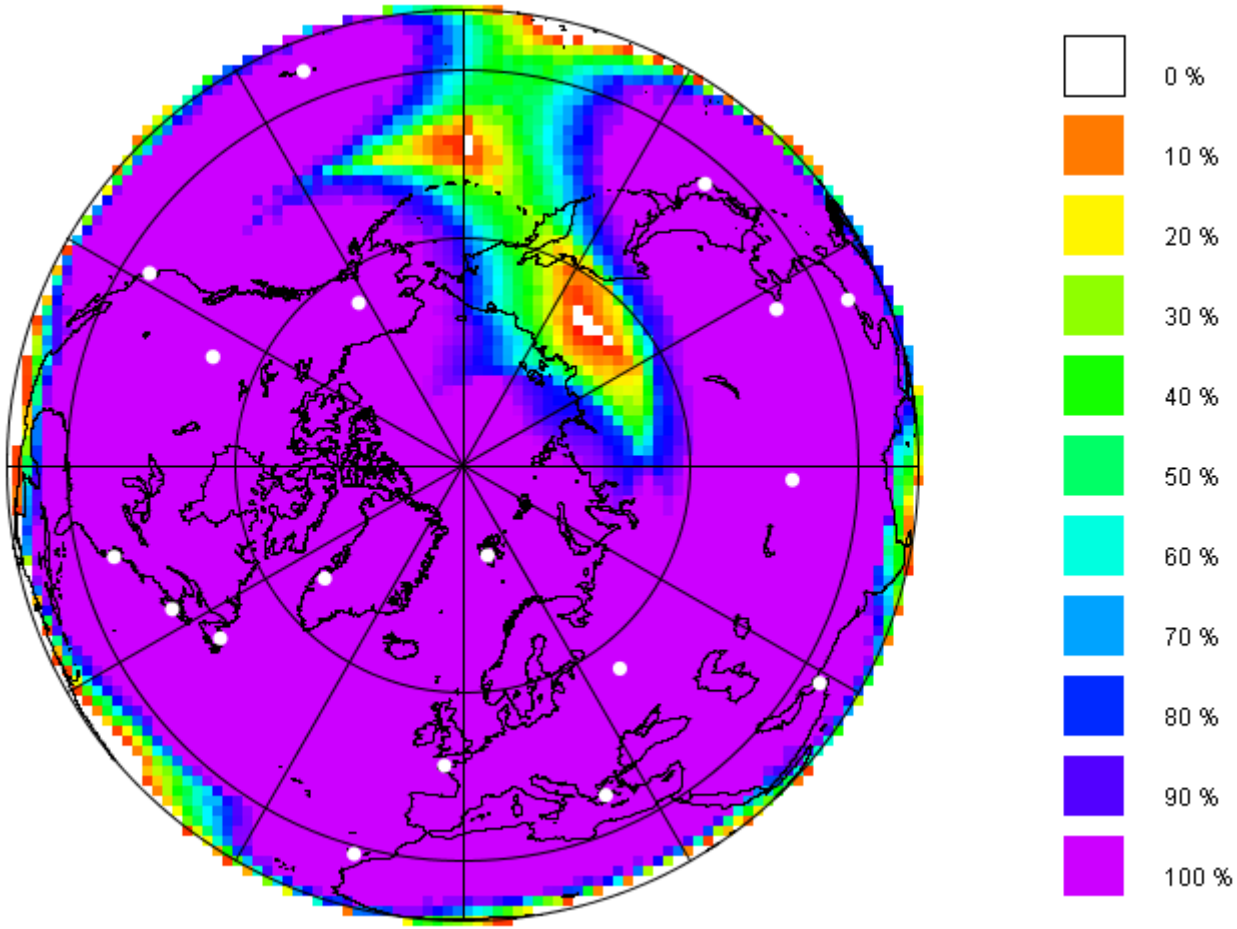
Effectively a "SafetyNet" ™ type approach at a regional level

Dissemination is via EUMETCast, which now also offers MSG data at Ku band in Europe

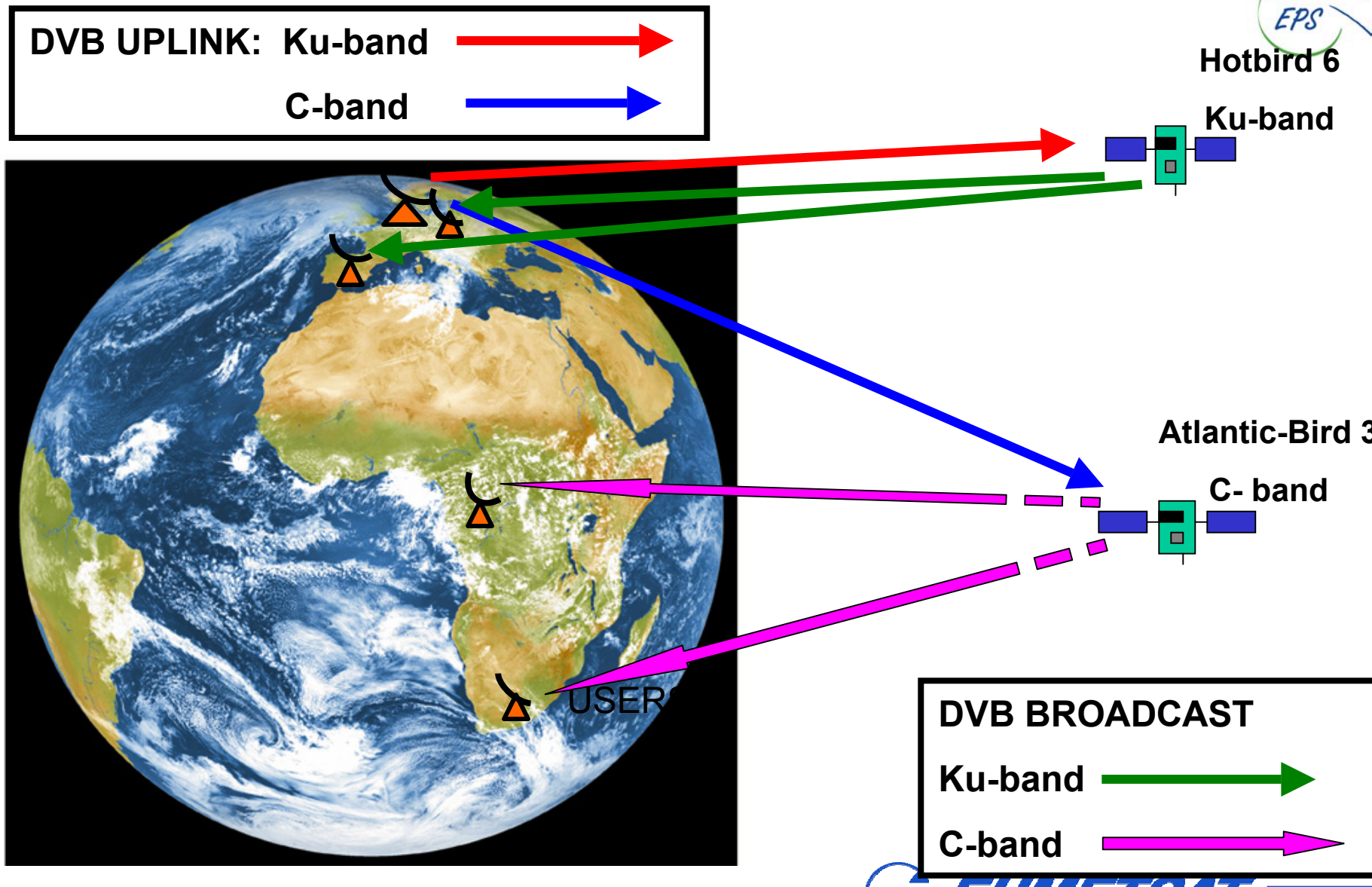
# Current EARS Coverage : Gander, Bedford, Wallops, Gilmore Creek



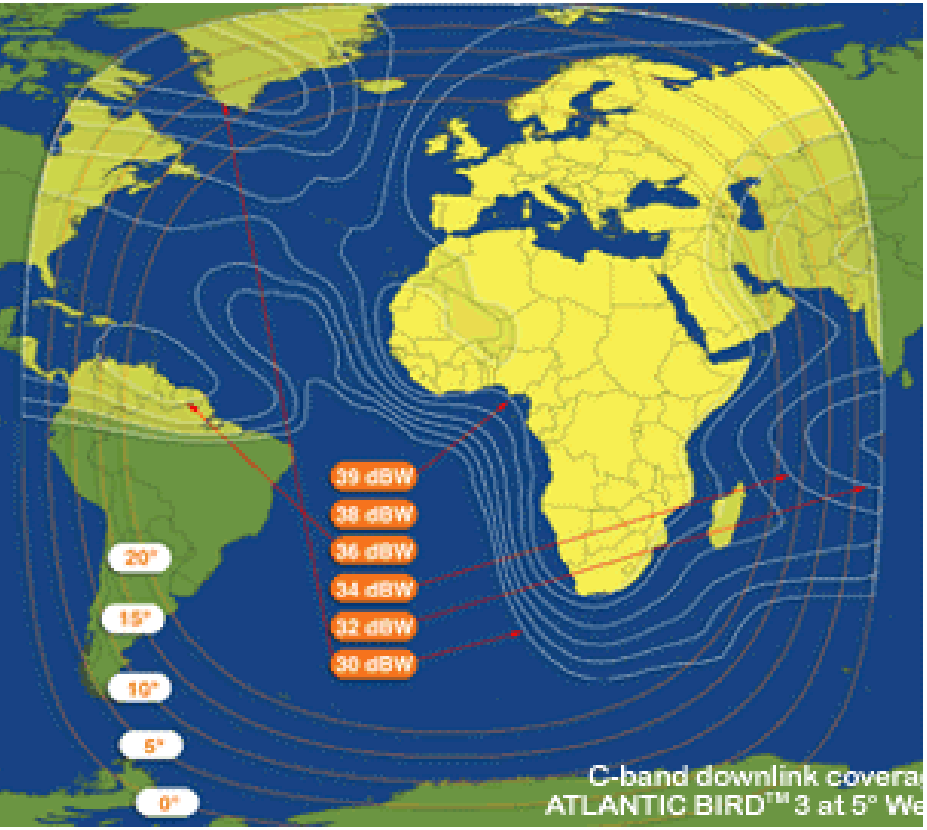
# Long Term Goal: Addition of Oman, Russia, Eastern Europe, Svalbard, China, Japan, Hawaii

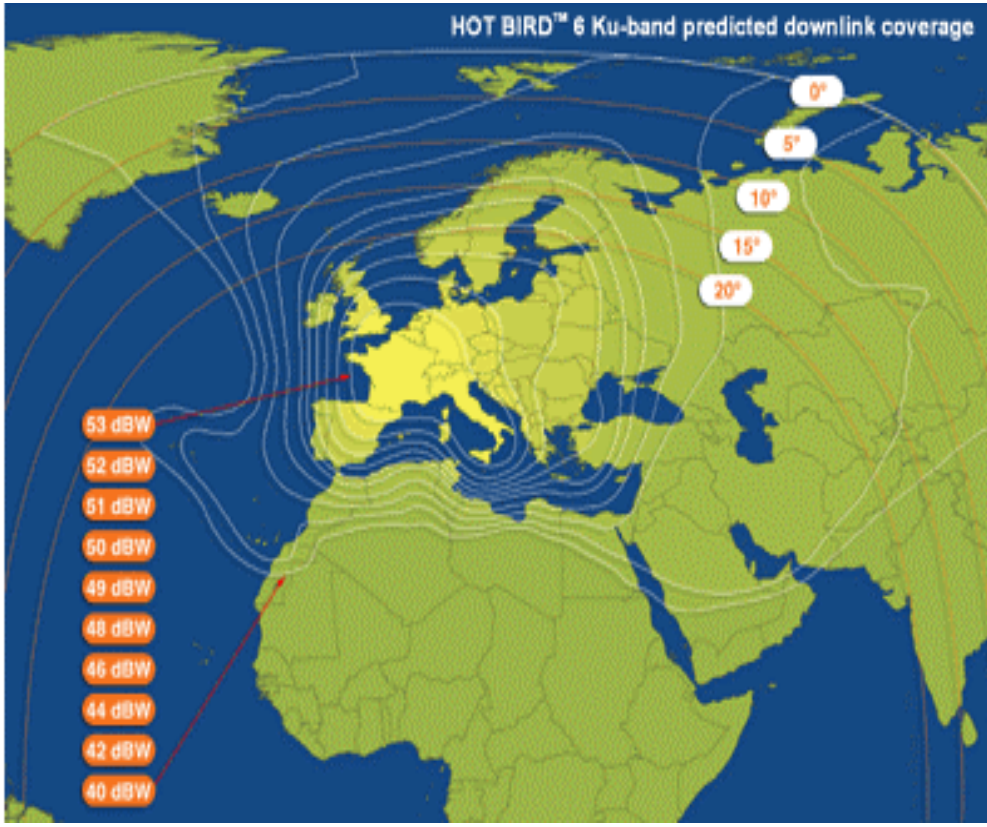


# EUMETSAT Services: EUMETCast

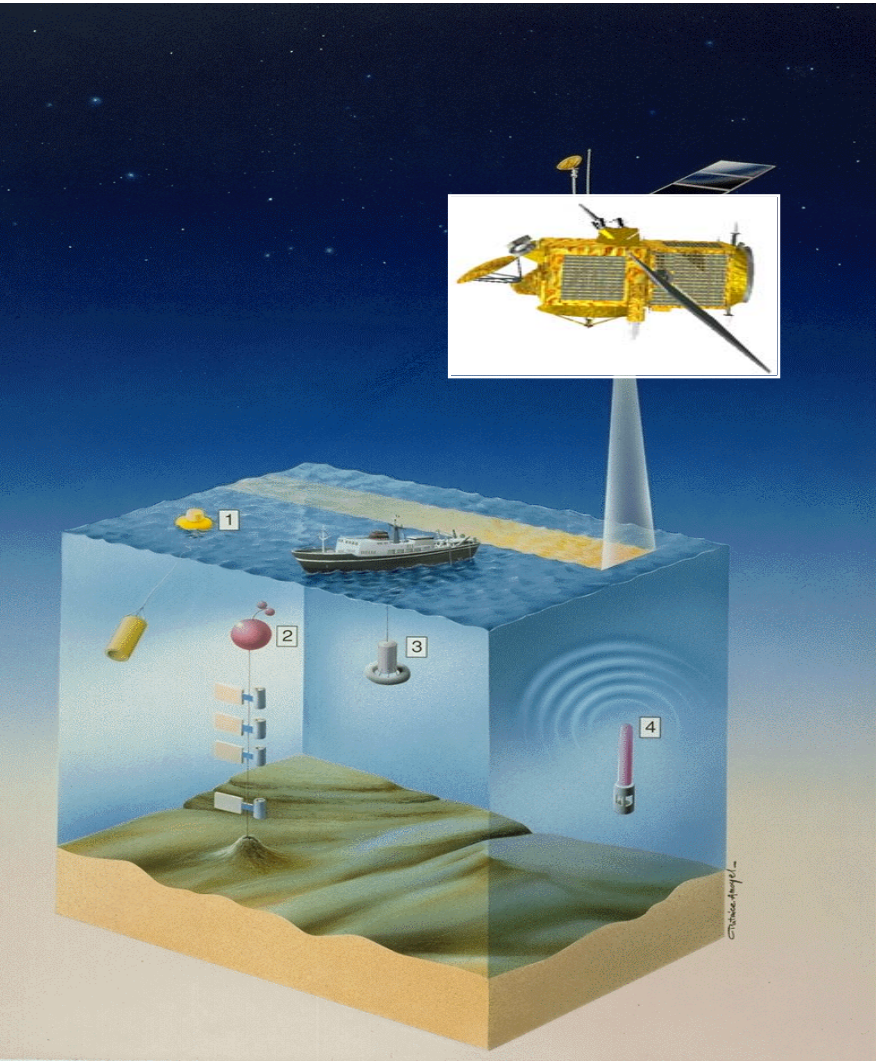


# Improved Access to Earth Observation Data: EUMETCast Coverage (C-& KU-band) Services



# Jason-2 Programme




**Launch April 2008**

**EUMETSAT one of four partners with CNES, NASA, NOAA.**

**EUMETSAT role is the European Operational Agency. EUMETSAT will operate an Earth Terminal, receive data, and disseminate rea time data.**

**EUMETSAT Programme came into force on 27 June 2003, Thus all EUMETSAT funding now guaranteed.**

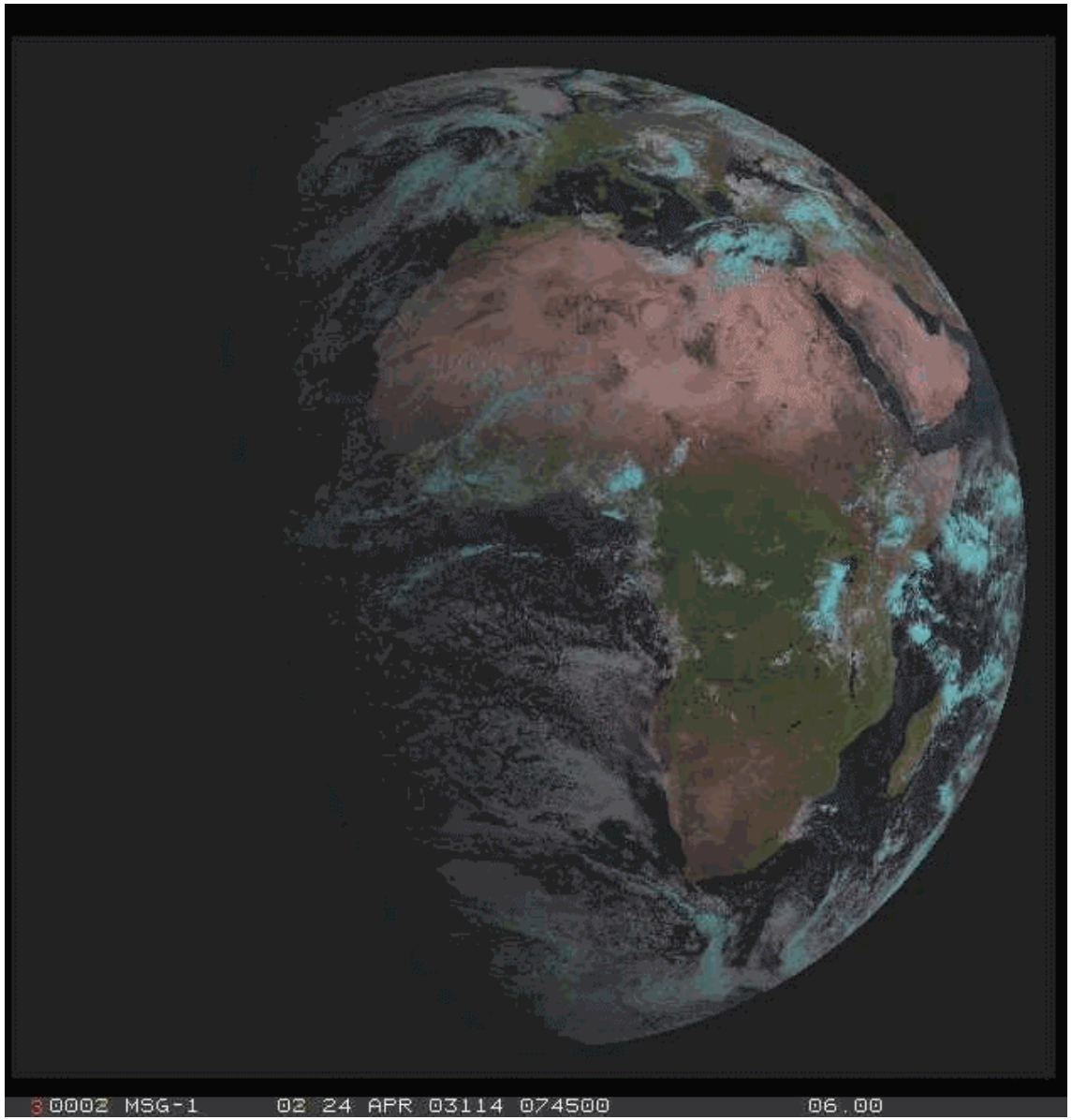
# EPS Towards Launch

Metop 1 mechanical tests

IASI PFM Instrument on PLM 2 at ESTEC

# IASI integrated on Metop PLM

# Metop 2 in integration (2004)




# MSG-1 SEVIRI RGB Image

0.6 µm => blue
0.8 µm => green
1.6 µm => red

# Thank You

**Ref:**
**www.eumetsat.de**