THE EUMETSAT POLAR SYSTEM

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EUMETSAT

PANEL ON FUTURE POLAR SATELLITE PLANNING
LONG BEACH, 11 January 2000

BACKGROUND: EUMETSAT CONVENTION

- **THE INITIAL CONVENTION**

  "The primary objective ... is to establish, maintain and exploit European systems of operational meteorological satellites...."

- **THE NEW CONVENTION:**

  "A further objective ... is to contribute to the operational monitoring of the climate and the detection of global climate change.."

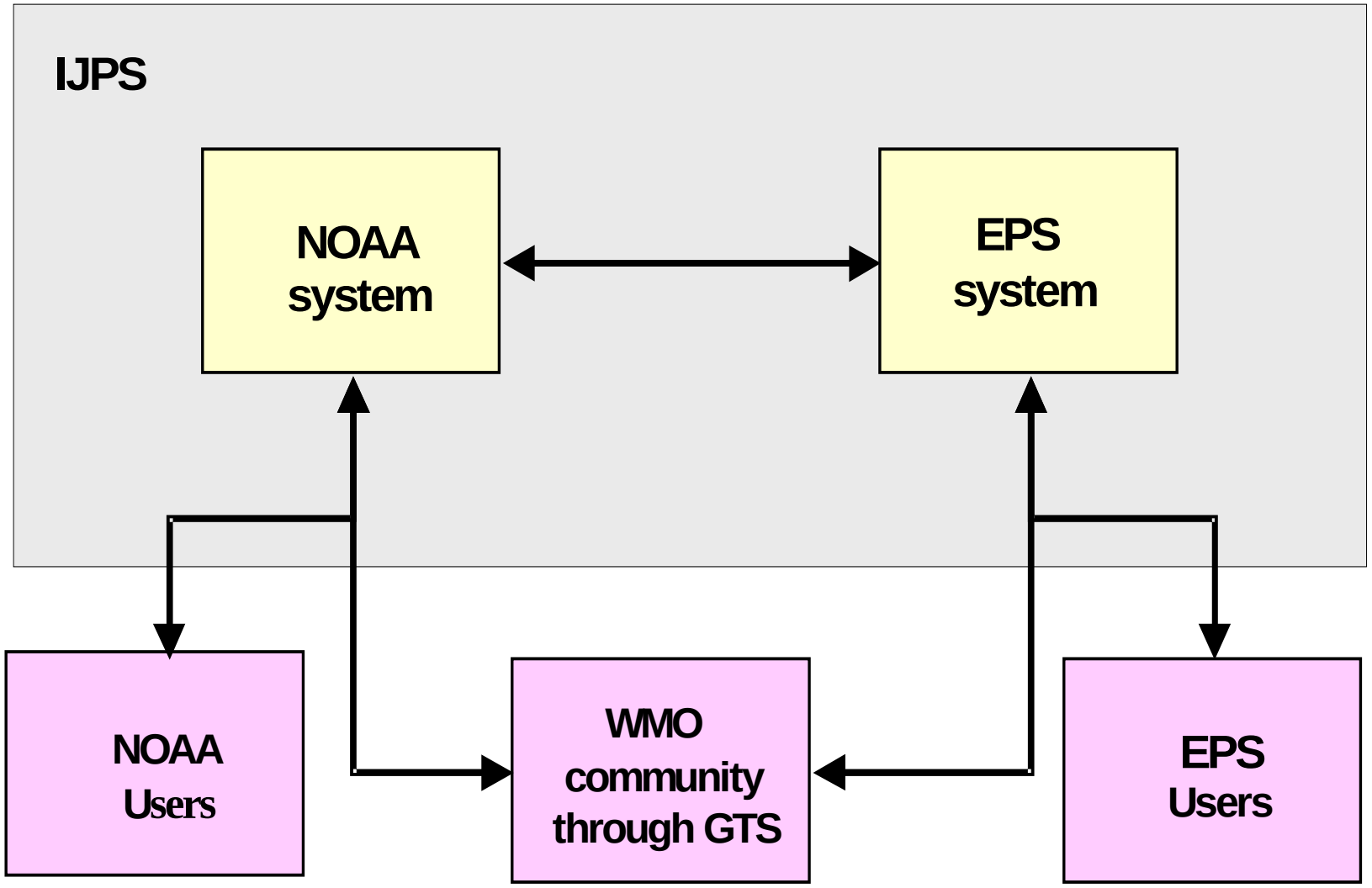
A MAJOR COOPERATION BETWEEN EUROPE AND THE US

- **IN THE MARGINS OF THE G7, EUROPE AGREED IN PRINCIPLE TO SHARE THE BURDEN OF THE METEOROLOGICAL POLAR SERVICE WITH THE USA**

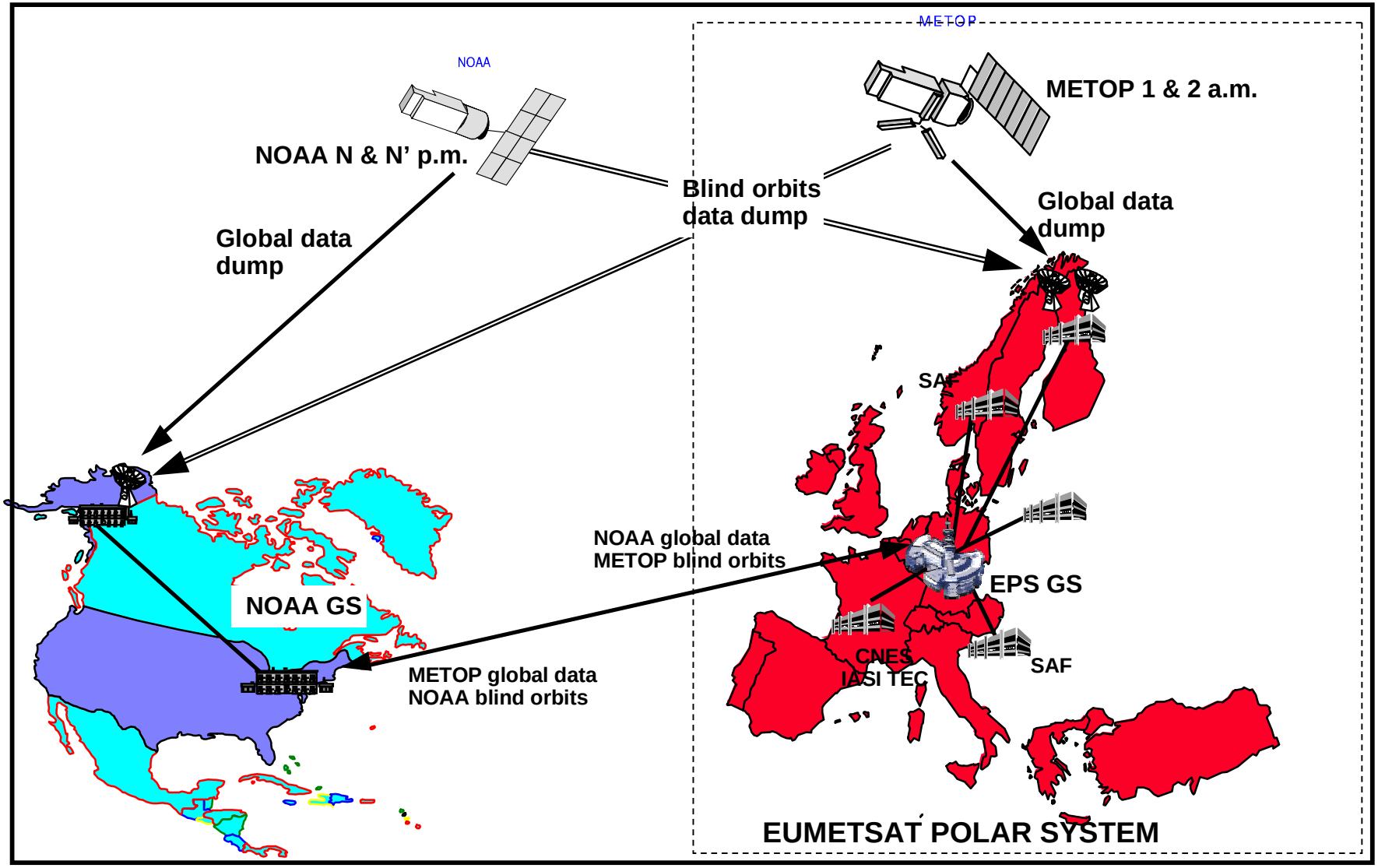
- **INITIAL JOINT POLAR SYSTEM (IJPS) TO BE IMPLEMENTED**
  - IN THE CONTEXT OF THE US CONVERGENCE
  - UNDER A NOAA-EUMETSAT COOPERATION AGREEMENT SIGNED IN NOVEMBER 1998
  - THROUGH INTEGRATION & COORDINATION OF THE NOAA POES AND THE EUMETSAT EPS (EUMETSAT POLAR SYSTEM) PROGRAMMES

- **SCOPE OF COOPERATION**
  - AFTERNOON & EARLY MORNING ORBITS COVERED BY THE US (POES & DMSP SATELLITES)
  - MORNING ORBIT COVERED BY EUROPE (METOP SATELLITES)
  - EXCHANGE OF INSTRUMENTS AND DATA, COORDINATED DEVELOPMENT AND OPERATIONS

The EPS System



EPS within IJPS



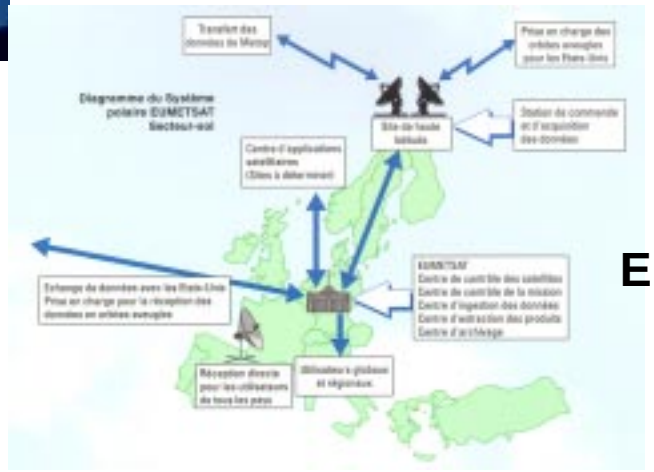
EPS: AN INTEGRATED EUROPEAN EFFORT

- **COOPERATION BETWEEN EUMETSAT, ESA AND CNES**
  - ALL DEVELOPMENT PROGRAMMES APPROVED (METOP-1, EPS, IASI)
- **EPS SPACE SEGMENT: METOP SATELLITES**
  - METOP-1 DEVELOPED/CO-FUNDED WITH ESA; METOP-2 & 3 JOINTLY PROCURED (SINGLE CONTRACT FOR METOP-1/2/3), FULLY FUNDED BY EUMETSAT
  - IASI-1 DEVELOPED/CO-FUNDED BY CNES, UNDER CNES-EUMETSAT COOPERATION; IASI-2 & 3 PROCURED BY CNES, FULLY FUNDED BY EUMETSAT
  - MHS INSTRUMENTS FOR NOAA N/N´ & METOP-1/2/3 PROCURED BY EUMETSAT
  - ARGOS DCS TERMINALS PROVIDED BY CNES
- **LAUNCH SERVICES PROCURED BY EUMETSAT**
- **EPS GROUND SEGMENT**
  - CENTRAL/CORE GROUND SEGMENT (CGS) DEVELOPED/PROCURED BY EUMETSAT
  - NETWORK OF 7 SATELLITE APPLICATIONS FACILITIES (SAF) DEVELOPED BY EUMETSAT MEMBER STATES UNDER COOPERATIONS WITH EUMETSAT
- **EPS SYSTEM OPERATED BY EUMETSAT (14 YEARS)**

SCOPE/BREAKDOWN OF EPS PROGRAMME

3 Launch services

3 Metop satellites



EPS Ground Segment including SAFs

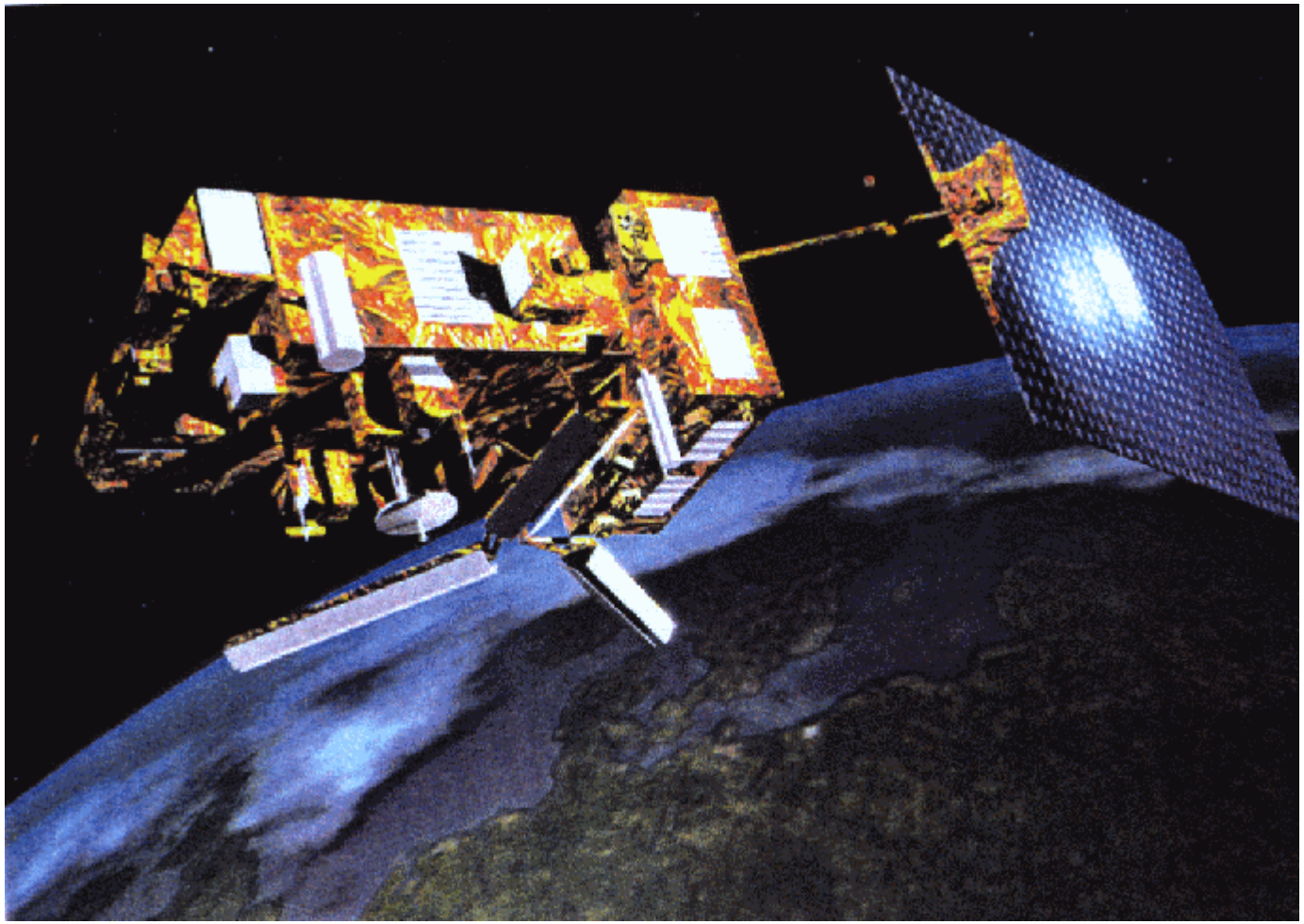
14 years of operation

EPS MISSION OBJECTIVES:
OPERATIONAL METEOROLOGY & CLIMATE MONITORING

- **Temperature and moisture sounding for NWP**
  - High accuracy/vertical resolution
  - All weather capability
  - Troposphere, stratosphere amd troposphere/stratoaphere interactions
- **Imagery of clouds and land/ocean surfaces**
- **Air-sea interactions**
- **Ozone mapping & monitoring**
- **Data collection and location**
- **Direct broadcast/support to nowcasting**
- **Search and Rescue**

EPS Capabilities/Payload

- **Atmospheric Sounding (temperature, moisture, O3/species):**
  - IR/MW imaging sounders: HIRS/IASI, AMSU-A/MHS
  - UV/VIS imaging sounder: GOME-2
  - limb viewing radio-occultation sounder: GRAS
- **Global VIS/IR Imagery:** AVHRR/3
- **2-Dimensional wind field at ocean surface:** ASCAT
- **Data Location & Collection:** ARGOS DCS Terminal
- **Global and Local Data Access:** solid state recorder/HRPT/LRPT
- **Search & Rescue:** S&R Terminal



height: 7,6 m
length: 6,8 m
width: 3,7 m

solar panels: 11,3 m

power: 3900 W
(end of life)

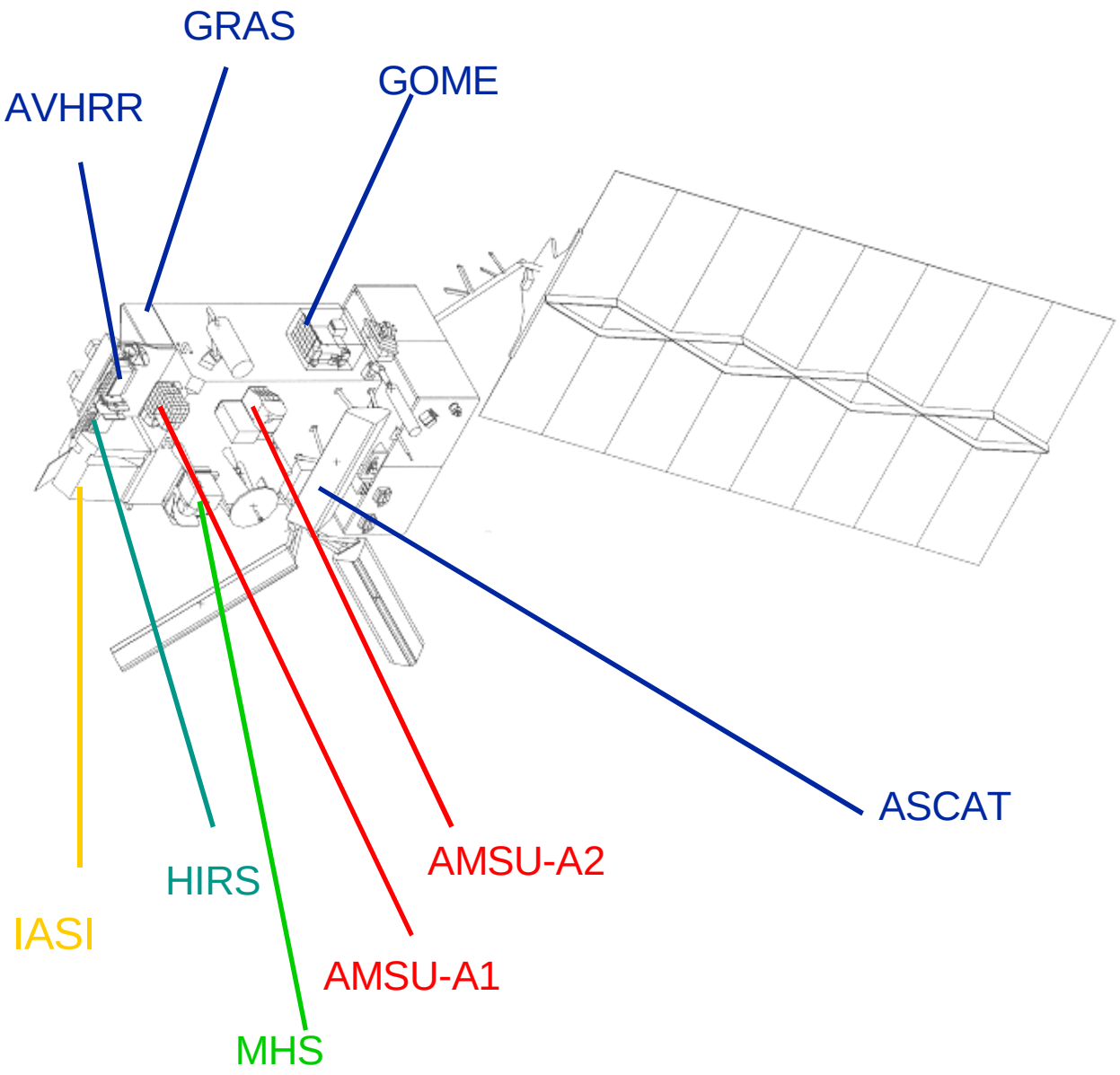
lifetime: 5 years

13 instruments

mass: 4500 kg
mass of instruments: 840 kg

data flow: 2250 kbps

The MetOp satellite



height: 7,6 m
length: 6,8 m
width: 3,7 m

solar panels: 11,3 m

power: 3900 W
(end of life)

lifetime: 5 years

13 instruments

mass: 4500 kg
mass of the
instruments: 840 kg

data flow: 3.5 Mbps

IASI Instrument

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

- **Main Characteristics:**
  - High spectral resolution (0.25 cm^{-1} unapodized)
  - Spectral range: 3.4 to 15.5 µ
  - 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 and Back-up

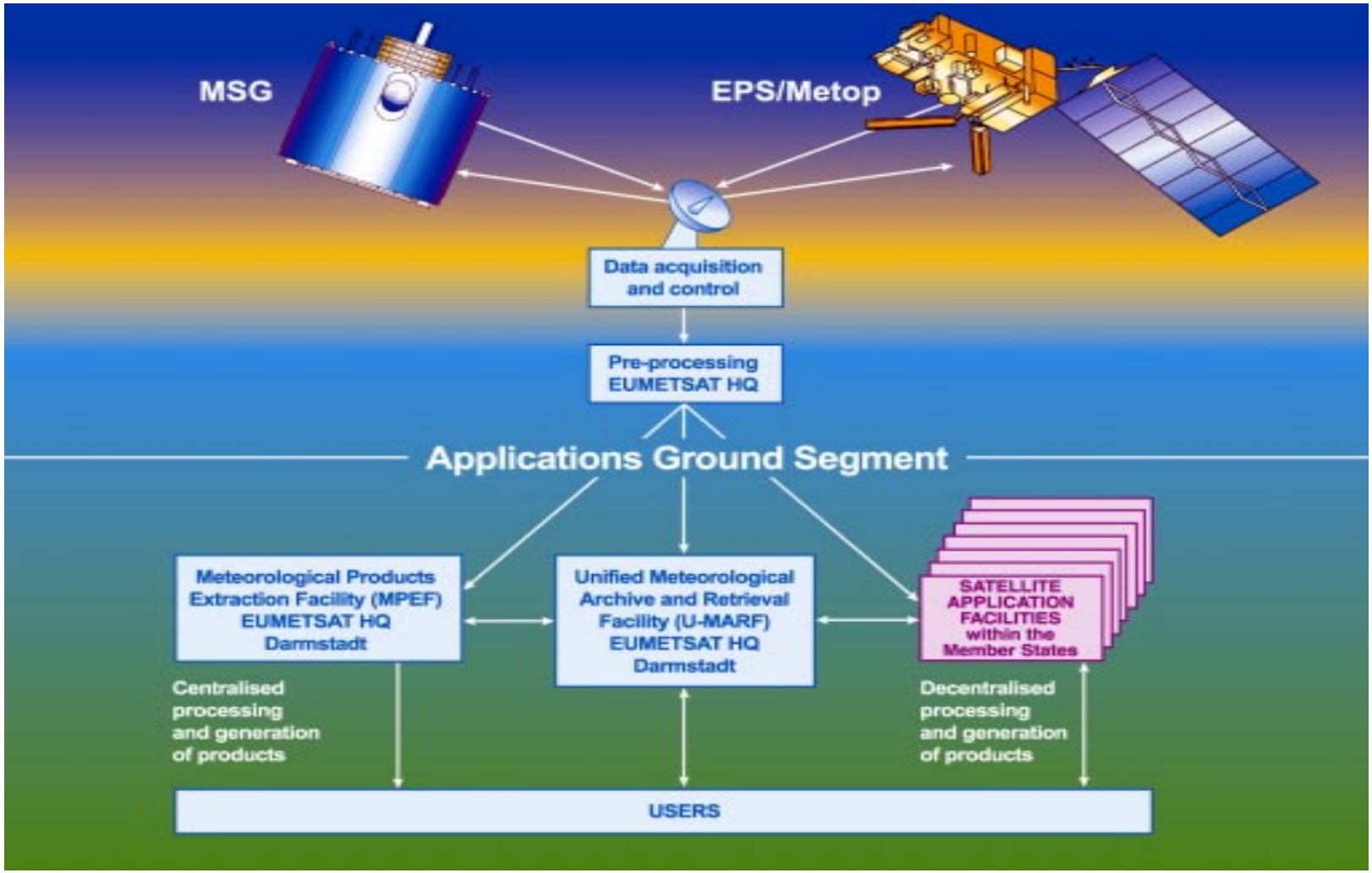
EPS PRODUCT SERVICES

- **PRODUCT SERVICES AVAILABLE FROM CORE GROUND SEGMENT & DISTRIBUTED NETWORK OF SAFs**

- **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 AVAILABLE FROM 7 SAFs**
  - OCEAN & SEA ICE
  - SUPPORT TO NOWCASTING & VSRF (SW PACKAGES)
  - OZONE MONITORING
  - GRAS METEOROLOGY
  - CLIMATE MONITORING
  - LAND SURFACE ANALYSIS
  - NWP

EUMETSAT Ground Segment Breakdown



VALUE OF EPS TO METEOROLOGICAL APPLICATIONS (1/2)

- **NOWCASTING AND VERY SHORT TERM FORECASTING**
  - HIGH REVISIT FREQUENCY AT HIGH LATITUDES NOT COVERED BY GEOSTATIONARY SPACECRAFT
  - MICROWAVE MEASUREMENTS NOT AVAILABLE FROM GEO ORBIT
    - PASSIVE TEMPERATURE/MOISTURE SOUNDING: AMSU-A/MHS
    - ACTIVE : SCATTEROMETRY OVER OCEAN (WIND), ICE AND LAND
  - SENSOR SYNERGY: CO-LOCATED SOUNDING, IMAGERY, SCAT...
  - HRPT/LRPT REAL TIME SERVICE

- **NUMERICAL WEATHER PREDICTION**
  - ADVANCED SOUNDING(GLOBAL MISSION)
    - TEMPERATURE, MOISTURE, OZONE
    - TROPOSPHERE, AND STRATOSPHERE
    - ALL WEATHER (AMSU-A/MHS/GRAS)
    - HIGHER ACCURACY VERTICAL RESOLUTION (1K/1km)
  - ENHANCED INFORMATION ON SURFACE PARAMETERS

VALUE OF EPS TO OTHER APPLICATIONS (2/2)

- **CLIMATE RESEARCH AND APPLICATIONS**
  - AIR SEA INTERACTIONS (AVHRR, IASI, ASCAT)
  - TROPOSPHERE-STRATOSPHERE INTERACTIONS (GRAS)
  - CLOUD-RADIATION INTERACTIONS/GEWEX
  - OCEAN, ICE AND CLIMATE (ASCAT, AVHRR…)
  - BIOSPHERE AND CLIMATE
  - DEDICATED SAF
- **OZONE & UV MONITORING, ATMOSPHERIC CHEMISTRY**
  - GOME-2, HIRS AND IASI
  - DEDICATED SAF
- **CONTINENTAL BIOSPHERE AND RESOURCE MANAGEMENT**
  - VEGETATION MONITORING
  - DEDICATED SAF

EPS PROGRAMME STATUS

PROGRAMMATICS/DECISIONS

- METOP-1 & EPS PROGRAMMES NOW FULLY APPROVED
- IJPS AGREEMENT SIGNED WITH NOAA
- GOME-2 ALSO ON METOP-3

DEVELOPMENT MILESTONES

- SATELLITE PDR HELD IN JUNE 1999
- GROUND SEGMENT REQUIREMENT REVIEW HELD IN JULY 1999, ITT RELEASED, INDUSTRIAL OFFERS UNDER EVALUATION
- SYSTEM REQUIREMENTS REVIEW (PART 2) ONGOING
- SATELLITE CRITICAL DESIGN REVIEW PLANNED IN MARCH 2001

POST-EPS/IJPS: PRELIMINARY PROSPECTS

- **STRATEGIC DISCUSSION ON POSSIBLE COOPERATION OPTIONS IN THE JPS/CONVERGED ERA TO BE INITIATED WITH NOAA IN JANUARY**

- **REVIEW OF GLOBAL OBSERVING SYSTEM PLANNED UNDER WMO LEADERSHIP**

- **VALUE OF WIND LIDAR TO BE EVALUATED FROM APPROVED ESA ADM MISSION (EARTH EXPLORER CORE MISSION)**

- **USER REQUIREMENTS TO BE REVISITED, TAKING INTO ACCOUNT**
  - WMO ROLLING REQUIREMENTS REVIEW
  - PRIORITIES OF MEMBER STATES AND NEW CONVENTION