Data and Services provided by EUMETSAT
The European Organisation for Exploitation of Meteorological Satellites

Meteosat
Metop
Jason
The primary objective is to establish, maintain and exploit European systems of operational meteorological satellites. A further objective is to contribute to the operational monitoring of the climate and the environment as well as the detection of global climatic changes.
EUMETSAT’s Members

Member States
- Austria
- Belgium
- Denmark
- Finland
- France
- Germany
- United Kingdom
- Greece
- Ireland
- Italy
- Slovak Republic
- Luxembourg
- The Netherlands
- Norway
- Croatia

Cooperating States
- Bulgaria
- Slovenia
- Czech Republic
- Hungary
- Iceland*
- Latvia
- Lithuania
- Poland
- Serbia & Montenegro*
- Latvia
- Lithuania
- Poland
- Serbia & Montenegro*

*Pending Ratification
Goal: Maintain continuity and develop the operational meteorological and climate data services with adequate satellite and ground infrastructure, and associated user services.
MFG: Meteosat First Generation

MSG: Meteosat Second Generation

EPS: EUMETSAT Polar System

OSTM: Ocean Surface Topography Mission
EUMETSAT Satellite Programmes

Meteosat
- 0° Service
- Indian Ocean
- Rapid Scan

MSG
- Meteosat 8
- Meteosat 9
- Meteosat 10
- Meteosat 11

MTG

EPS
- Metop-A
- Metop-B
- Metop-C

OSTM
- Jason-2
Meteosat - Status

- **Meteosat-6**: Launched on 20 November 1993, since May 2007 at 67.5E as stand-by over the Indian Ocean.

- **Meteosat-7**: Launched on 2 September 1997, operational at 57.5E in support of the Indian Ocean Data Coverage Service.

- **Meteosat-8 (MSG-1)**: Launched on 28 August 2002, stand-by at 3.4W since 11 April 2007; will be used for a rapid scanning service (trials in summer 2007 – operational from spring 2008 onwards at a new position of 9.5E).

- **Meteosat-9 (MSG-2)**: Launched on 22 December 2005, operational at 0.0 degree since 11 April 2007.
Meteosat Second Generation
Example of a Multi-Channel RGB loop from Meteosat-8
Launch from the Baikonour Cosmodrome with Sojuz/Fregat the 19th October 2006
We have a really global view now...

EUMETSAT Satellite Programmes

MHS on Metop

Meteosat 8

Prepared with IDV by Roesli, 2006
EUMETSAT Satellite Programmes

EPS: The EUMETSAT Polar System with its Metop Satellites
- Metop-A launched 19th October 2006
- Sun-synchronous Orbit
- 820 km, 9h30 LST, 102 min
- Only polar data source from mid-morning orbits
- 11 Instruments
- Metop-B and Metop-C recurrent models
- Soyuz launcher service (Baikonour)
- LEOP Service from ESOC (Darmstadt)
- Central and distributed Ground Segment components
- 14 years of operations
EUMETSAT Satellite Programmes

Metop Satellite Instruments

- AVHRR
- HIRS
- IASI
- GRAS
- GOME
- AMSU-A1
- AMSU-A2
- MHS
- ASCAT
The EPS Services

**Global mission**: delivery of global measurements to Met Services and NOAA within 2¼ hours of the instant of observation (GTS, EUMETCast).

**Local mission**: real-time transmission of imaging and sounding data to local user stations.

**Search and Rescue** service (S&R).

**ARGOS** mission of in-situ observational data.

**Data Dissemination**
- EUMETCast: Full NRT data stream
- GTS: Subset

**Archiving & Retrieval**
- All data and products are archived in the **UMARF**

**IASI TEC**
- CNES Toulouse
- CalVal of IASI
- Monitoring of IASI

**EUMETSAT Satellite Programmes**
The SAF Network

EUMETSAT Satellite Programmes

SAF on Numerical Weather Prediction
SAF on Ocean & Sea Ice
SAF on Land Surface Analysis
SAF on Nowcasting & Very Short Range Forecasting
SAF on GPS Profiling
SAF on Climate Monitoring
SAF on Ozone Monitoring
SAF on Hydrology & Water Management

Member State
Cooperating State
Satellite Application Facilities (SAF) consortium leaders
National meteorological service / SAF partner
Meteorological Products: Wind Vector Example

EUMETSAT Satellite Programmes

24 February 2003, 12:00 UTC
wind vectors
low / medium / high
EUMETSAT Satellite Programmes

Archive of Imagery and Products

Meteorological Archive and Retrieval Facility

- Off-line Access
- Publications
- & Electronic Media
- On-line Dissemination
- Photographic Products
ATOVS and AVHRR:
Continuity and Commonality

Level 1 NRT Products (2h15min)
Level 2 NRT Products (3h)
Global Sounding: Global Products are dump-based

Composite of 14 level-1b products of one day from HIRS covering the Earth twice

Continuity is based on ATOVS and AVHRR Level 1b and Level 2 products
Processing of AHRPT data by Meteo-France and EUMETSAT (right)

F. Montagner, 2006
AMSU-A L1
Trial dissemination of L1 started 31 October 2006
First evaluations by ECMWF
First guess departures
Infrared Atmospheric Sounding Interferometer (IASI)

Fourier Transform Spectrometer based on a Michelson interferometer
(8461 channels)

- IASI developed by CNES, under CNES-EUMETSAT cooperation
- Operational level 1 processor developed and delivered by CNES
- IASI TEC at Toulouse
- IASI SIOV and Cal/Val level 1 performed by CNES
A Major Step Forward
In Infrared Sounding

EUMETSAT Satellite Programmes

HIRS 19 channels vs IASI 8461 spectral samples
IASI brightness temperatures
15 January 2007, 19:50 – 21:30 UTC

EUMETSAT Satellite Programmes

IASI – 645 cm\(^{-1}\)

Schlüssel and Hultberg, 2007
First GOME-2 Ozone Total Column

EUMETSAT Satellite Programmes

Loyola, 2007
First GOME-2
Nitrogen Dioxide Total Column

Loyola, 2007
GOME-2 Nitrogen Dioxide Total Column shows the improvement by GOME-2
Advanced Scatterometer (ASCAT)

Wind vectors at the ocean surface - 25km and 12.5km
Ocean winds by ASCAT

Ocean winds, produced by KNMI from ASCAT data
Compared with ECMWF winds (FG)

H. Hersbach, 2006
Tracking GPS satellites with GRAS
GPS tracked by GRAS

EUMETSAT Satellite Programmes

GPS tracked by GRAS Zenith antenna: blue=DF; green=SF

ESA - GPP SIOV 27 Oct 2006 ML
First GRAS retrievals – Setting occultations

“No frills” measurement reconstruction & dry temperature retrieval
No raw sampling
Initialised with CIRA climatology
Compared with ECMWF operational analysis on 21 standard pressure levels
Higher altitude biases related to known CIRA biases

C. Marquardt
and the GRAS Team
MTG will provide continuity of EUMETSAT Services

EUMETSAT Satellite Programmes

1977

MOP/MTP

1 observation mission:
-MVIRI: 3 channels
-Spinning satellite
800 kg

2002

MSG

2 observation missions:
- SEVIRI: 12 channels
- GERB
- Spinning satellite
Class 2-ton

2015

MTG

3 or 4 observation missions:
- Combined Imager: 16 channels
- Infra-Red Sounder
- Lightning Imager?
- 3-axis stabilised satellite(s)
Class 3-ton

Implementation of the EUMETSAT Mandate for the Geostationary Mandatory Programme

... 30 years of continuous operations achieved ...

Possible Chemistry Mission UVS coordinated with ESA for implementation via GMES Sentinel 4/5
The MTG Imagery Missions

- MTG imagery missions served by a Flexible Combined (FC) imager
- Use of in-orbit spare satellite for rapid scan

**FDHSI mission (continuation of MSG-SEVIRI):**
FC imager on the operational satellite in Full Disk mode with 10 min repeat cycle

**HRFI mission (continuation of Rapid Scan):**
FC imager on fully commissioned in-orbit hot standby in Rapid Scan mode over ¼ of Full Disk with 2.5 min repeat cycle

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Repeat cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDHSI</td>
<td>10 min</td>
</tr>
<tr>
<td>HRFI</td>
<td>2.5 min</td>
</tr>
</tbody>
</table>
Jason-2

Ocean Surface Topography Mission

EUMETSAT Satellite Programmes

Jason-2

Precise and continuous altimetry data (in support of operational activities in marine meteorology, seasonal forecasting and oceanographic services) through laser technology.
Goal: Ensure that the EUMETSAT activities are part of a coherent WMO global system

WMO system is designed to meet needs of our Member and Co-operating States

Recognition of European contribution to this global system

Key message: Remain a recognised global actor
Goal: Maximize the use and ensure the maximum benefit is delivered from the EUMETSAT systems.

SAF Interactions with Users

- Users
  - Near-Real-Time Products (via GTS/RMDCN, EUMETCast)
  - Off-line Products Retrieval
  - Hot-line Calls
  - Distribution of Software Applications

- SAFs
- EUMETSAT data
- Other data
- User Support Services
- UMARF

Key Message:
Promote the use of key EUMETSAT infrastructures

GCOS focus on Essential Climate Variables (ECV):
- Currently feasible for global implementation
- High impact on the UNFCCC requirements
- New parameters to be added after on-going research

GCOS related activities:
- OSI SAF: Global Sea Ice
- OSI SAF: Global Sea Surface Temperature
- OSI SAF: Sea Ice Reprocessing
- CM SAF: Global Humidity Product
- Cross-SAF: Integrated SAF product

Environmental Security
- GRAS
- LSA
- CM
- OSI
- GMES

Climate Change and Ozone Depletion
- NWC
- O3M

GEO?
EUMETCast - EUMETSAT’s Data Dissemination Service

EUMETCast
EUMETSAT’s Broadcast System for Environmental Data

- A multi-service dissemination system based on standard Digital Video Broadcast (DVB) technology
- Using commercial telecommunication geostationary satellites to multicast files (data and products) to a wide user community
- EUMETCast is now available for use by Global Earth Observation System of Systems (GEOSS), the European Global Monitoring for Environmental and Security (GMES) initiatives and other environmental data providers
- EUMETCast is also a EUMETSAT contribution to the Integrated Global Data Dissemination Service (IGDDS), a component of the World Meteorological Organization Information System (WIS)
- Generic, multi-mission dissemination systems based on standard DVB multicast technology
- Uses commercial broadcast channels on TV, DTH telecommunication satellites
- Off-the shelf, commercially available reception equipment
- IP over DVB standard coding
- Use of standard formats/encoding - XRIT, BUFR, GRIB, HDF
- Secure access control at individual file and group of Users level
- Open, flexible, scalable architecture
EUMETCast Overview

EUMETSAT Satellite Programmes

- EUMETSAT Data
- SAF Data
- DWDSAT
- VITO Data
- GTS/RMDCN Data
- NOAA/NESDIS
- Other Data Providers

Communication Lines

HotBird-6
- Users in Europe
- NewSkies-806
- American Service

AtlanticBird-3
- Users in Africa
- Users in America
EUMETCast Coverage

EUMETSAT Satellite Programmes

European service
HE-6, Ku-band operational

American service
NSS 906, C-band operational

African service
AB-3, C-band operational

North America & Canada

Europe

Middle East

India

Africa

Australia

New Zealand

Antarctica
### EUMETCast Solution

#### EUMETCast (DVB) Standard Hardware - indicative costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNB/Feedhorn, Antenna</td>
<td>200 EUR</td>
</tr>
<tr>
<td>2 x PC, Hard Disk, Ethernet</td>
<td>2000 EUR</td>
</tr>
<tr>
<td>DVB PCI Card</td>
<td>100 EUR</td>
</tr>
<tr>
<td>EUMETCast Client Software</td>
<td>60 EUR</td>
</tr>
<tr>
<td>EUMETCast Key Unit (EKU)</td>
<td>40 EUR</td>
</tr>
</tbody>
</table>

**Total (2 PCs):** 2400 EUR  
**Total (1 PC):** 1400 EUR
Goal: Extend the EUMETSAT user base through collaboration in research, training support and assistance to countries in Europe and the developing world in the exploitation of EUMETSAT data

Key Message: Broaden the user communities
EUMETSAT Training Programme

The Role of EUMETSAT in Training

- To act as a catalyst, promoting training in use of satellite data in Member & Cooperating States

- No competition with training institutes of larger Member State but close cooperation (Germany, UK, France etc.)

- Expertise from Member or Cooperating States often used at EUMETSAT training courses, workshops, etc.

- EUMETSAT often takes the lead when the scope of a training activity is too big for one country: EUMeTrain, SATMANU, MSG Interpretation Guide, etc.
EUMETSAT’s training is achieved through:

- Classroom courses
- Preparation of training material (e.g. CAL modules)
- Distant learning activities (e.g. VisitView)
- Preparation of Web content
The EUMETSAT distance learning Web Page at:
http://www.eumetsat.int/idcplg?IdcService=SS_GET_PAGE&nodeId=532&l=en
EUMETSAT’s training activities focus primarily on operational personnel from weather services of Member States and Co-operating States.

Training outside Member States is coordinated in Europe through EUMETCAL and worldwide with the WMO.

International Training Cooperation with NOAA and COMET.
EUMETSAT like NOAA, JMA and CMA contributes to the WMO Virtual Laboratory for Education and Training.
Goal: Identify partners for potential EUMETSAT optional or third party programmes or for enhancement of future mandatory Programmes.

Group on Earth Observation
Objective: to put in place a Global Earth Observation System of Systems (GEOSS).

EUMETSAT wants to be part of this global system and contribute directly (i.e. GEONETCast)

Post-EPS partners.
USA, Canada

Key Message:
Build EUMETSAT global player profile through international partnerships
Potential Areas of Cooperation with UNIDATA:

- Joint training efforts, especially in Africa (e.g. Sahel Conference 2007)

- Investigations of archive interoperability (e.g. THREDDS server at EUMETSAT ?)

- Data distribution to universities (using LDM ?)

- Interest in usage of the IDV tools for training and scientific cooperation
Thank you for your attention!