



EUMETSAT programmes

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Member & Cooperating States



Date Joined: June 1986

Funding Contribution: 12.64%

USAM Ufficio Generale Spazio

Aereo e Meteorologia

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Via di Centicelle 301

00175 Roma

Tel: +39-06-2400.2458

Fax: +39-06-2400.2767

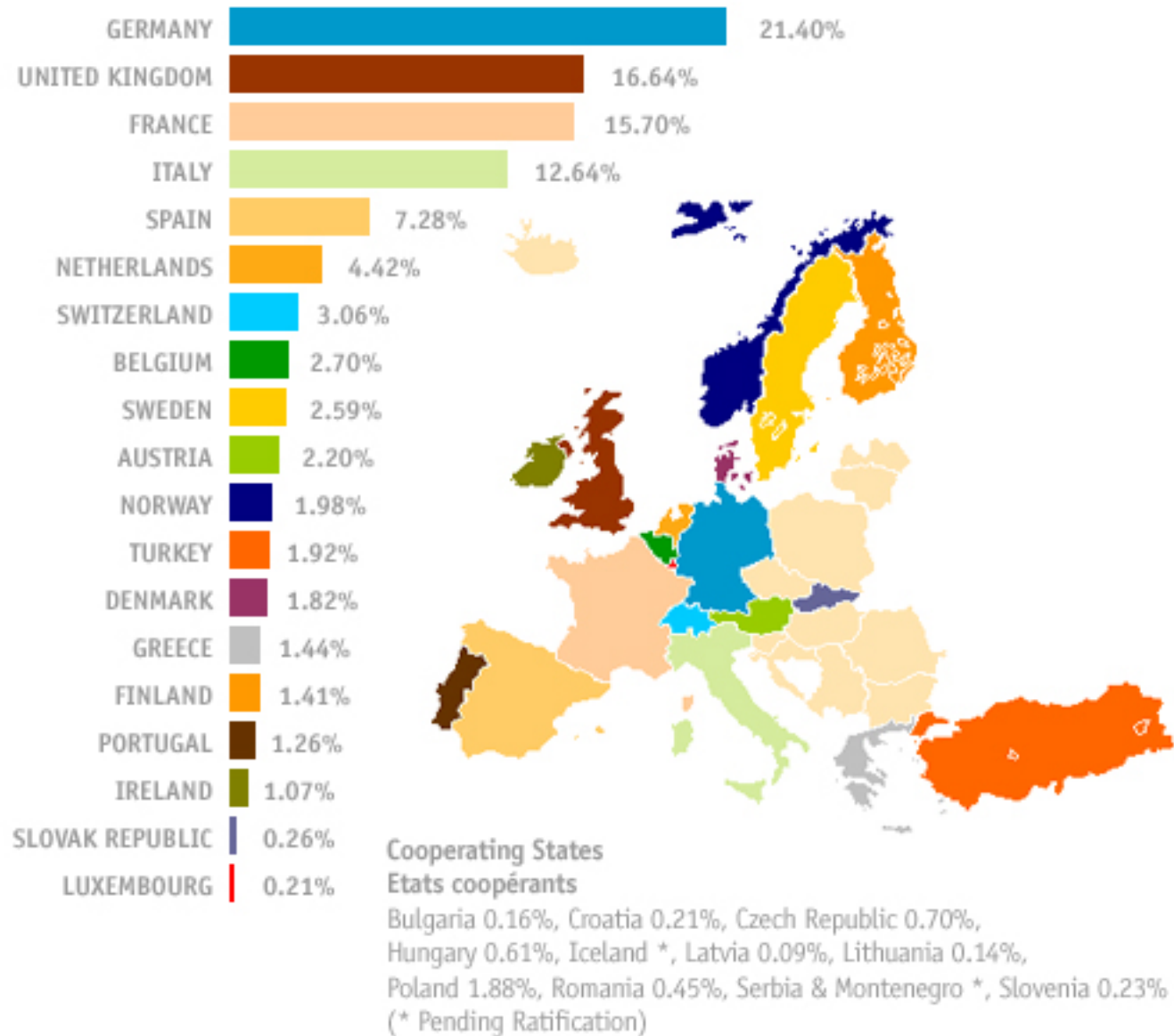
<http://www.aeronautica.difesa.it/>



EUMETSAT objectives: operational meteorology, climate, ..

Member States Contributions Applicable for 2006

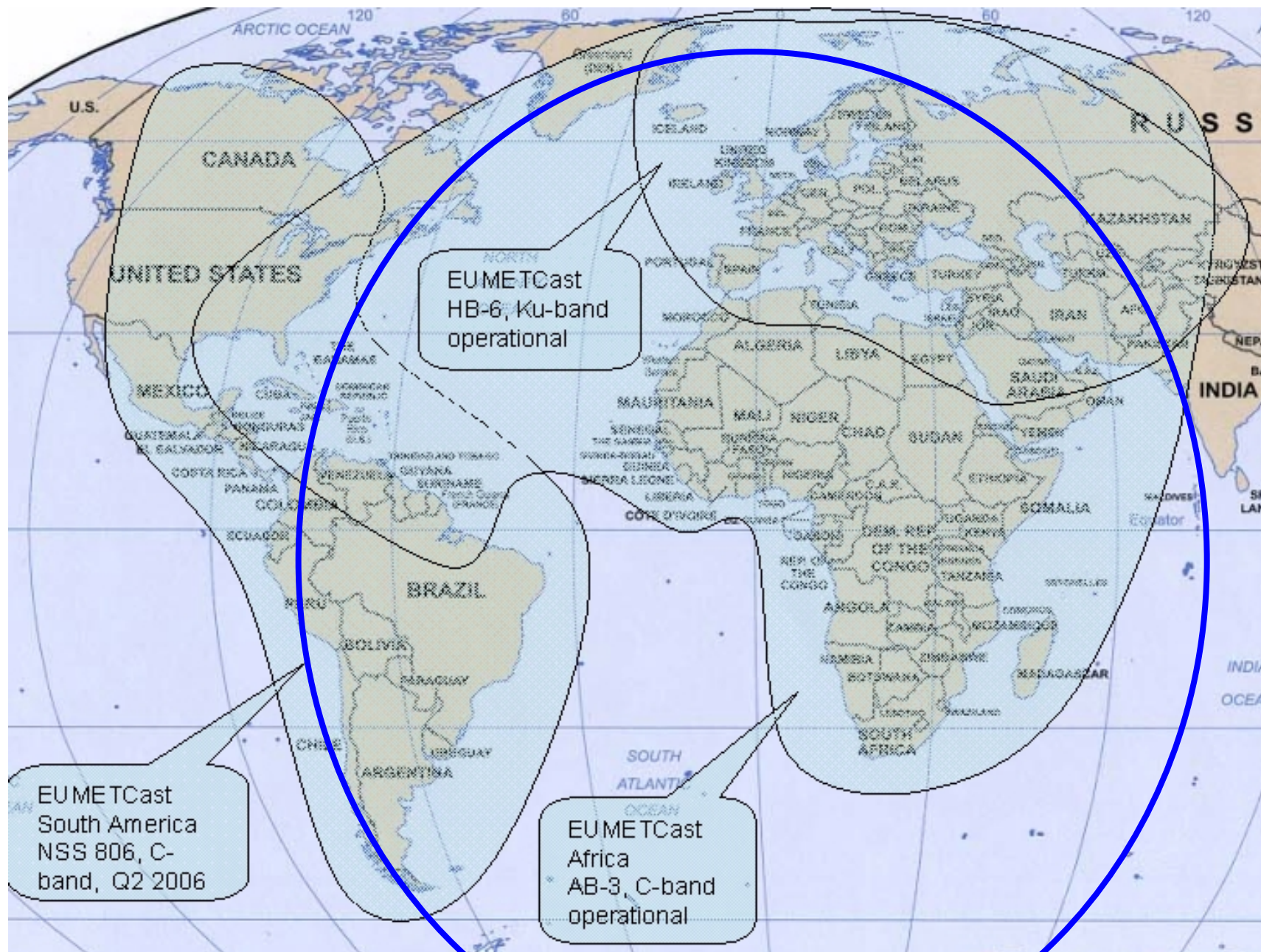
Contributions des Etats membres en 2006



Meteorological data distribution from EUMETSAT:

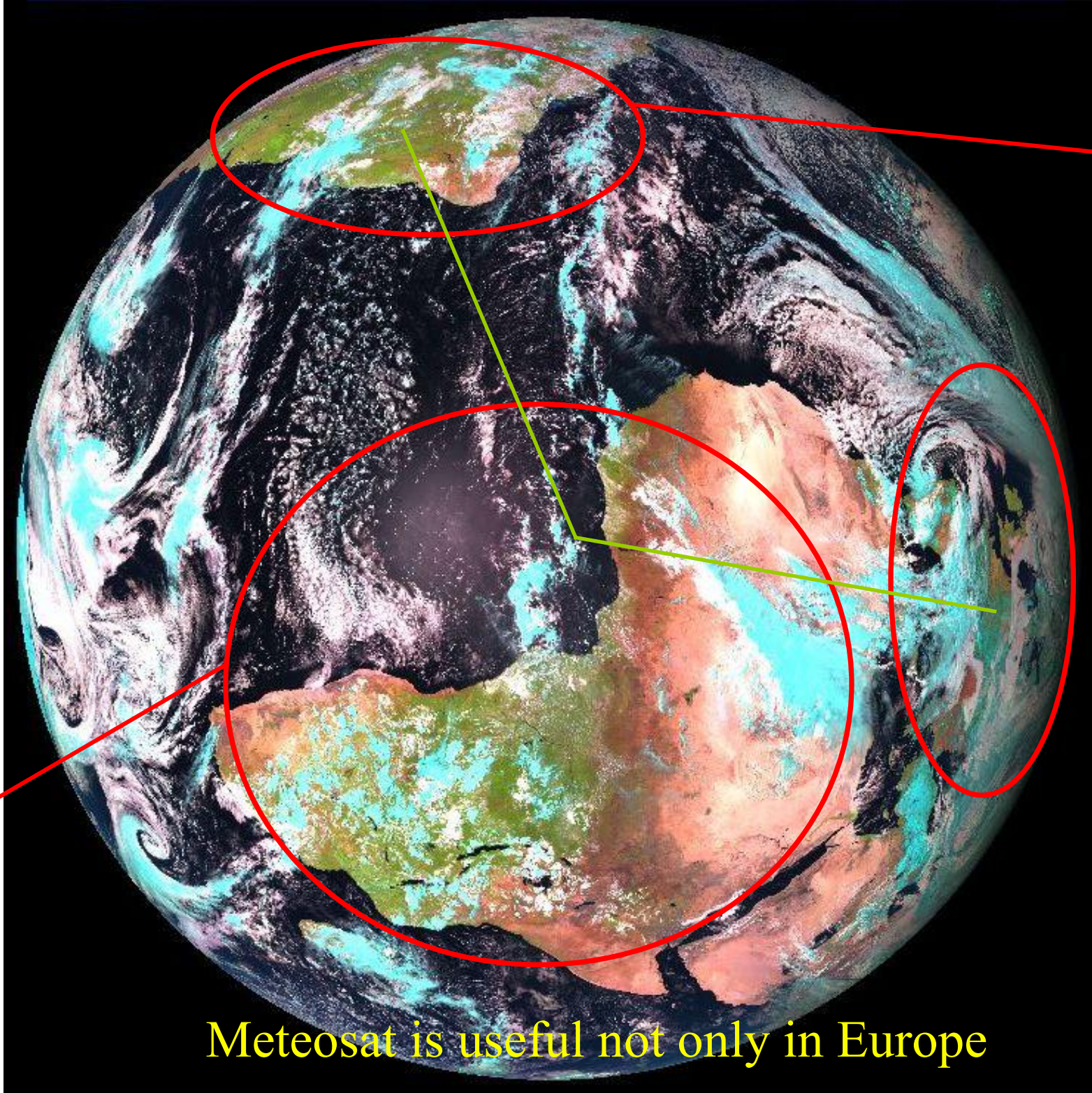
- Digital Video Broadcast (SAT TV standard)
- 3 telecommunication satellites
- Cheap reception
- User control: encryption (2400 ECU so far, 100 outside of Europe)
- Meteosat, Metop, SAF, GOES, SPOT, MODIS, MTSAT..
- Community of 1500 users

EUMETCast for 4 continents



Meteosat contour >





7 km

440
W/m²

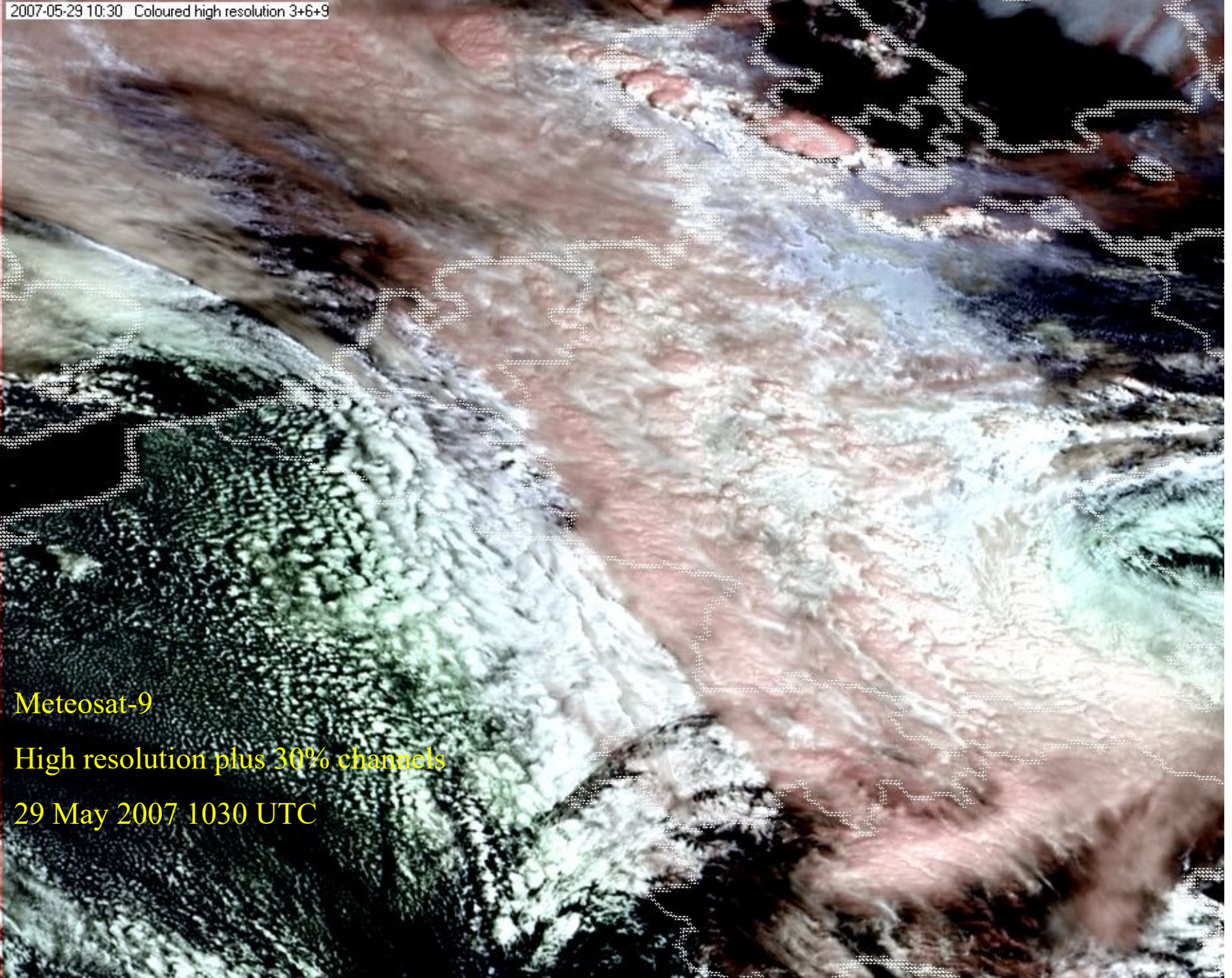
7 km

240
W/m²

5 km

440
W/m²

Meteosat is useful not only in Europe

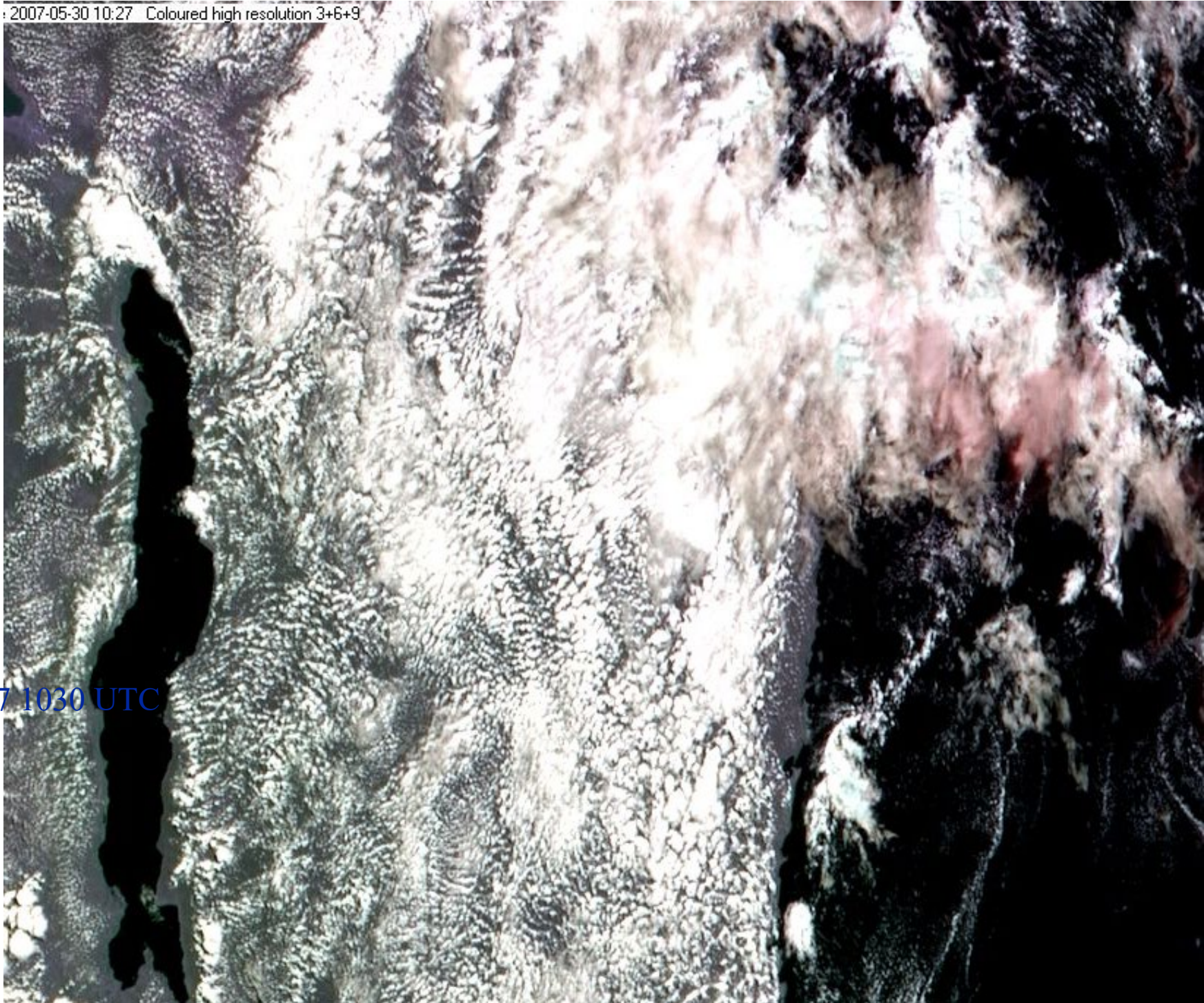


Meteosat-9

High resolution plus 30% channels

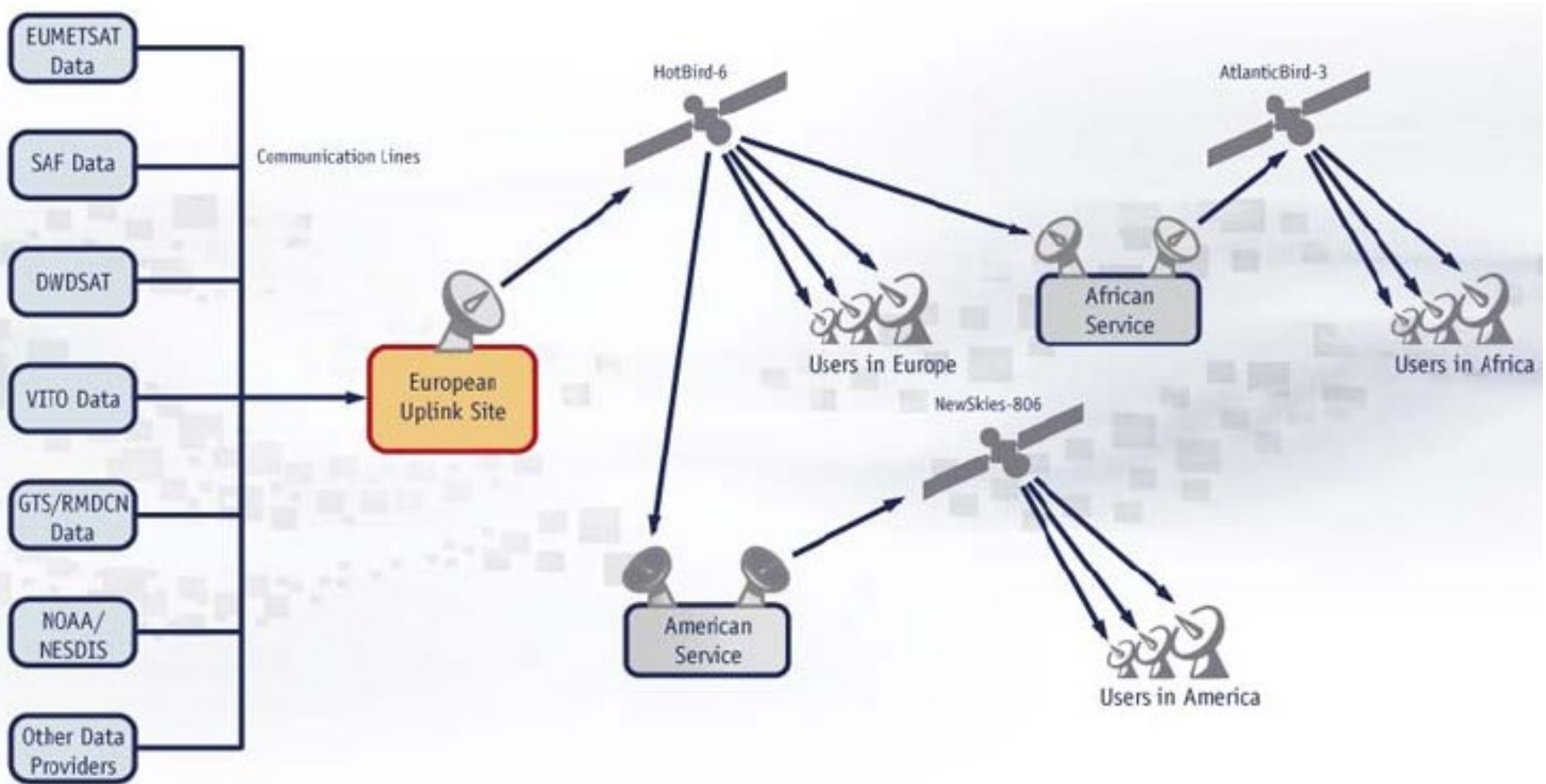
29 May 2007 1030 UTC

2007-05-30 10:27 Coloured high resolution 3+6+9

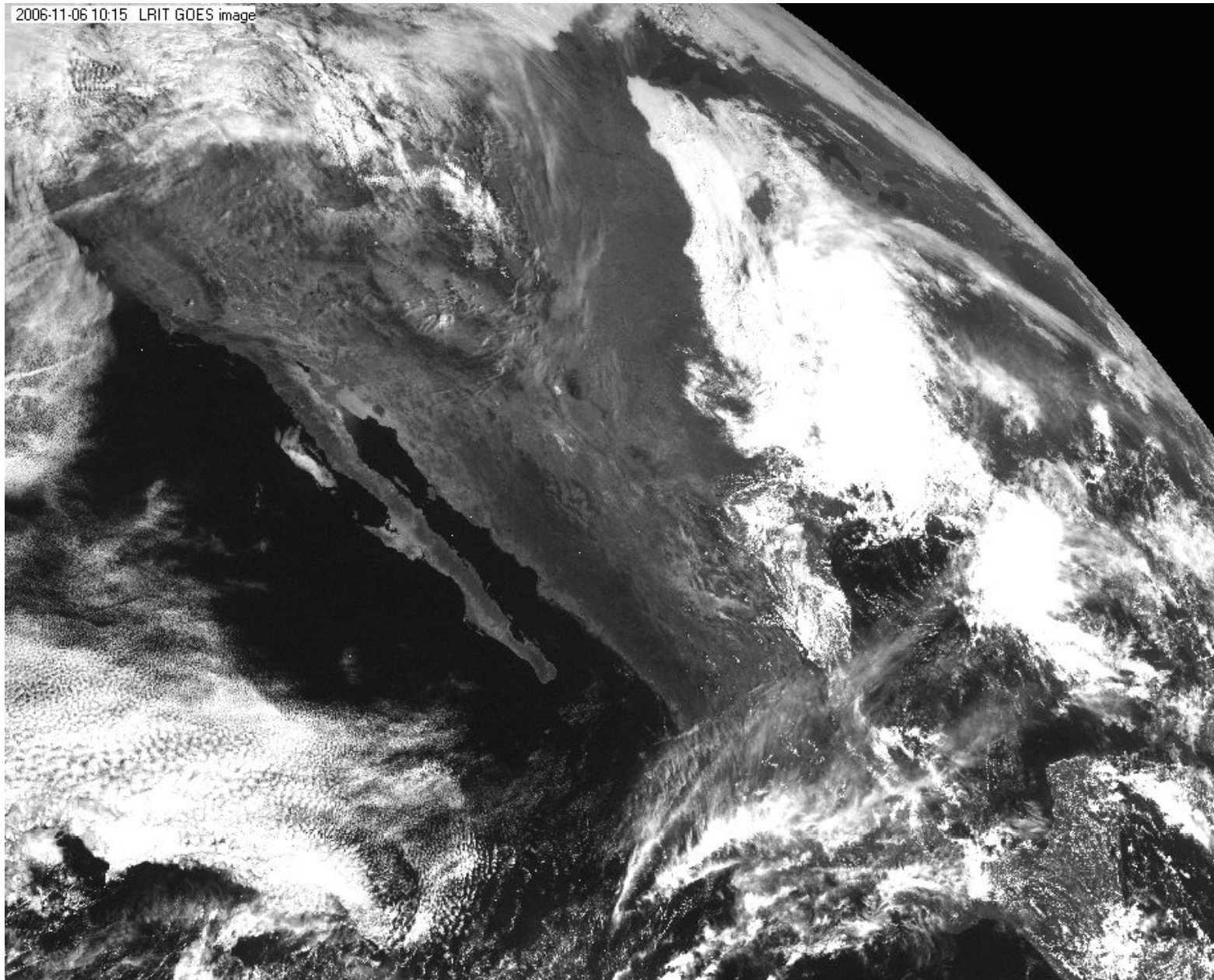


Lake Nyasa
Meteosat-9
HRV 30%
30 May 2007 1030 UTC

Data dissemination



GOES imagery every 3 hours



Receiving station

Hardware components

LNB band-C 2m-antenna

800 EUR

DVB receiver card

100 EUR

DVB client

60 EUR

Access control (EKU)

40 EUR

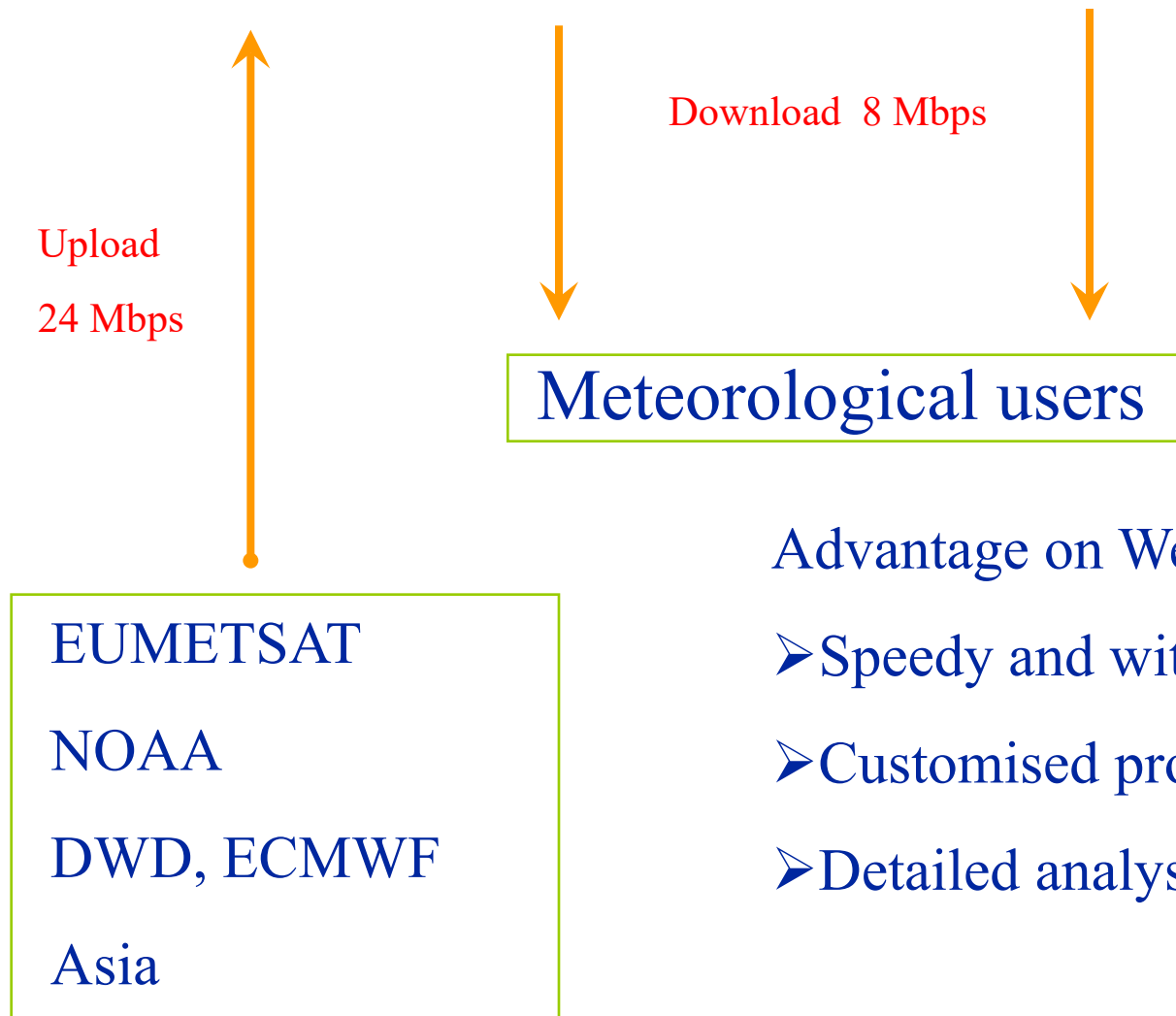
PC + ethernet

1000 EUR

2000 EUR



EUMETCast: telecommunication satellites

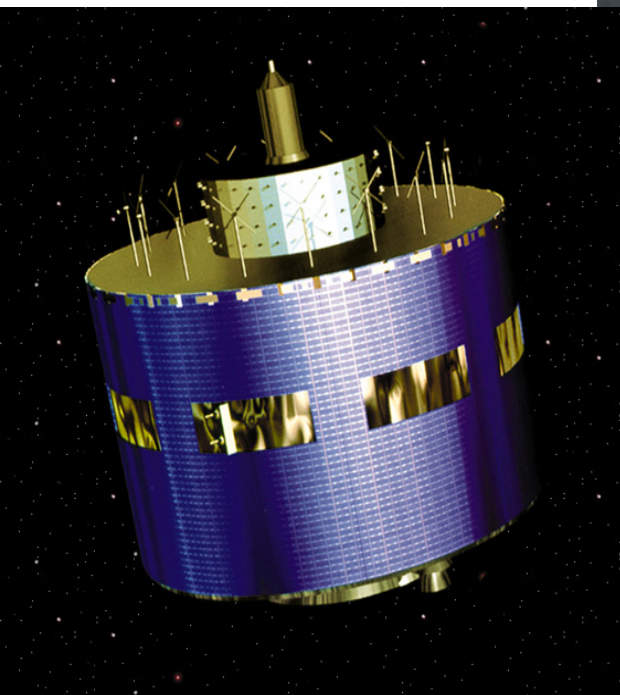


Advantage on Web:

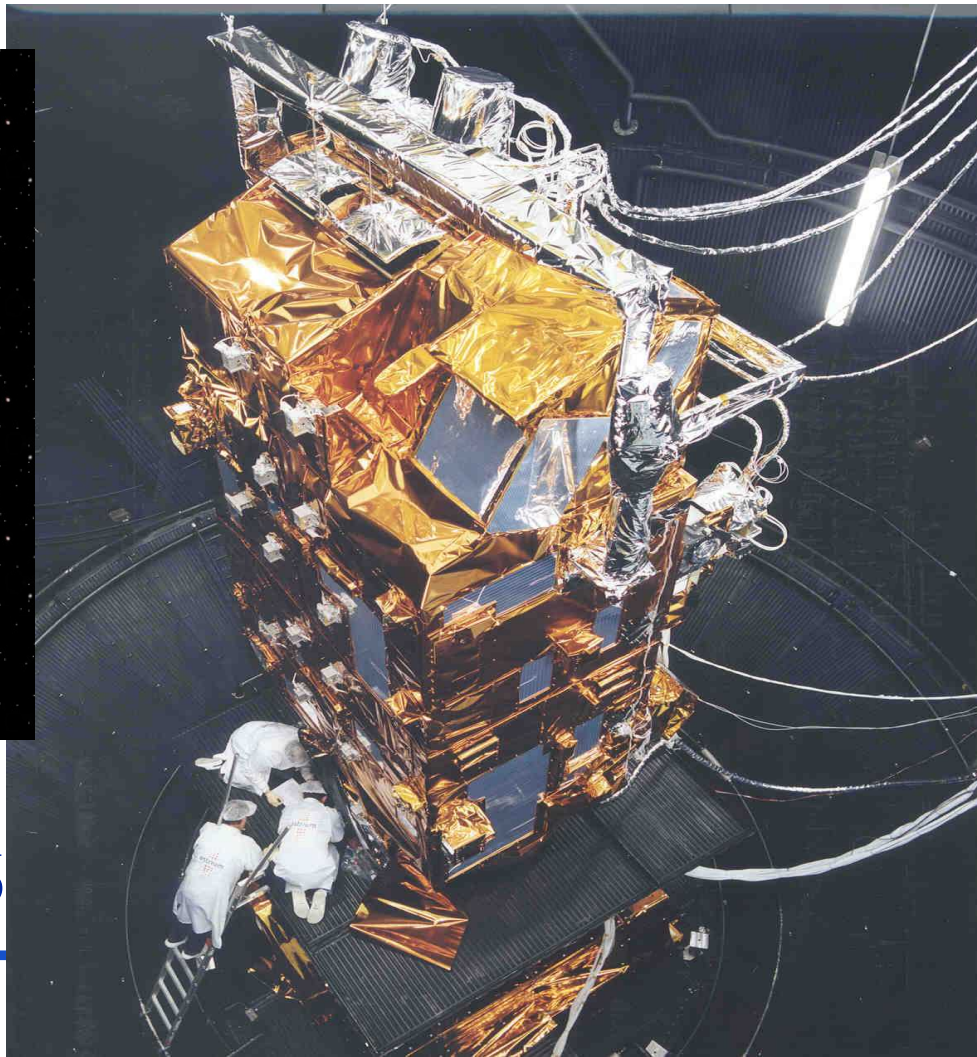
- Speedy and without bottlenecks
- Customised processing
- Detailed analysis

EUMETSAT missions

- From the geostationary orbit: Meteosat
- From the polar orbit: Metop
- Ocean altimetry: Jason-2

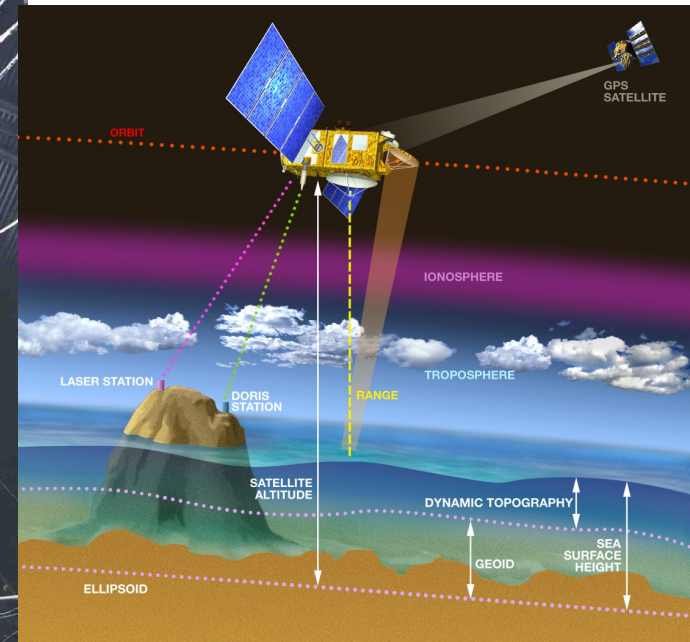


2004



2006

Benevento, 3-13 June 2007



2008

EUMETSAT

Slide: 14



Meteosat

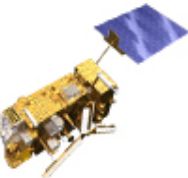
0° Service
Indian Ocean
DCS backup



MSG

Meteosat 8
Meteosat 9
Meteosat 10
Meteosat 11

MTG



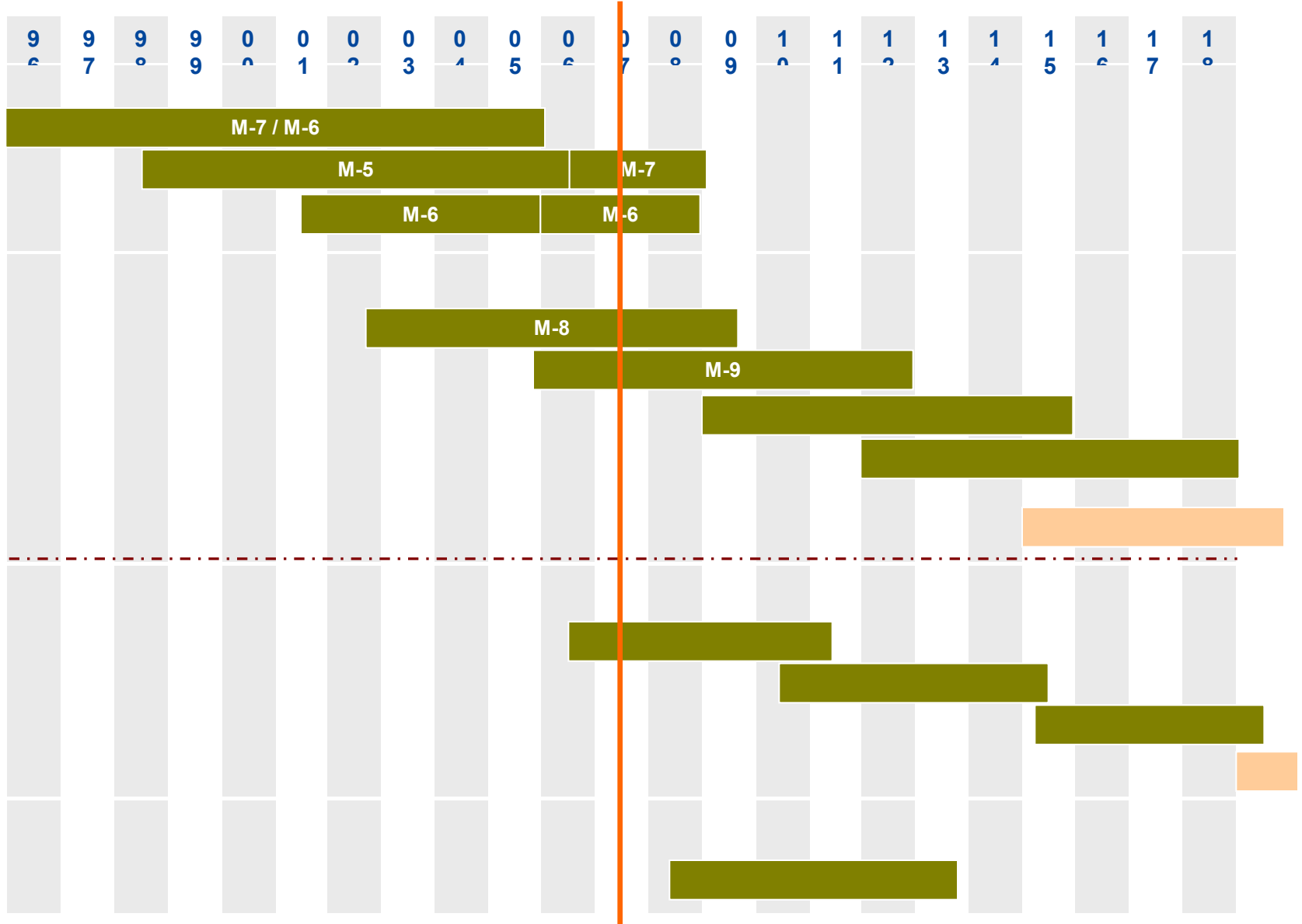
EPS

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



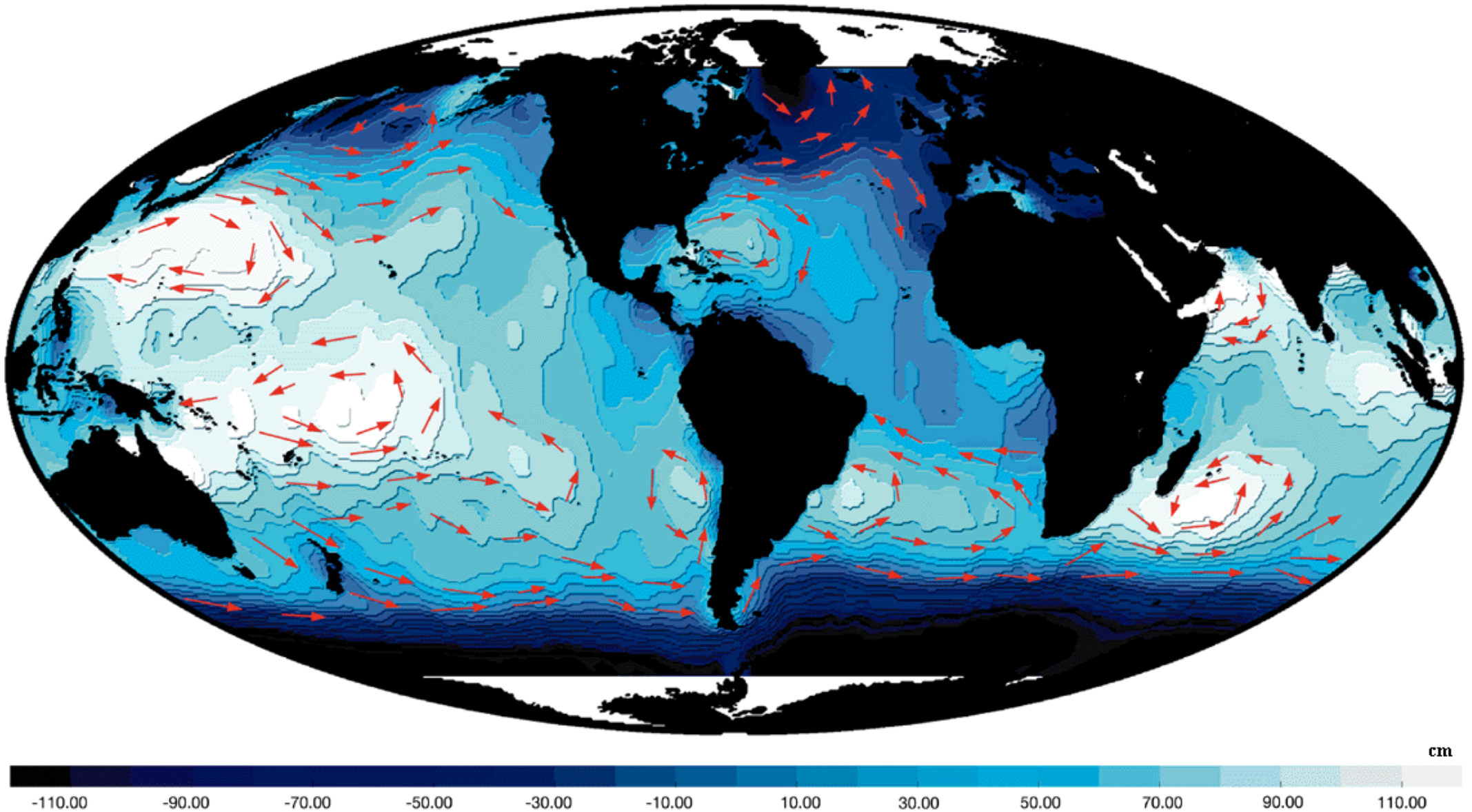
OSTM

Jason-2



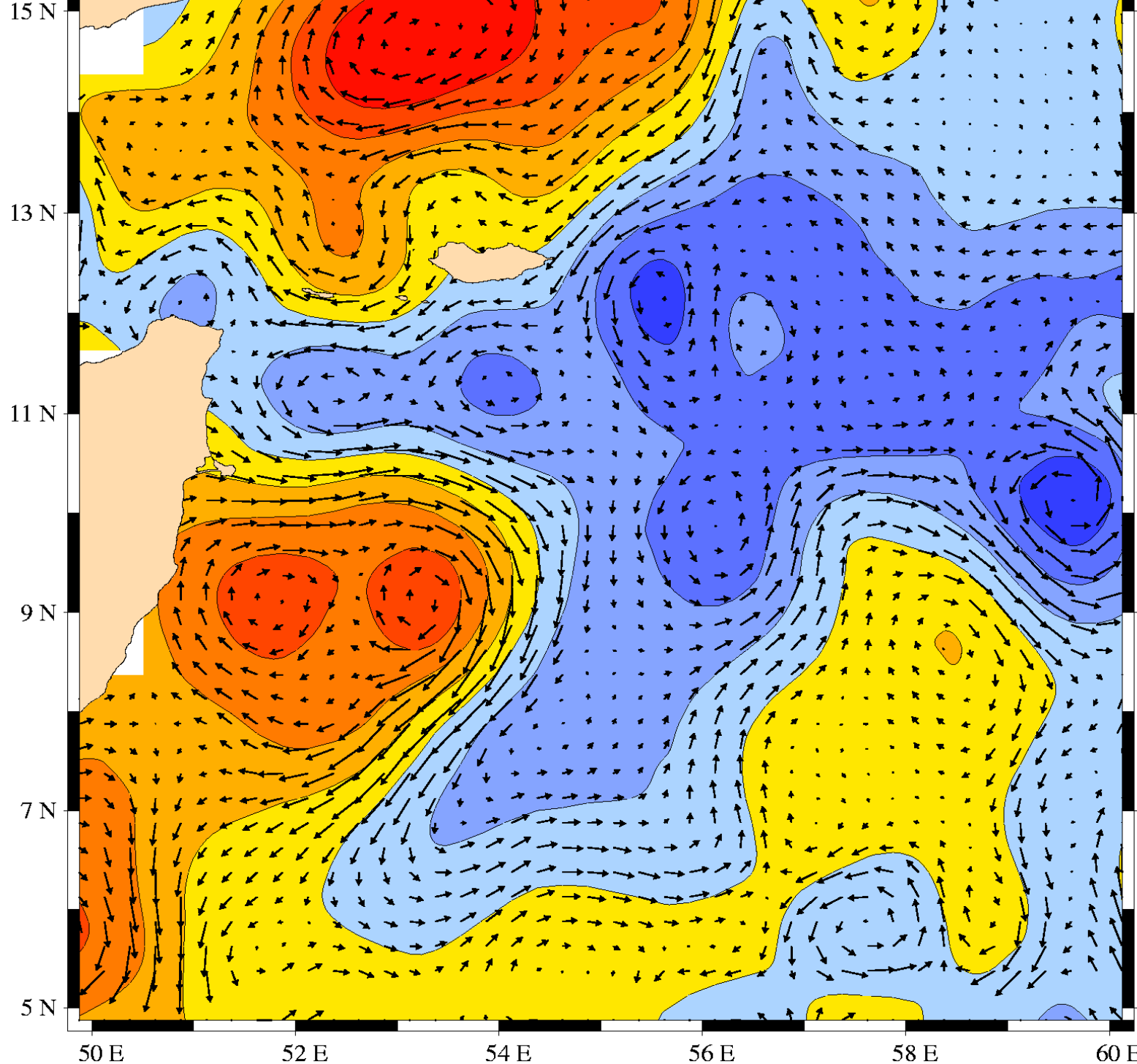
Jason-2

- Altimetry satellite
- CNES, NOAA, EUMETSAT
- Wave height, wind, height anomaly
- Direct and CNES-processed products
- Hydrology models:
 - density, salinity, temperature, atmospheric pressure

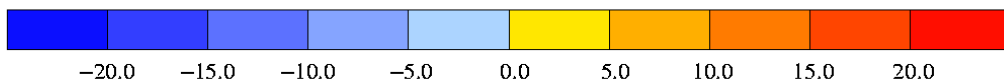


Dynamic topography (cm=mbar)

Currents, eddies, temperature (cold=deep)



04/25/2001
Sea level height anomalies and surface currents
East of Madagascar



Anomalies de niveau de la mer (cm)

1 cm = 2 Noeuds



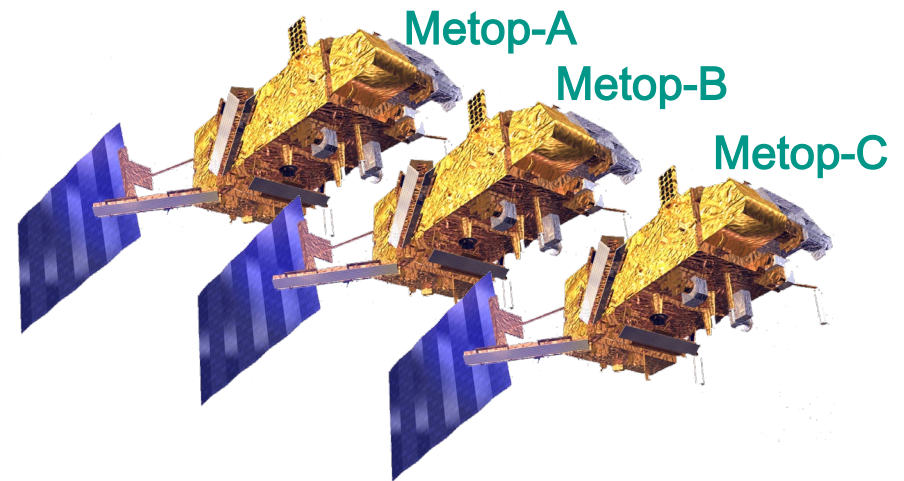
EPS Programme Elements



Polar Stations
Svalbard, 78 deg Nord



Launcher Service
(Soyuz/Fregat)



LEOP Service
(ESOC)



EUMETSAT
Mission Control Centre



**Satellite Application-
Facilities**
(SAF)
8 Meteorological
themes

- 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

Initial Joint Polar System (IJPS)

Fairbanks, Alaska

Wallops Island, MD

Suitland, MD

Svalbard, Norway

Darmstadt, Germany

MetOp

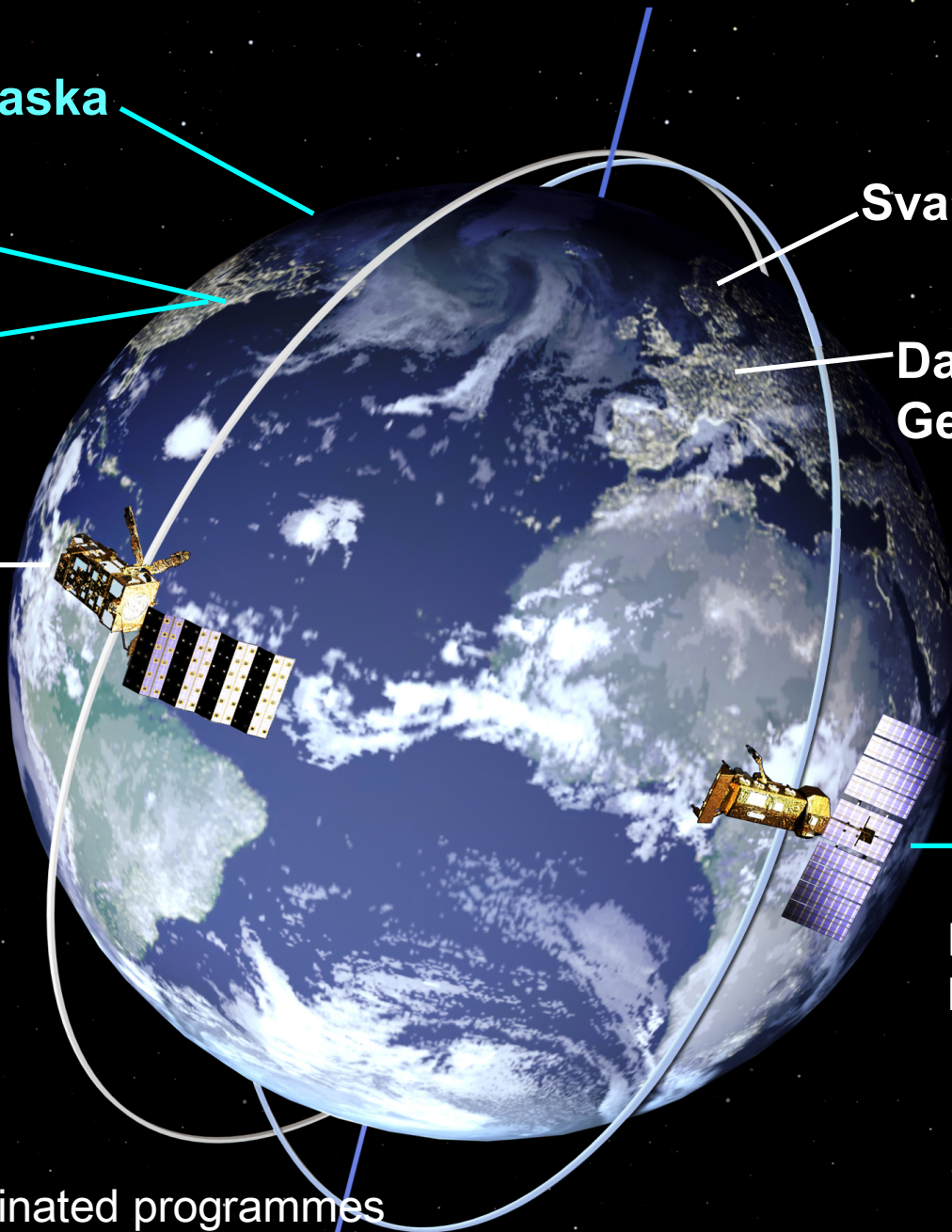
METOP-A (in orbit)
METOP-B (2010)
METOP-C (2014)

POES

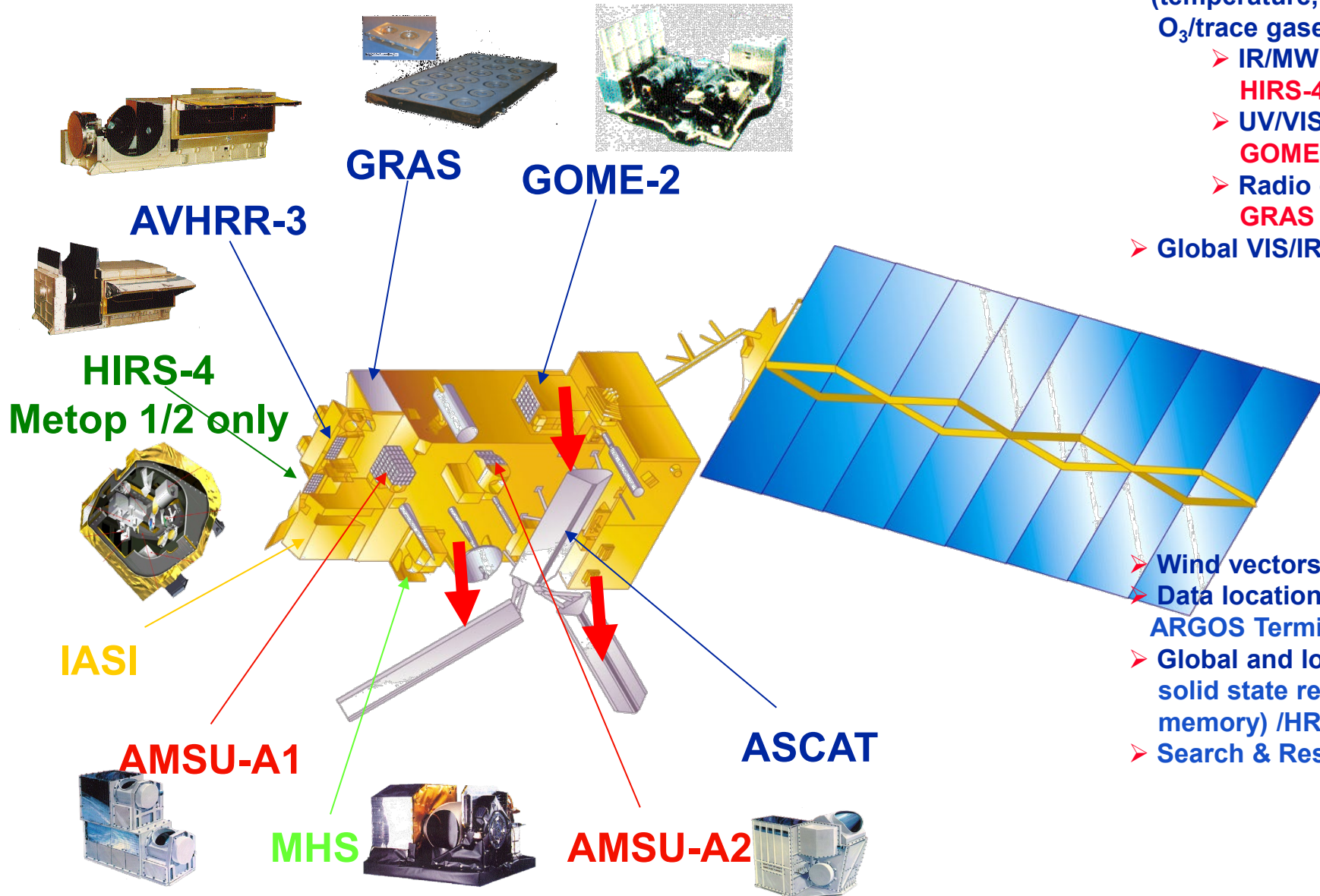
NOAA-18 (in orbit)
NOAA-N' (2009)

- EUMETSAT-NOAA coordinated programmes
- Exchange of instruments (ATOVS from NOAA, MHS from EUMETSAT)
- Coordinated operations, data and services
- Extended agreement in 2003 to include MetOp-C

**Sun-synchronous
Orbit of 102 minutes
14.1 orbits per day**



Space Segment: MetOp Satellite, Instruments and Missions



- Atmospheric Sounding (temperature, humidity, O₃/trace gasses):
 - IR/MW sounders: **HIRS-4/IASI, AMSU-A/MHS**
 - UV/VIS sounder: **GOME-2**
 - Radio occultation limb sounder: **GRAS**
- Global VIS/IR Imagery: **AVHRR/3**

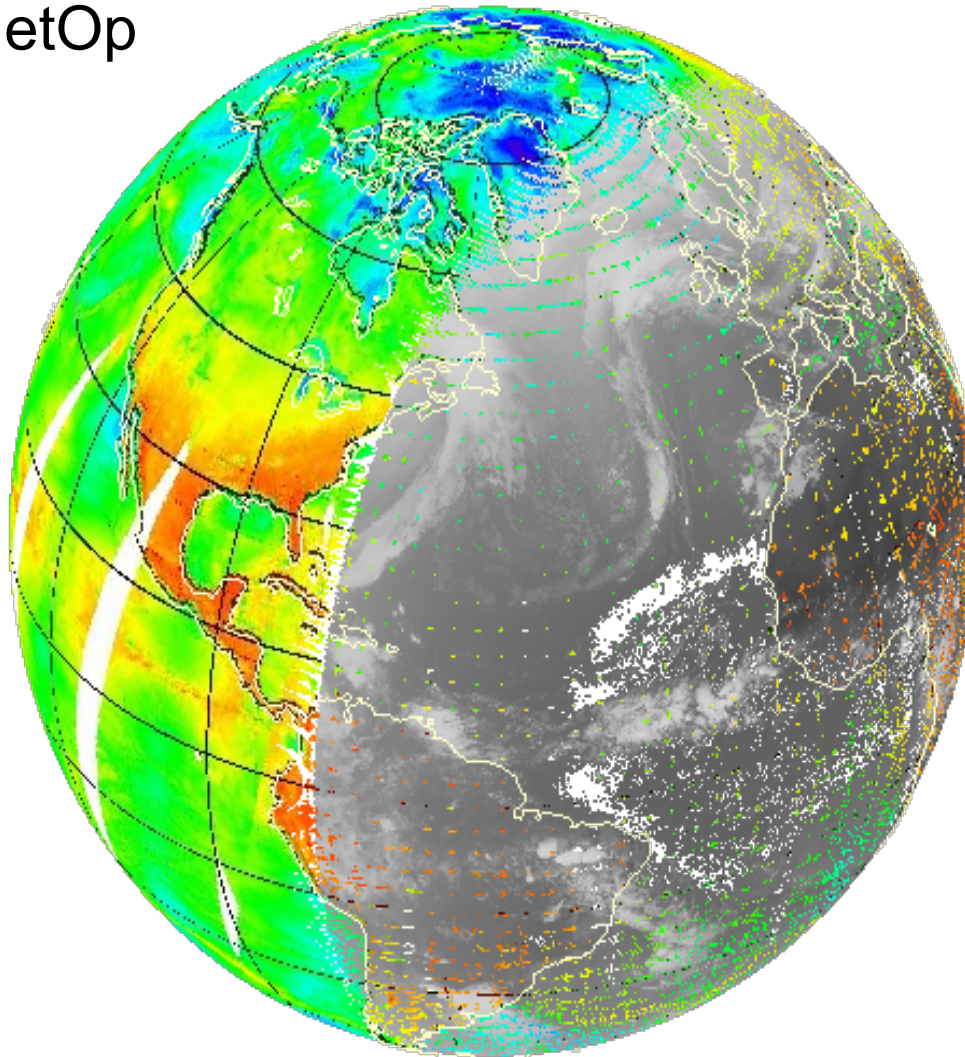
- Wind vectors over the ocean: **ASCAT**
- Data location and collection: **ARGOS Terminal**
- Global and local data access: solid state recorder (on board memory) /HRPT/LRPT
- Search & Rescue Terminal

Launch from the Baikonour Cosmodrome with Sojuz/Fregat the 19th October 2006



a global view

MHS on MetOp



Meteosat

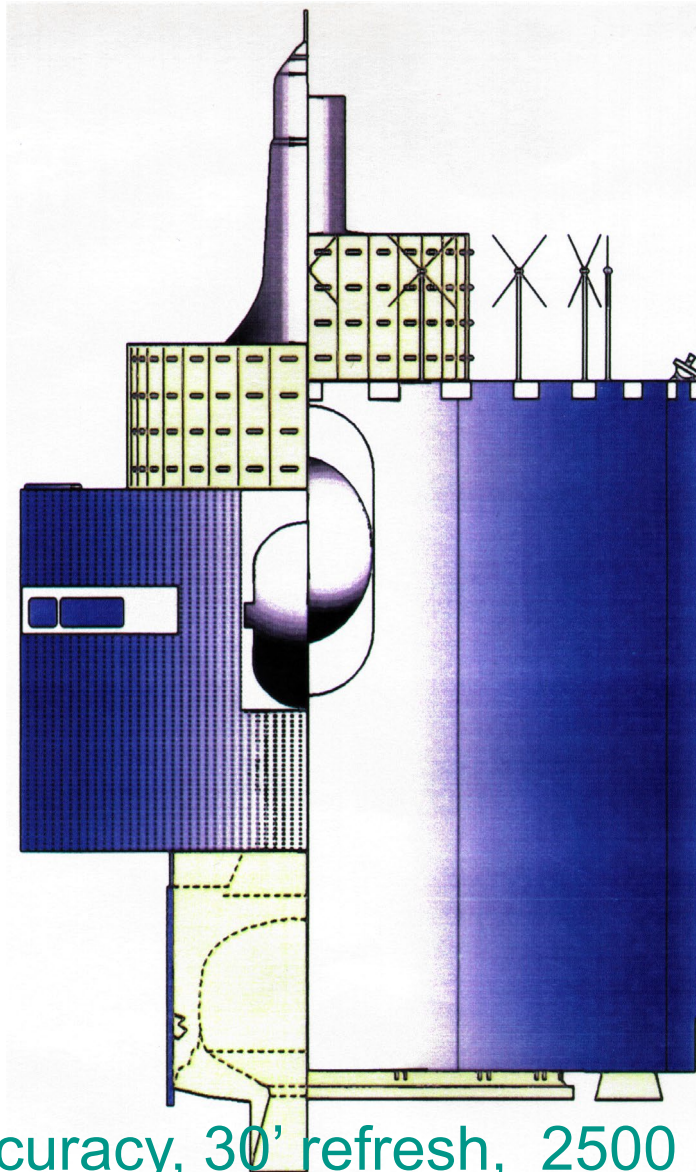
Roesli, 2006

data compos of Meteosat-8 and Metop-A
SEVIRI 10.8um - MHS 89GHz

Comparison MTP - MSG

METEOSAT First Generation (MOP/MTP)

- 3-channel
- 100 RPM Spin-stabilised
- Solid Apogee Boost Motor
- 5 years Station Keeping
- 200 Watts Power Demand
- 720 kg in GTO orbit
- Delta 2914, Ariane 1-3-4



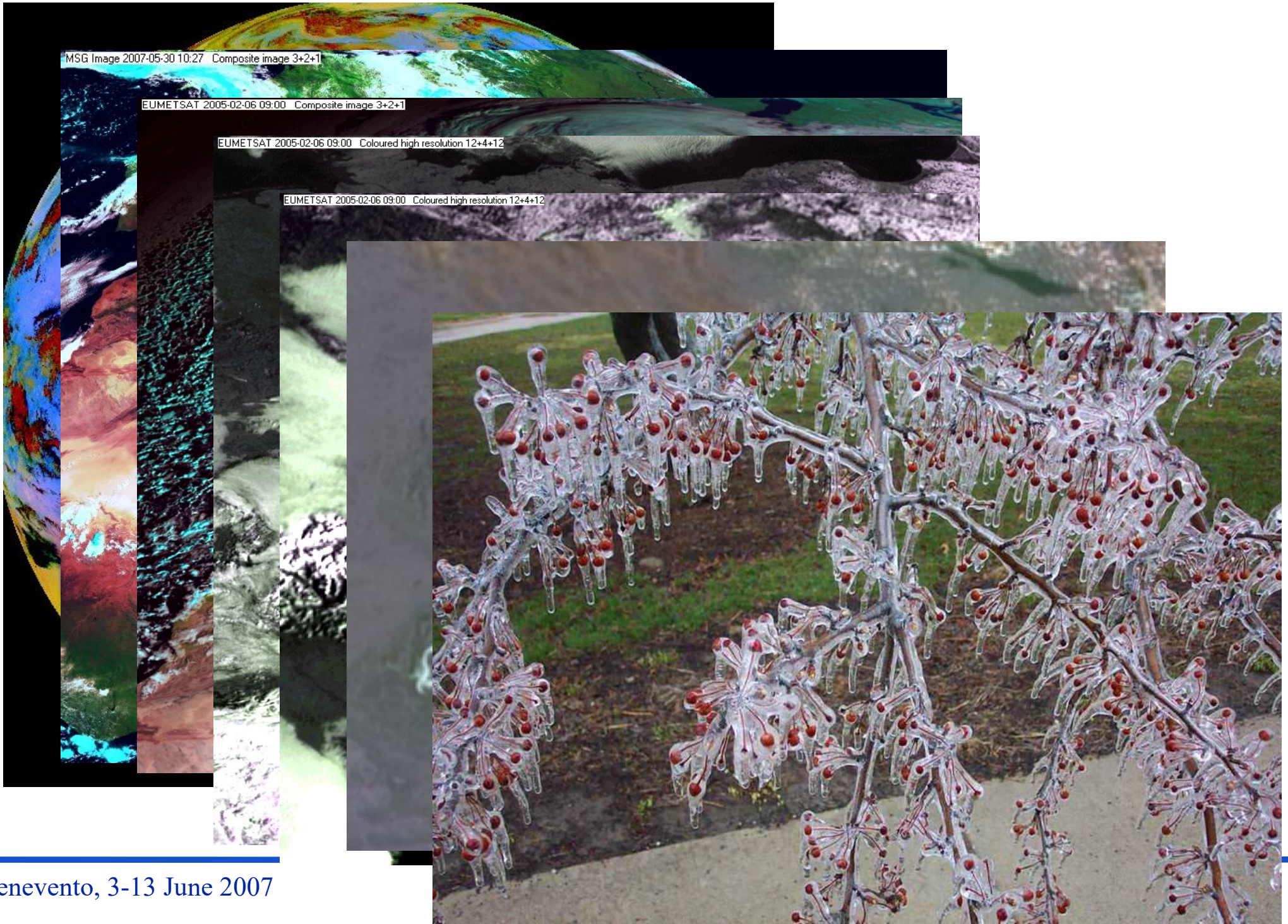
METEOSAT Second Generation (MSG)

- 12-channel
- 100 RPM Spin-stabilised
- Bi-propellant Propulsion
- 7 years Station Keeping
- 600 Watts Power Demand
- 2000 kg in GTO orbit
- Ariane 4 and 5, Atlas 1

2+1 channels, 8 bit accuracy, 30' refresh, 2500 lines = 80 MB/hour

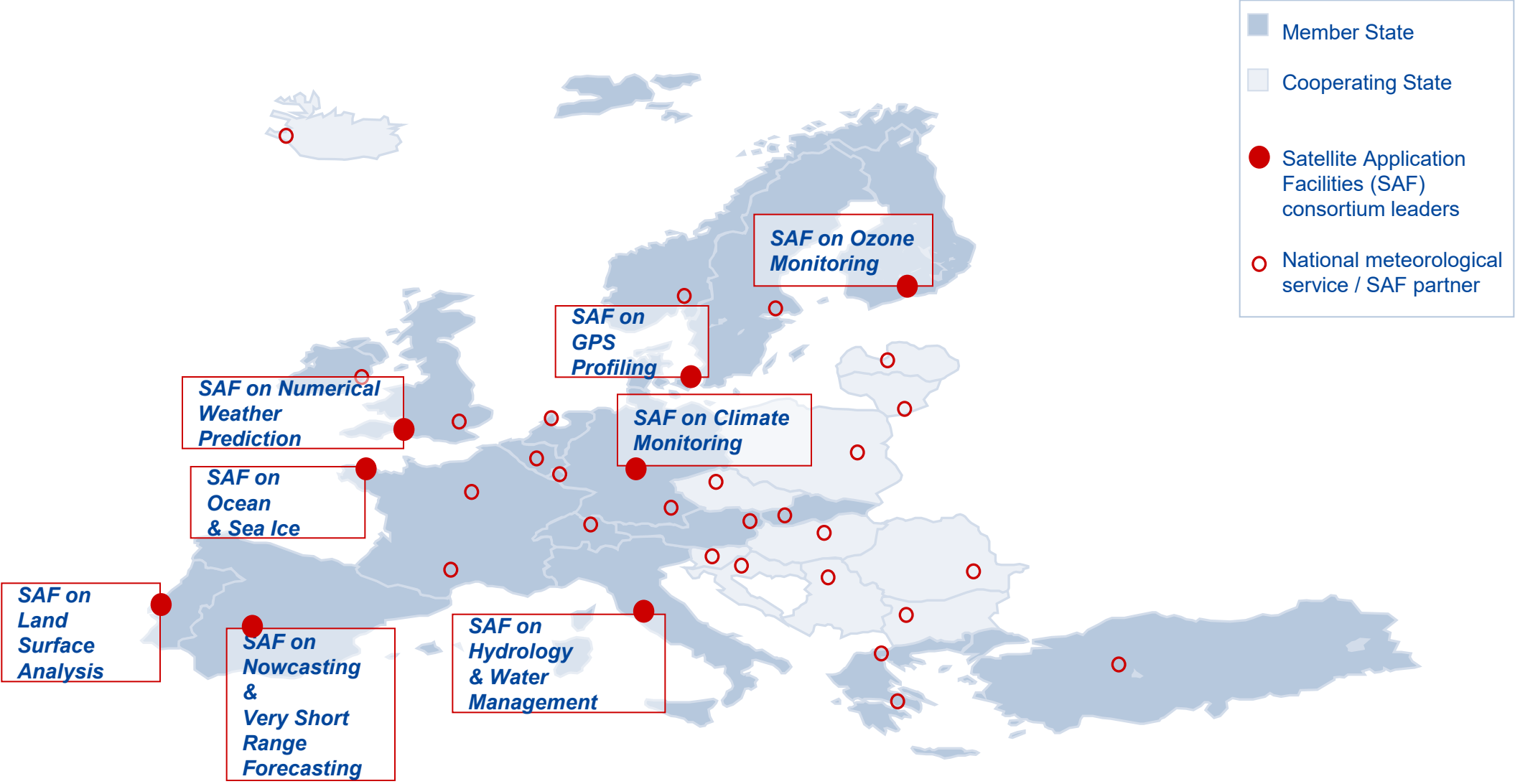
11+1 channels, 10 bit accuracy, 15' refresh, 3712 lines = 1000 MB/hour

Meteosat-9

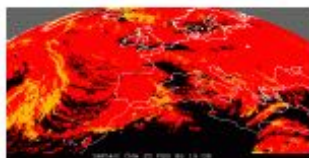


Benevento, 3-13 June 2007

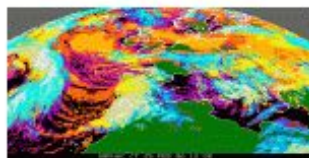
The SAF Network



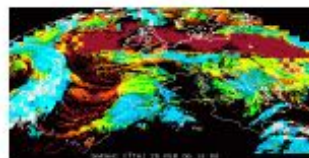
MSG



PGE01: CMa (Cloud Mask)

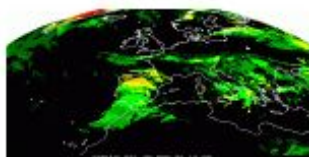


PGE02: CT (Cloud Type)



PGE03: CTTH (Cloud Top Temperature and Height)

CMa, CT & CTTH Examples from MSG/SEVIRI, MODIS and GOES-East

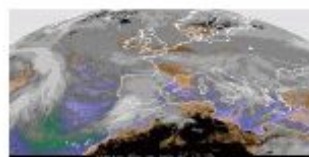


PGE04: PC (Precipitating Clouds)

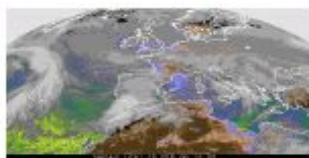


PGE05: CRR (Convective Rainfall Rate)

CRR Meteosat-7 Examples



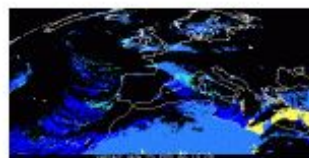
PGE06: TPW (Total Precipitable Water)



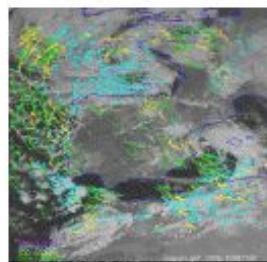
PGE07: LPW (Layer Precipitable Water)



PGE08: SAI (Stability Analysis Imagery)

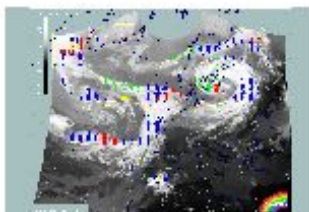


PGE12: AMA (Air Mass Analysis)

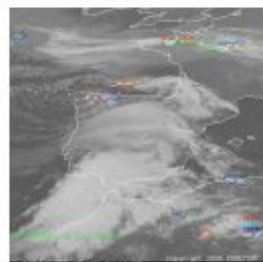


PGE09: HRW (High Resolution Winds)

HRW Meteosat-7 Examples

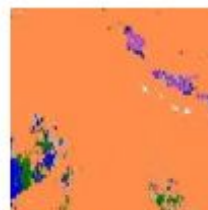


PGE10: ASII (Automatic Satellite Image Interpretation)



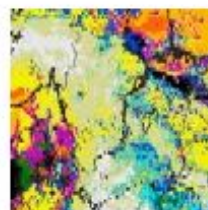
PGE11: RDT (Rapid Developing Thunderstorms)

PPS



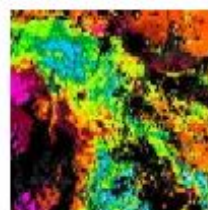
PGE01b: CM (Cloud Mask)

CM AVHRR Examples



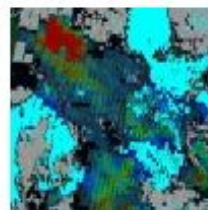
PGE02b: CT (Cloud Type)

CT AVHRR Examples



PGE03b: CTTH (Cloud Top Temperature and High)

CTTH AVHRR Examples



PGE04b: PC (Precipitating Clouds)

PC AVHRR Examples

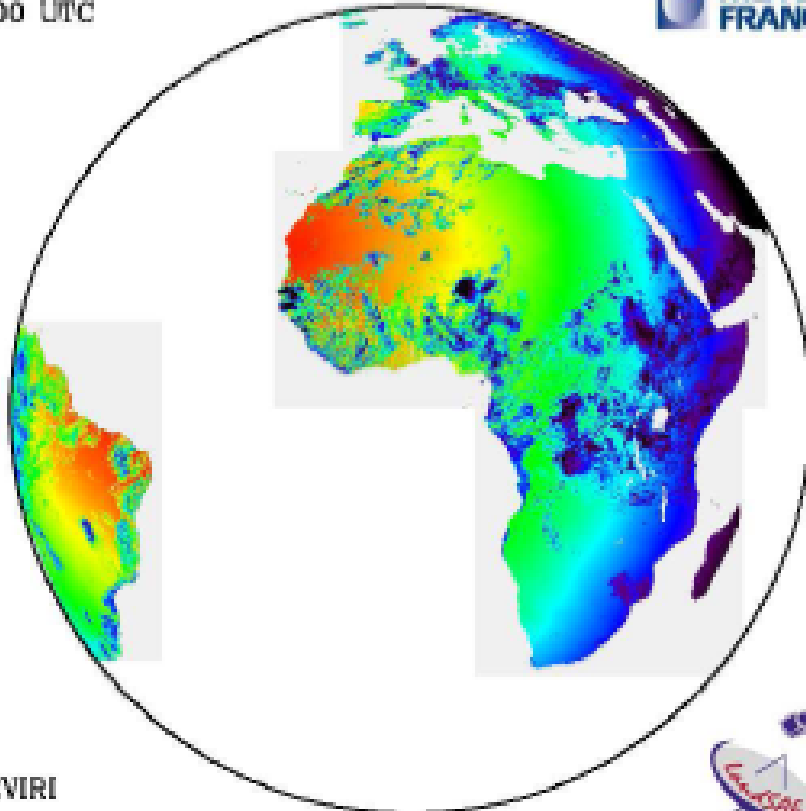
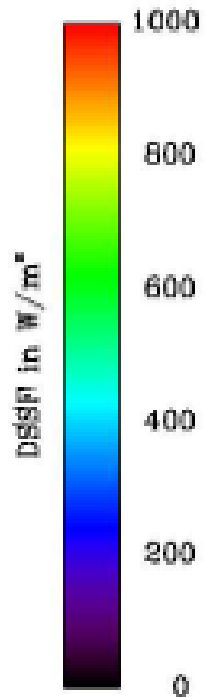
Nowcasting SAF products

Free software

METSAT

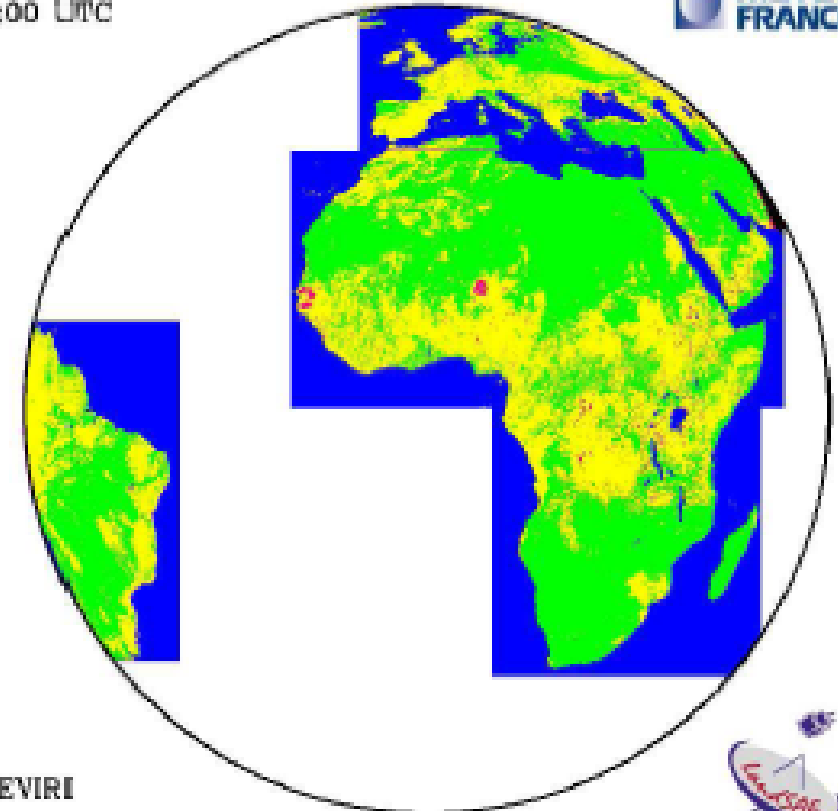
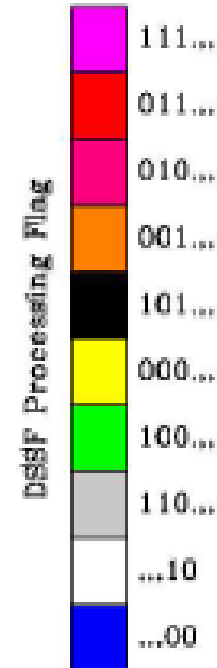
Downwelling Shortwave Flux at the Surface

19.08.2005 14:00 UTC



Meteosat-8/SEVIRI

19.08.2005 14:00 UTC



Meteosat-8/SEVIRI

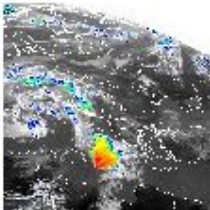
All at one glance: www.eumetsat.int/products

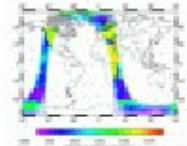


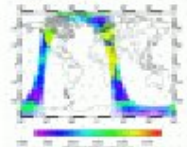
EUMETSAT Data and Products Navigator

Type	Geophysical property	Coverage	Satellite	Month	Dissemination
Images	--all--	--all--	--all--	--all--	--all--

6 results found

Meteosat-8	Meteosat Meteorological Product												
4 Jul 2006, 11:00 UTC	Global Instability Index (GII)												
	<table border="1"> <thead> <tr> <th>Dissemination</th> <th>Format</th> <th>Size</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> EUMETCast</td> <td>Native, BUFR</td> <td>586 KB</td> </tr> <tr> <td><input type="checkbox"/> Archive</td> <td>BUFR</td> <td>195 KB</td> </tr> <tr> <td><input type="checkbox"/> FTP</td> <td>Native, BUFR</td> <td>586 KB</td> </tr> </tbody> </table> <p>Atmospheric air mass instability. Developed by the SAF in support of Nowcasting and Very Short Range Forecasting but produced at EUMETSAT. +≡ more</p>	Dissemination	Format	Size	<input type="checkbox"/> EUMETCast	Native, BUFR	586 KB	<input type="checkbox"/> Archive	BUFR	195 KB	<input type="checkbox"/> FTP	Native, BUFR	586 KB
Dissemination	Format	Size											
<input type="checkbox"/> EUMETCast	Native, BUFR	586 KB											
<input type="checkbox"/> Archive	BUFR	195 KB											
<input type="checkbox"/> FTP	Native, BUFR	586 KB											

4 Oct	Instrument: AMSU-A												
4 Oct 2005, 11:00 UTC	AMSU radiation channel 1												
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Dissemination	Format	Size											
<input type="checkbox"/> EUMETCast	Native, BUFR	548 KB											
<input type="checkbox"/> Archive	Native, BUFR	548 KB											
<input type="checkbox"/> FTP	BUFR	195 KB											

HOAA	Instrument: MHS												
4 Oct 2005, 11:00 UTC	MHS radiation channel 1												
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Dissemination	Format	Size											
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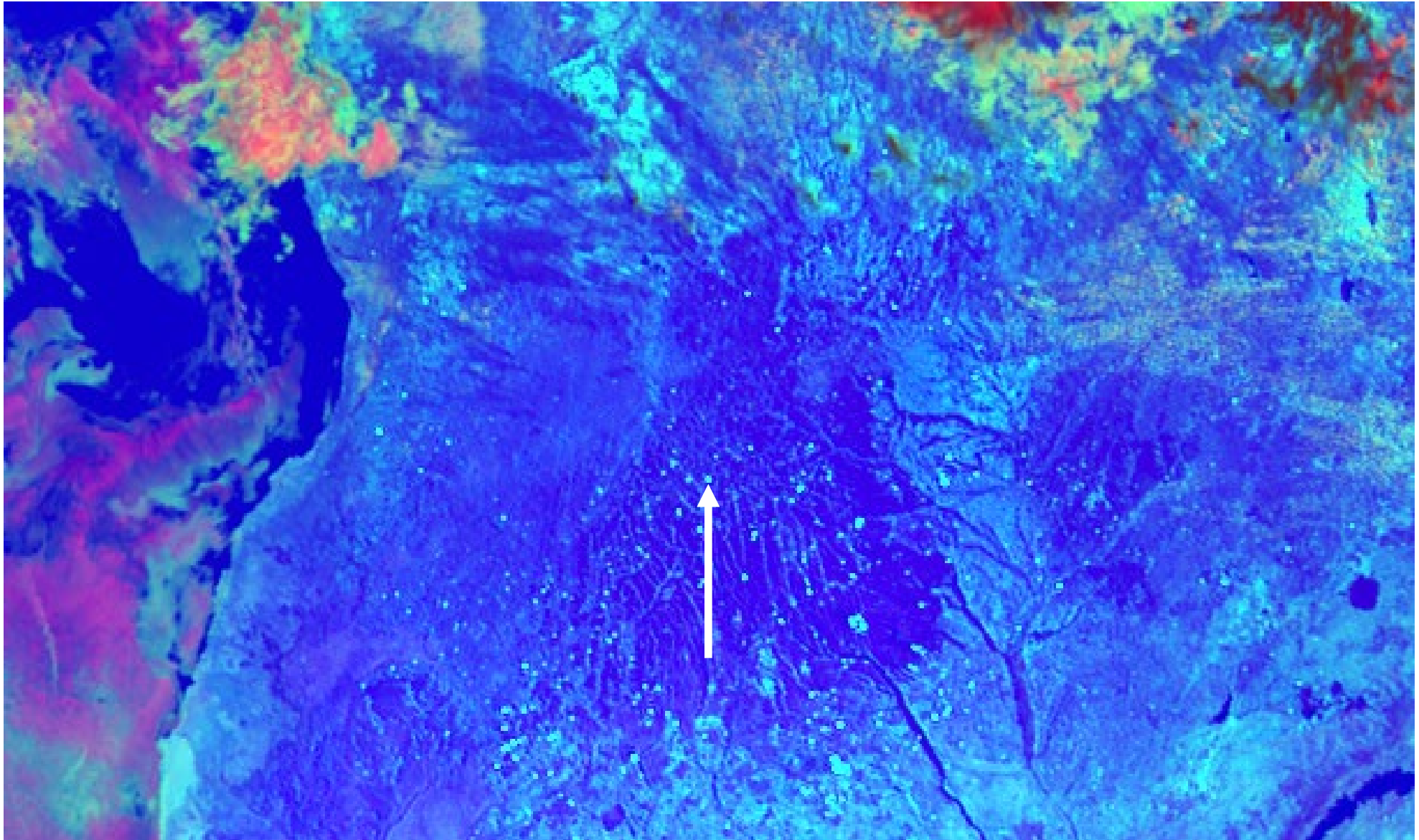
Meteosat-8	Image												
3 Oct 2005, 10:30 UTC	High Resolution Visible (HRV)												
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Dissemination	Format	Size											
<input type="checkbox"/> EUMETCast	Native, BUFR	619 KB											
<input type="checkbox"/> Archive	BUFR	225 KB											
<input type="checkbox"/> FTP	BUFR	225 KB											

Meteosat-8	RGB Composite												
3 Oct 2005, 9:00 UTC	NIR1.6, VIS0.8, VIS0.6												
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Dissemination	Format	Size											
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Meteosat-8	Image												
16 Jul 2005, 17:00 UTC	High Resolution Visible (HRV)												
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Dissemination	Format	Size											
<input type="checkbox"/> EUMETCast	JPG, GIF	488 KB											
<input type="checkbox"/> Archive	JPG, GIF	488 KB											
<input type="checkbox"/> FTP	JPG, GIF	488 KB											

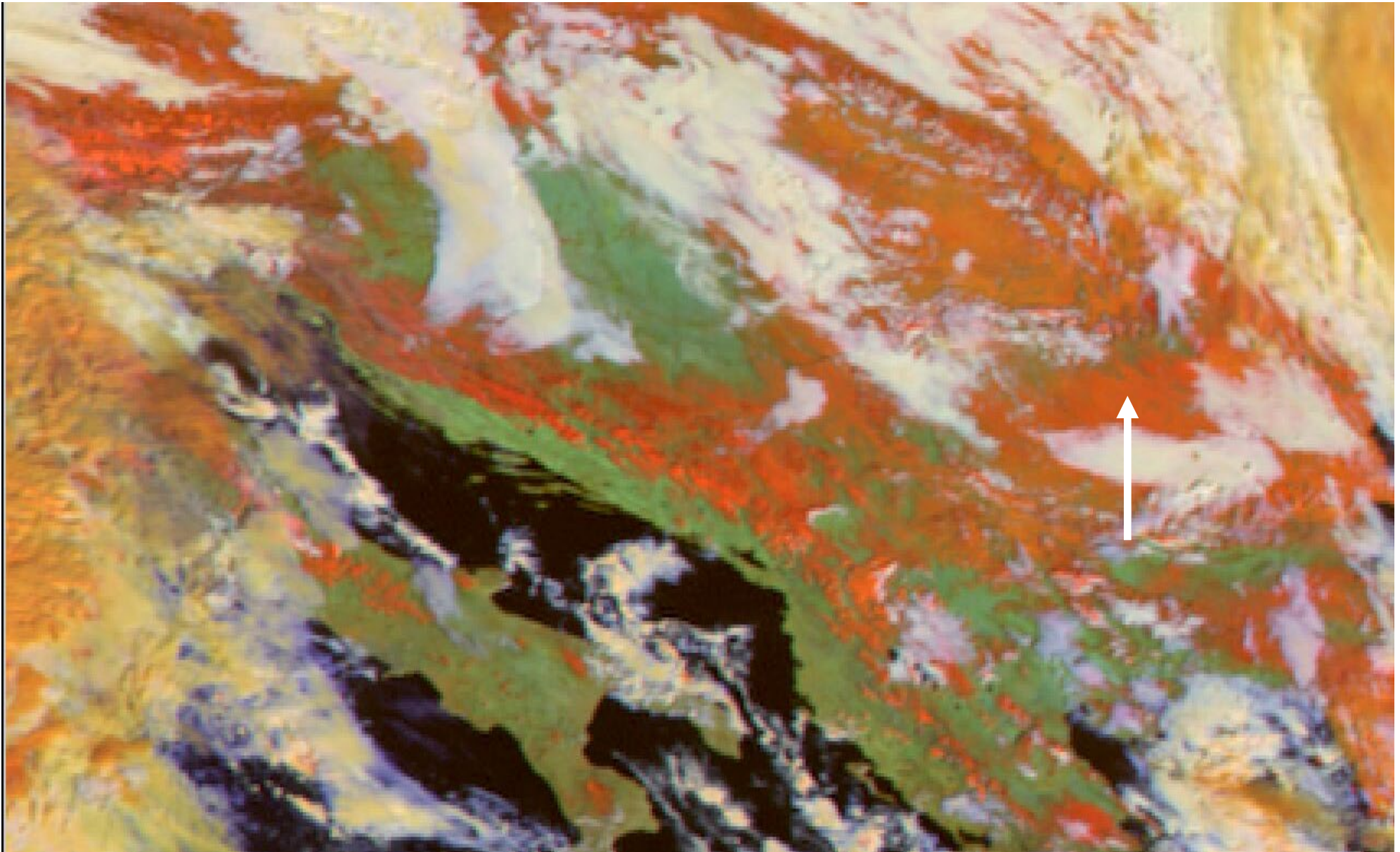


RGB 02, 04r, 09 Example: Fires



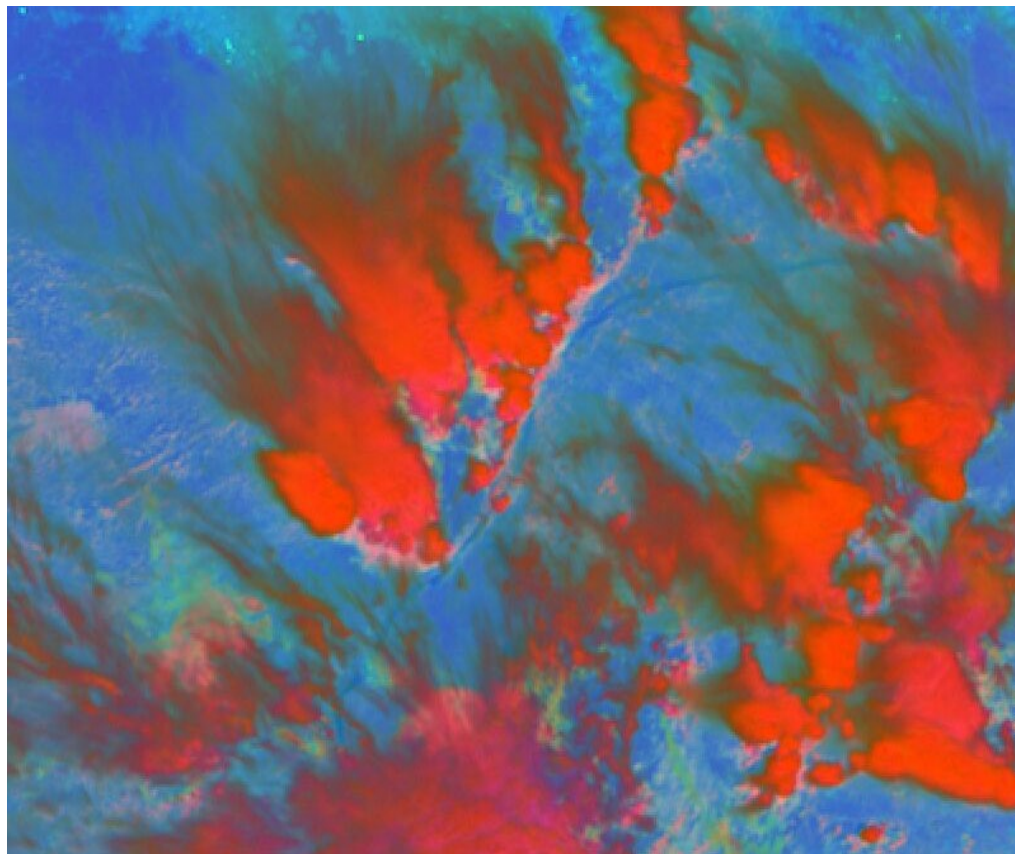
MSG-1, 7 September 2003, 11:45 UTC ("winter" enhancement)

RGB 02, 03, 04r Example: Snow

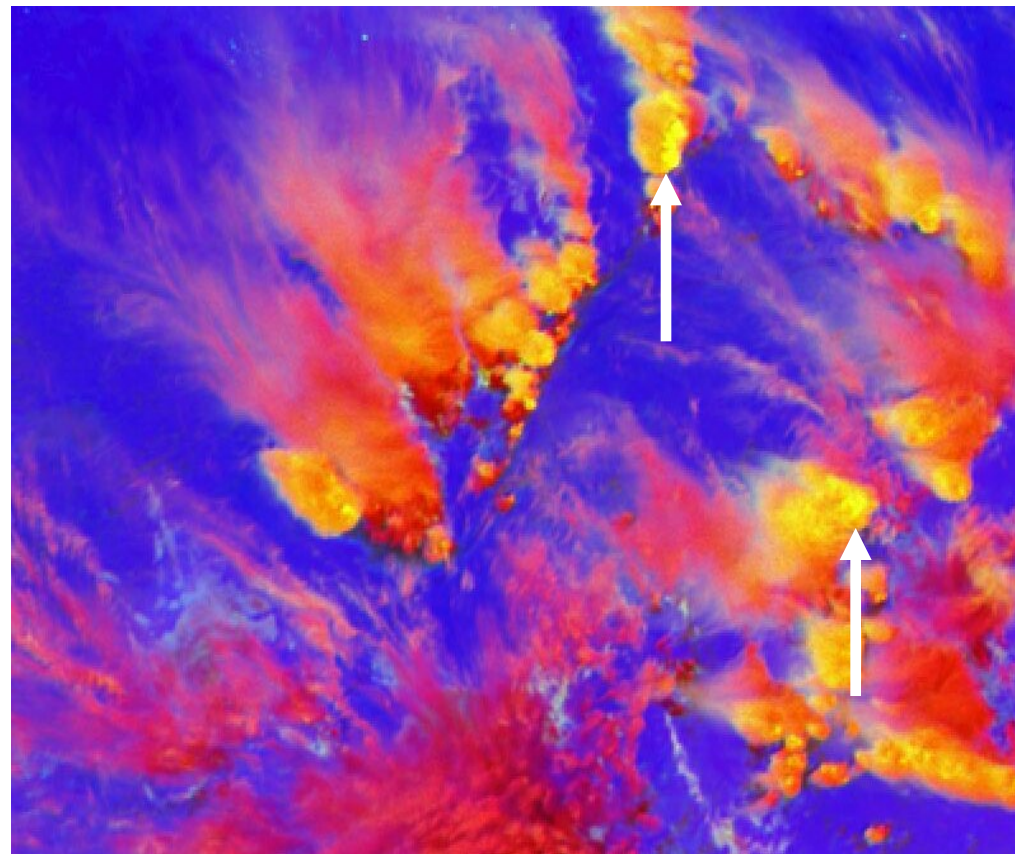


MSG-1, 26 January 2004, 10:00 UTC

RGB 05-06, 04-09, 03-01 Example: Severe Convection



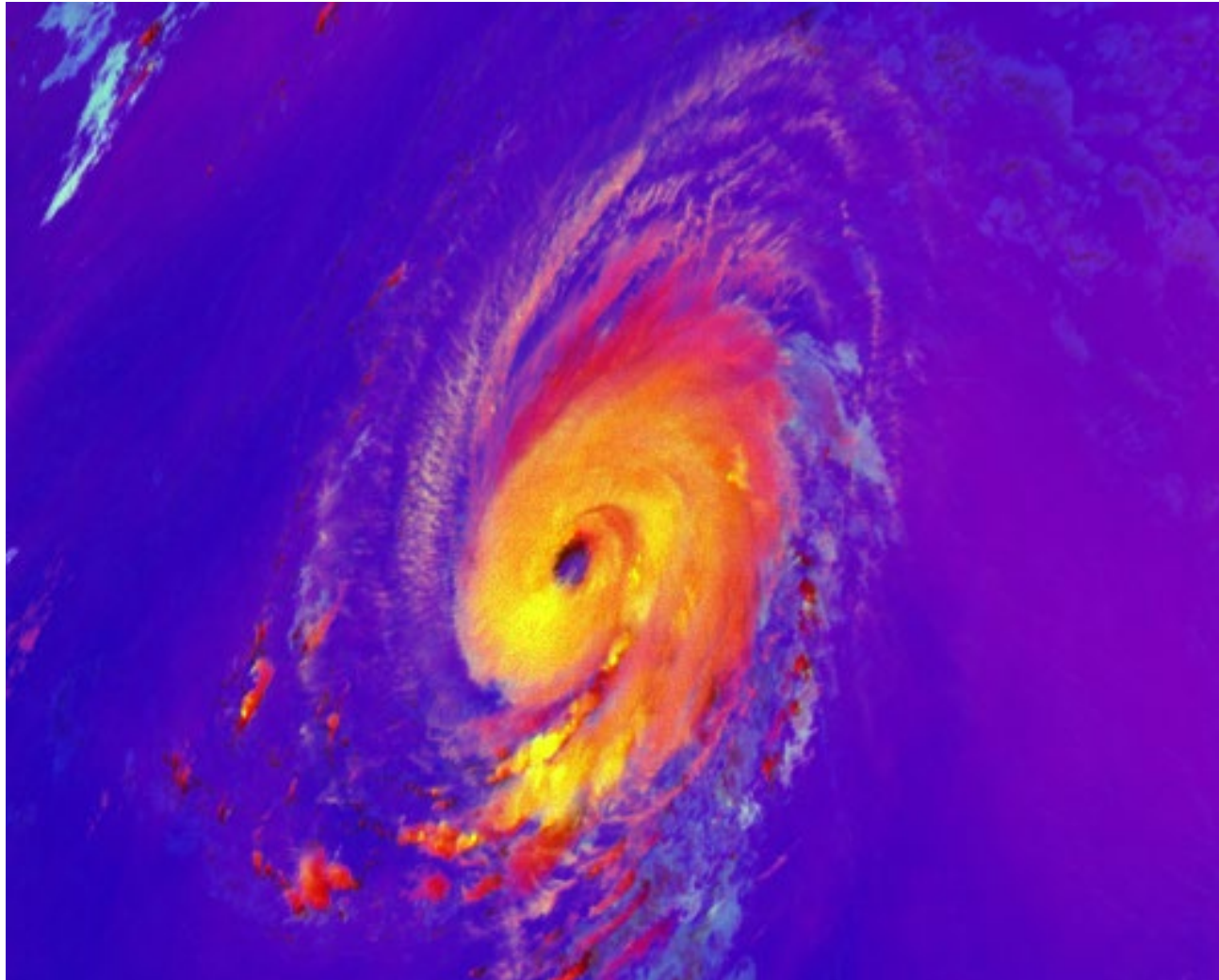
**RGB 02,04r,09
(for comparison)**

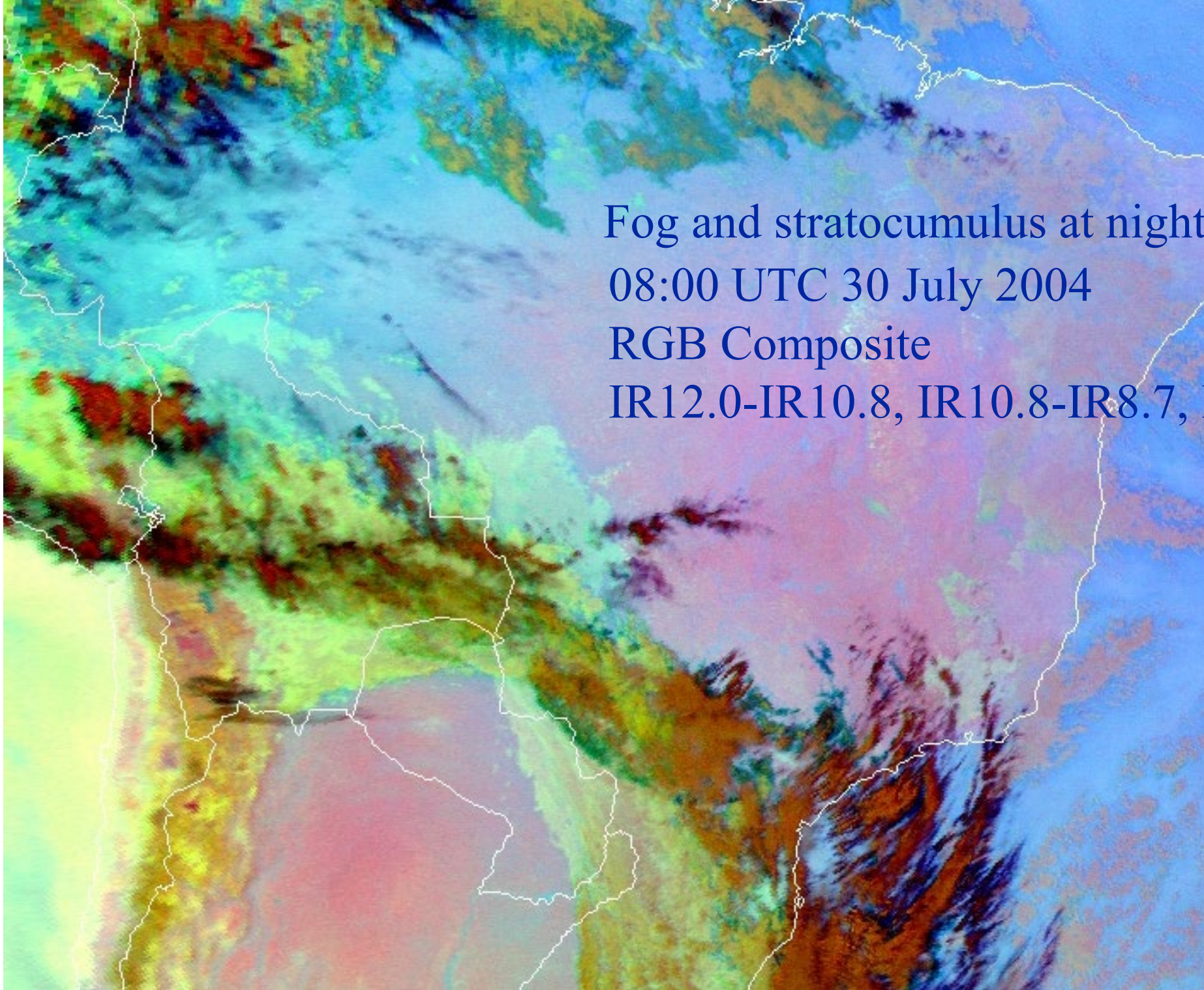


**RGB 05-06,04-09,03-01
better identification of young, severe storms**

MSG-1, 3 February 2004, 11:30 UTC

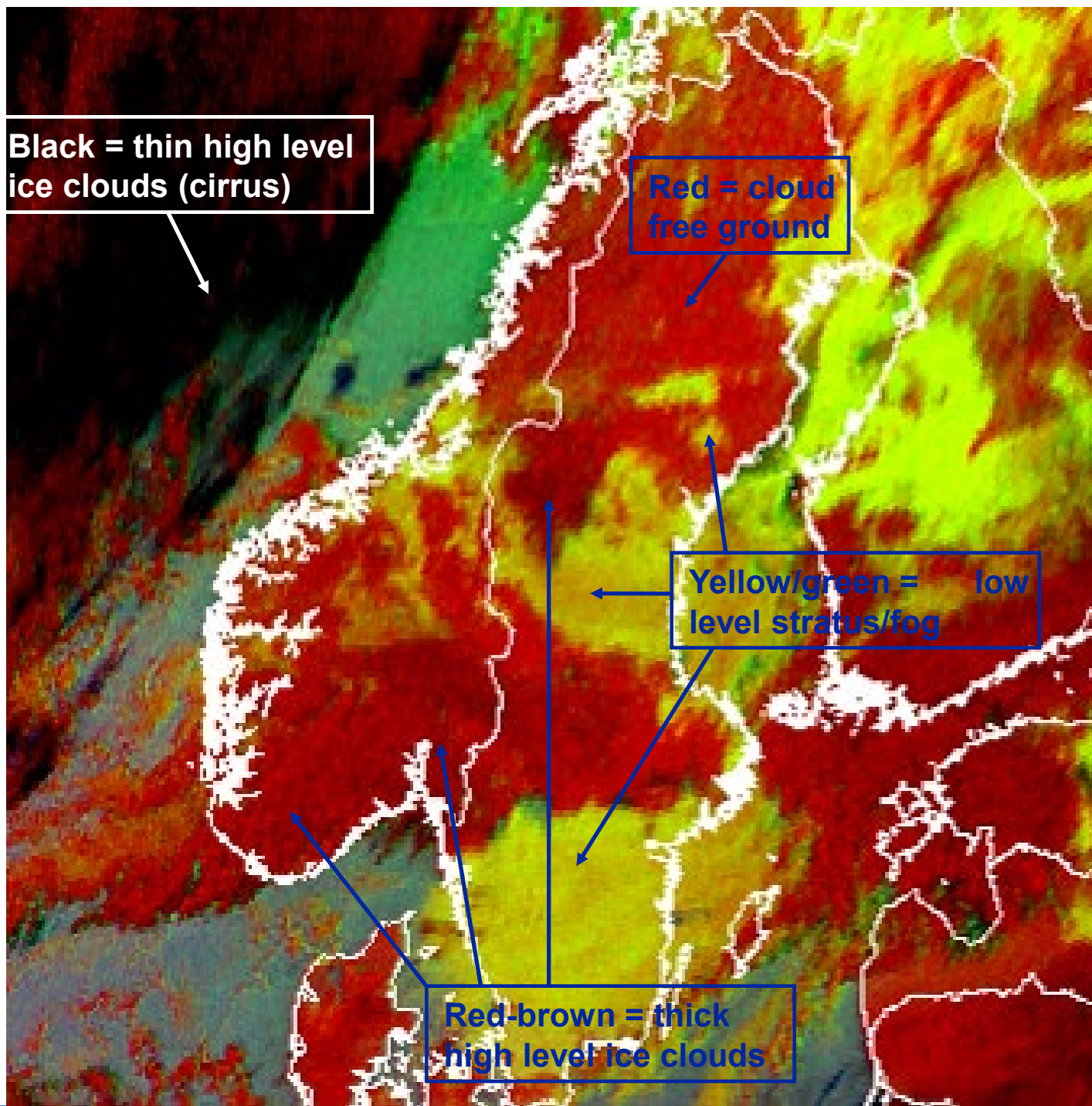
Hurricane ISABEL





Fog and stratocumulus at night
08:00 UTC 30 July 2004
RGB Composite
IR12.0-IR10.8, IR10.8-IR8.7, IR10.8

Colour interpretation RGB Cloud product



Meteosat-8

03.00utc 24 January 2007

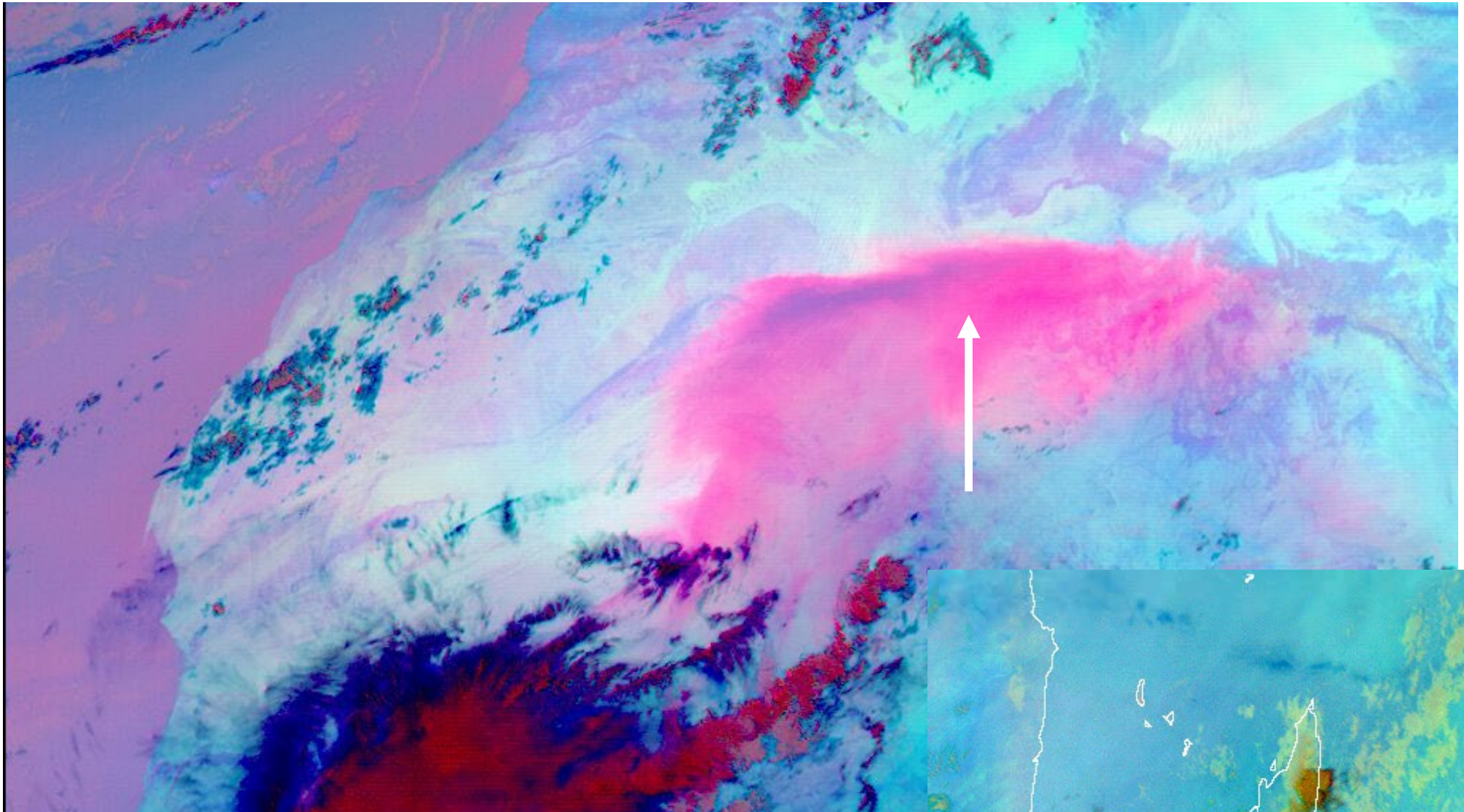
RGB Composite

R: IR12.0-IR10.8 (-4 to +2 K)

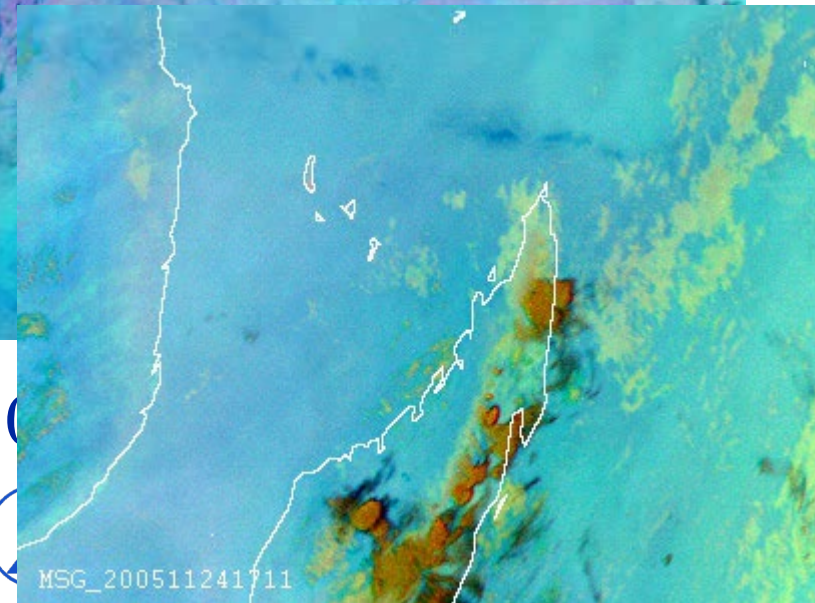
G: IR10.8-IR8.7 (2 to 6 K)

B: IR10.8 (263 to 293 K)

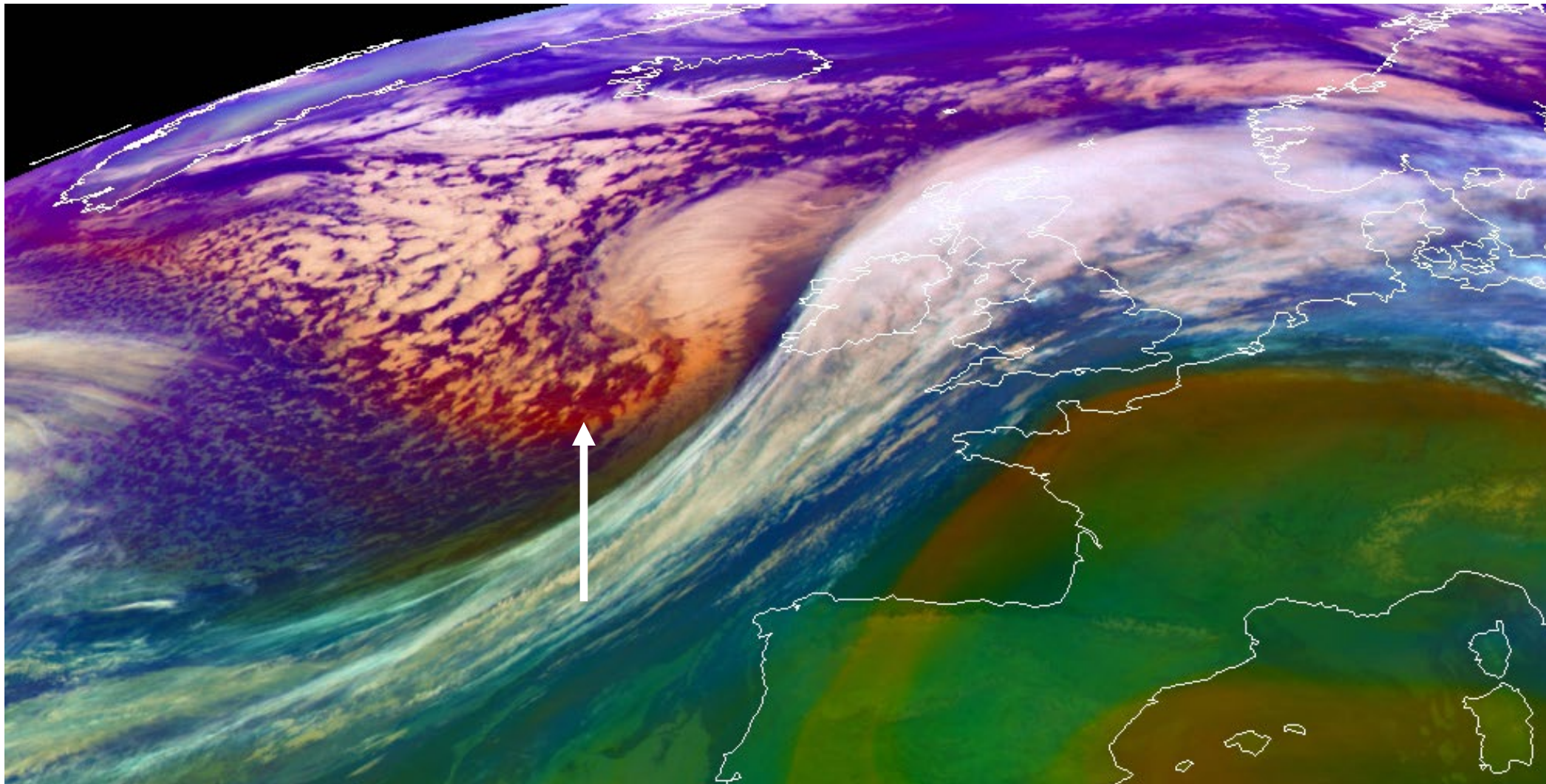
RGB 10-09, 09-07, 09 Example: Dust



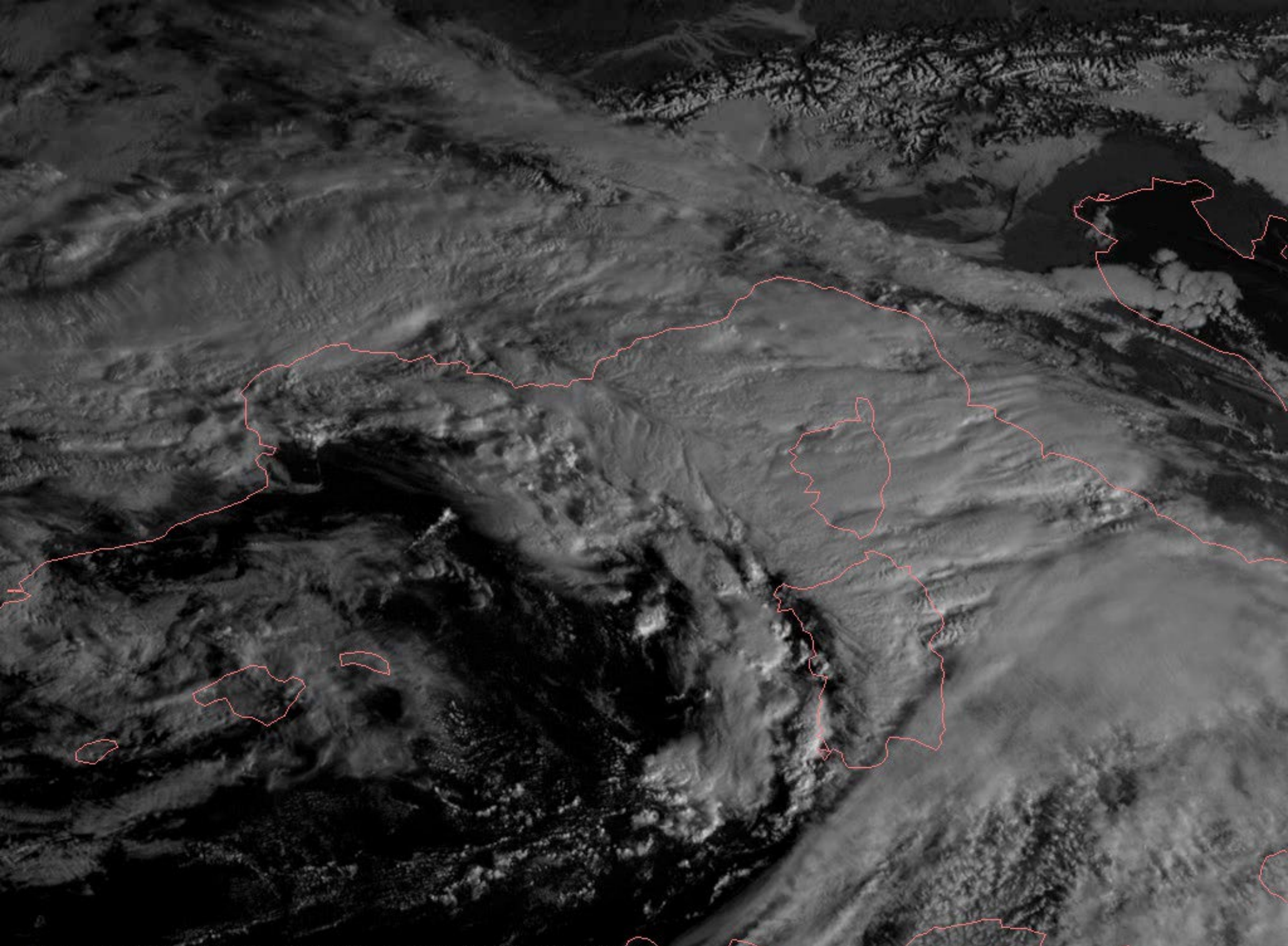
MSG-1, 3 March 2004, 10:00



RGB 05-06, 08-09, 05i Advection Jet



MSG-1, 7 January 2005, 22:00 UTC



20002 METEOSAT9 12 18 FEB 07049 080900 01150 05613 01.00

The technology market

Nails	1 €/kg
Cars	10 €/kg
PC	100 €/kg
Planes	1000 €/kg
Optical fibre	10000 €/kg
Satellite	100000 €/kg

Meteosat data 0 €/kg

❖ Our archive is underutilized for climate and weather research

❖ <http://archive.eumetsat.org/umarf/>

❖ Data portal



THANK YOU FOR YOUR ATTENTION

1977



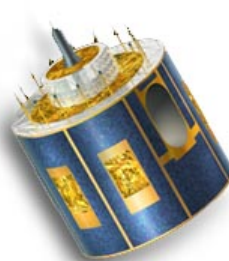
MOP/MTP



2002

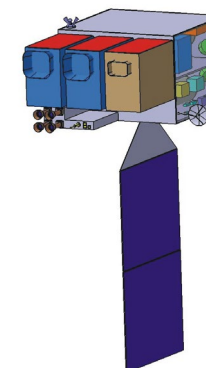


MSG



2015

MTG



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

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

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

**Implementation of the EUMETSAT
 Geostationary Programme**

**... 30 years of continuous
 operations ...**

Possible **Chemistry Mission UVS**
 coordinated with ESA for implementation
 via GMES Sentinel 4/5