EUMETSAT

Monitoring weather and climate from space

Status of EUMETSAT current and future programme

Mikael Rattenborg, Director of Operations

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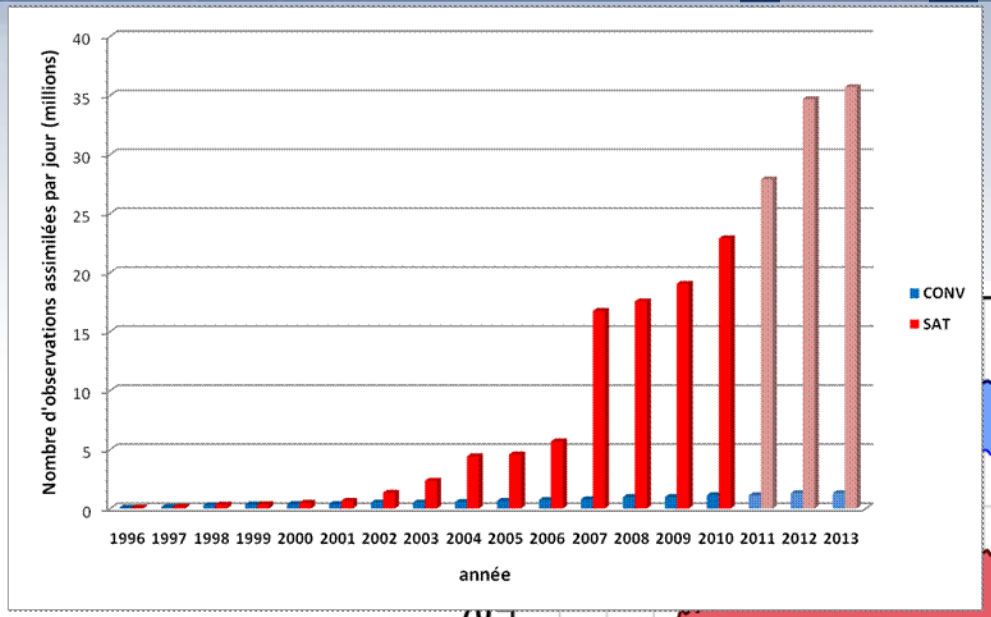
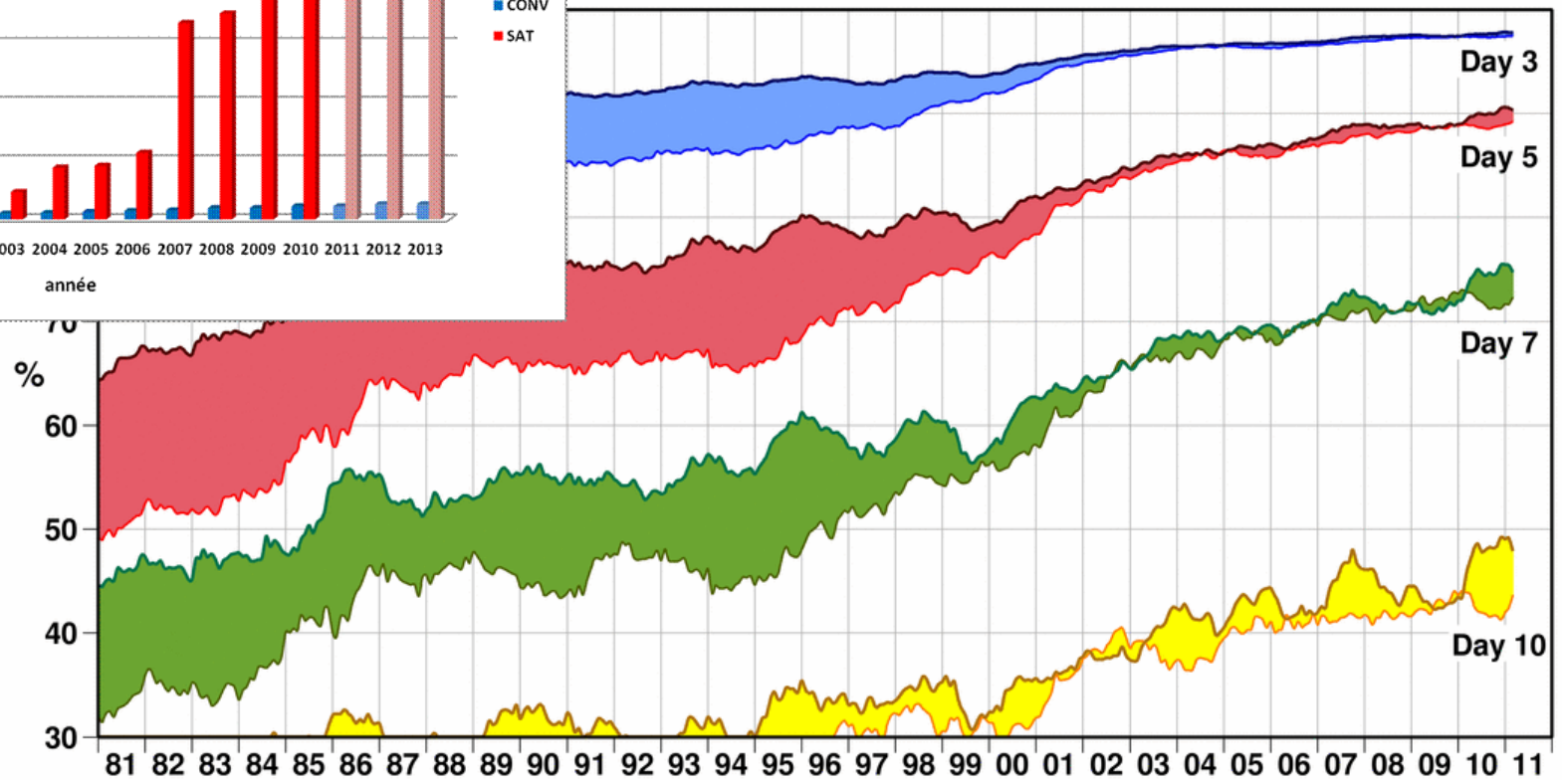
Impact of satellite data on medium range NWP



(Source : ECMWF)



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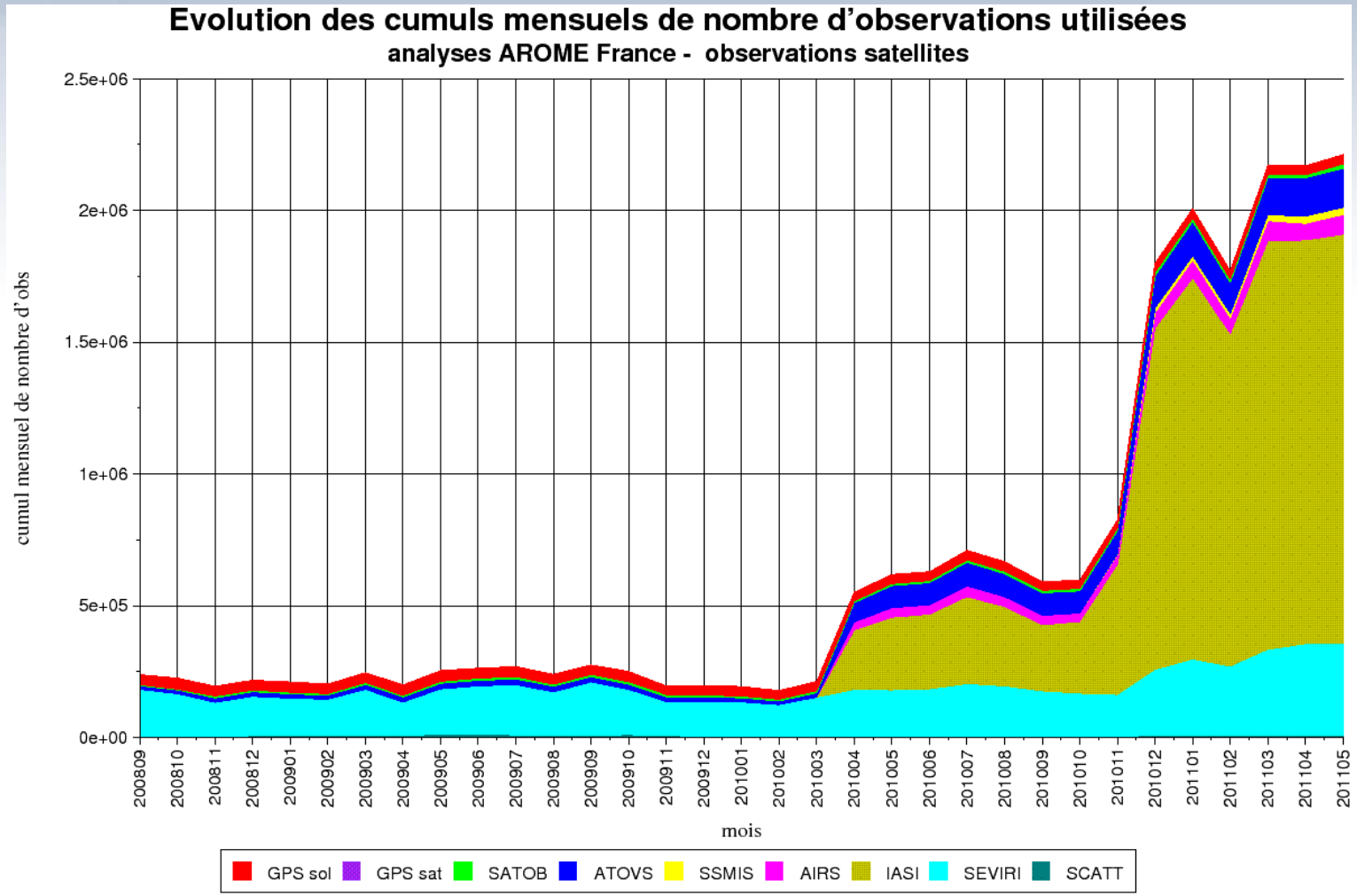
Ingestion of satellite data by new VHR models



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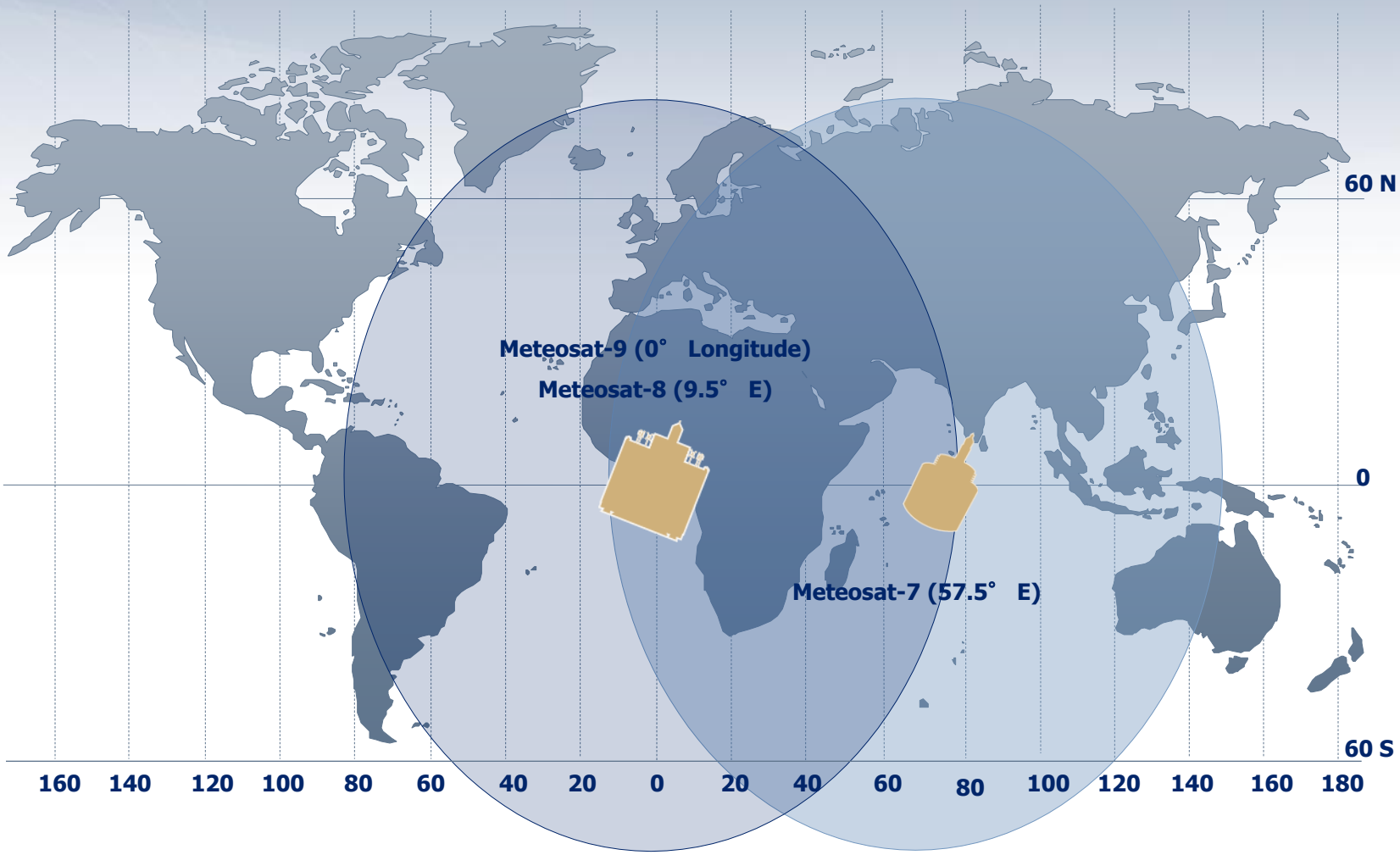
EUMETSAT's geostationary satellite coverage



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MSG-3 launch planned June-July 2012

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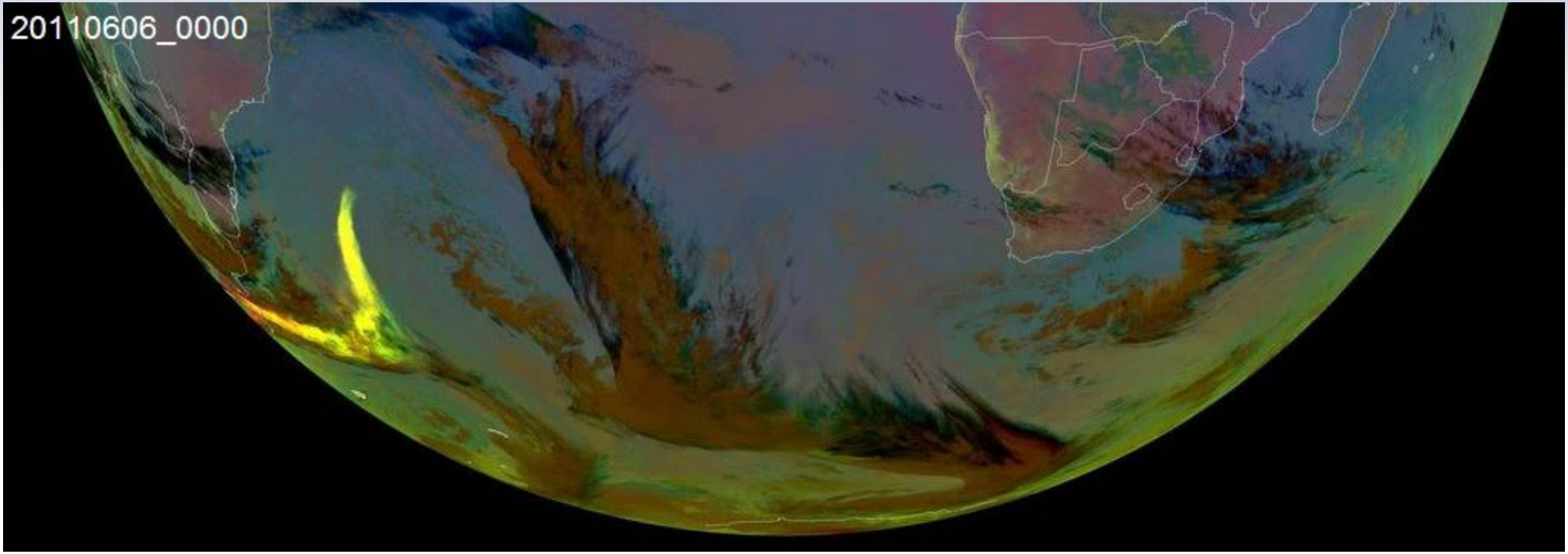
Southern Hemisphere Volcanic Ash Cloud



(Source: NILU Institute, Norway)

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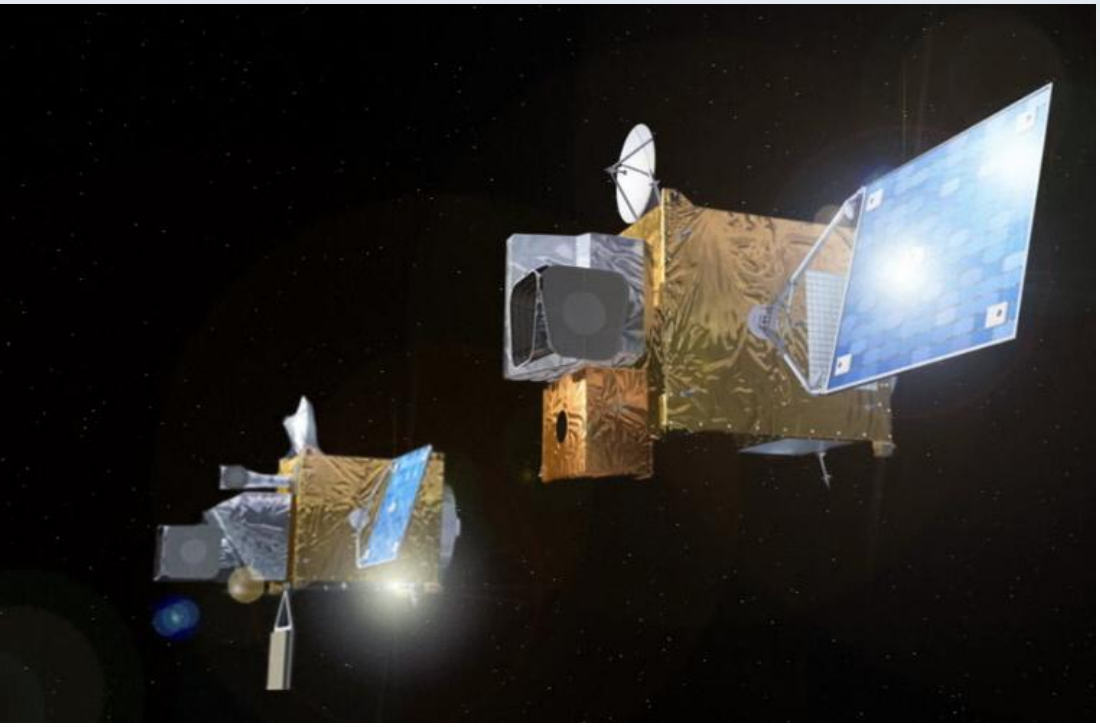
Geostationary satellites - MTG

Meteosat Third Generation (MTG)

Approved by EUMETSAT's Council on 25 February 2011



- will consist of four imaging (MTG-I) and two sounding satellites (MTG-S)
- scheduled to start operations from 2019, taking over from MSG
- will provide important image data on European weather on a daily basis, every 10 minutes with 16 spectral bands
- the imaging satellites will carry the revolutionary new Lightning Imager providing better data for users such as civil aviation
- the sounding satellites will carry an infrared sounder for the first time ever providing four-dimensional (over time and space) high-resolution data on water vapour and temperature structures
- also on board the sounding satellites will be the Global Monitoring for Environment and Security Sentinel-4 Ultraviolet Visible Near-infrared spectrometer for atmospheric chemistry and air quality monitoring

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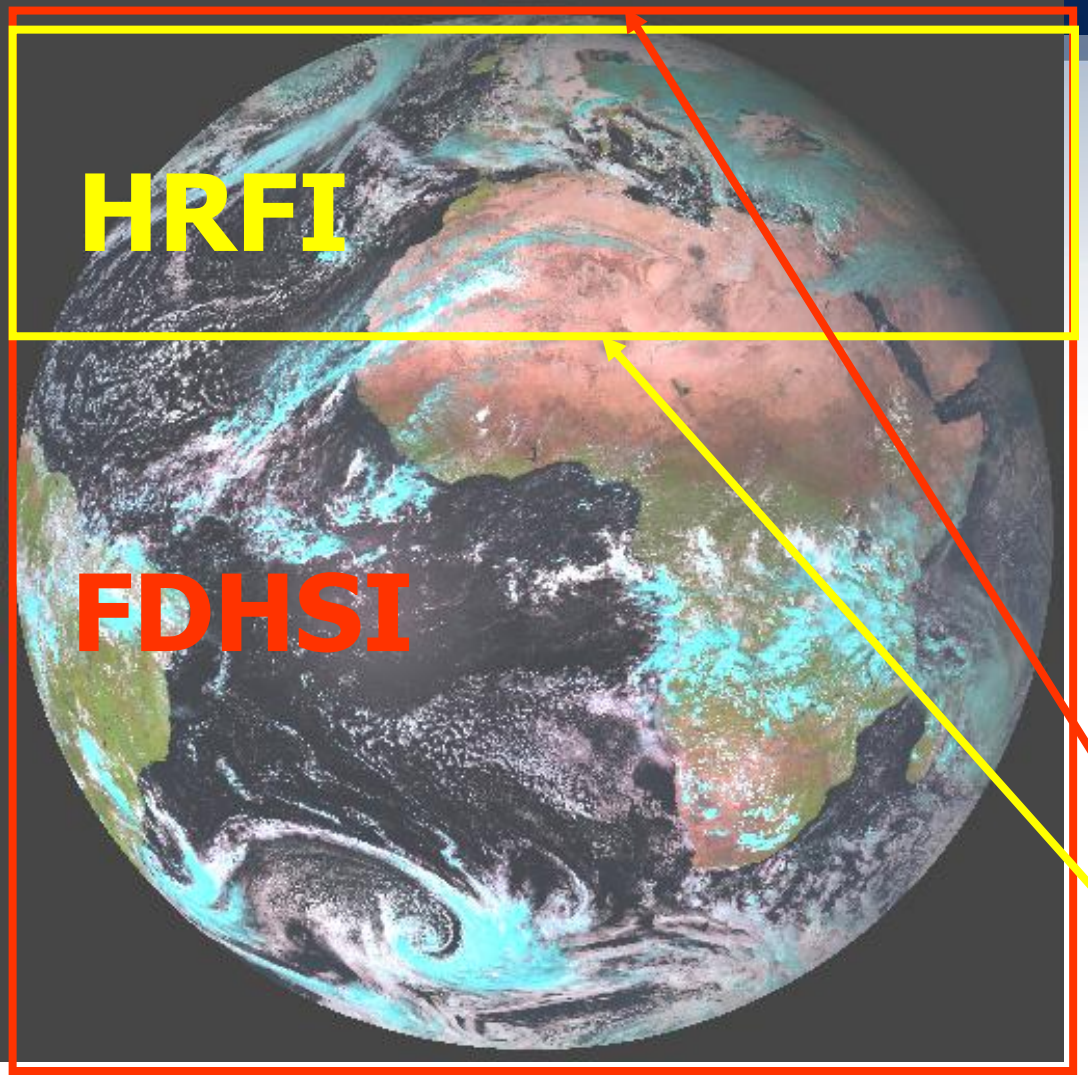
From SEVIRI to the FC Imager



MTG FCI outbids MSG SEVIRI observations on cloud, aerosol, moisture and fire

by adding new channels and

by improving temporal-, spatial-, and radiometric resolution

	Coverage	Repeat cycle
FDHSI mission	18°x18°	10 min
HRFI mission	1/4 FD	10/4 min

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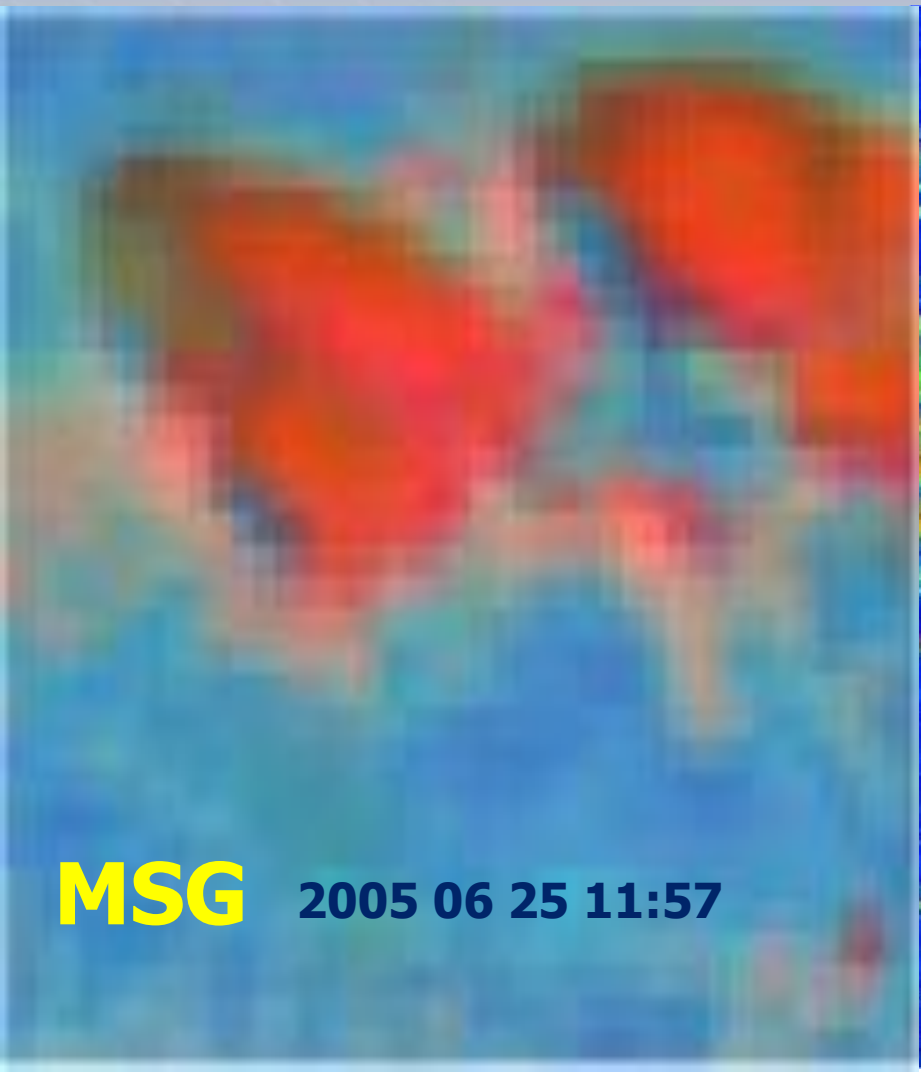
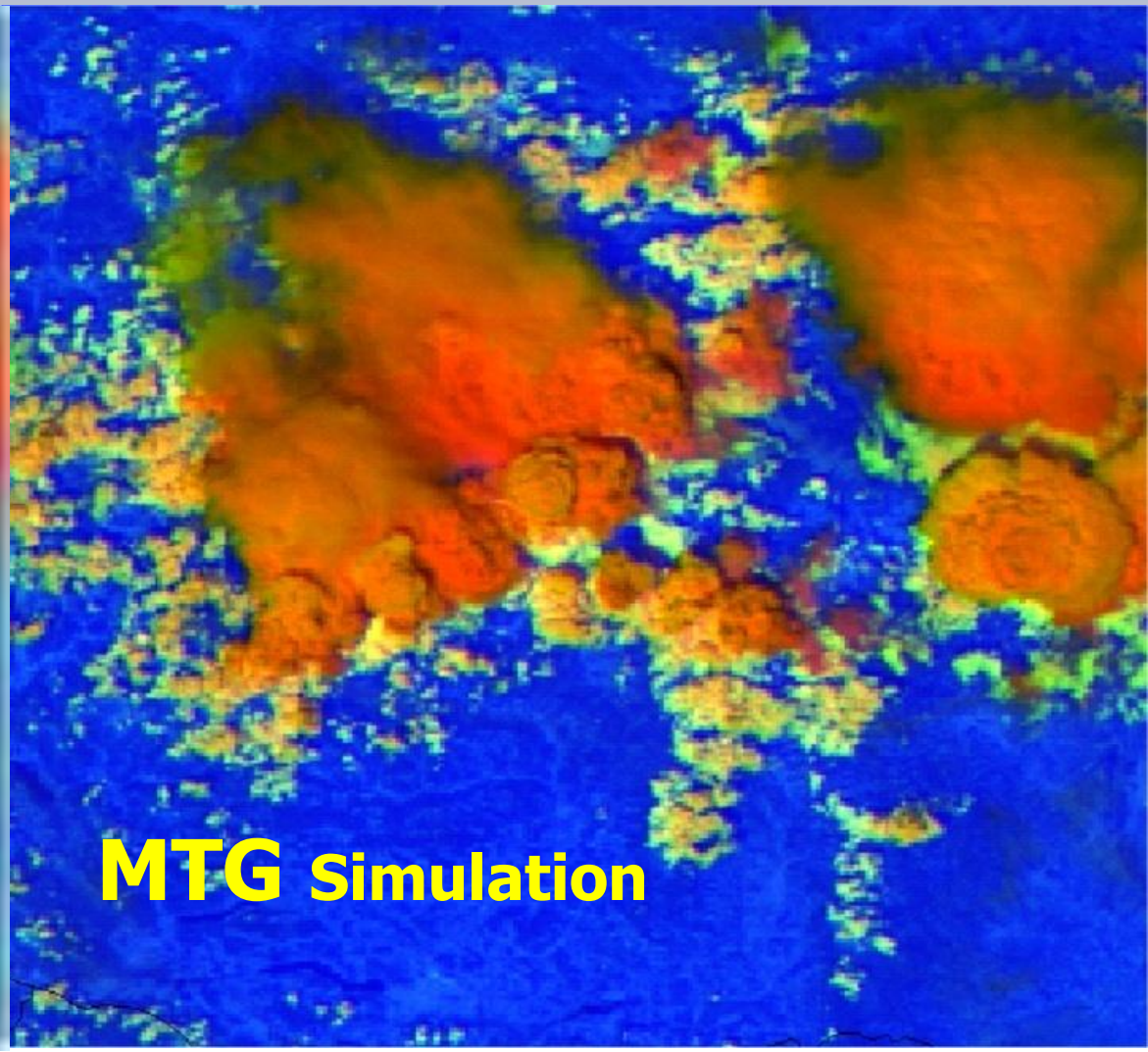
SEVIRI versus FCI on MSG and MTG
MTG-FC Delivers Information on Smaller Scales





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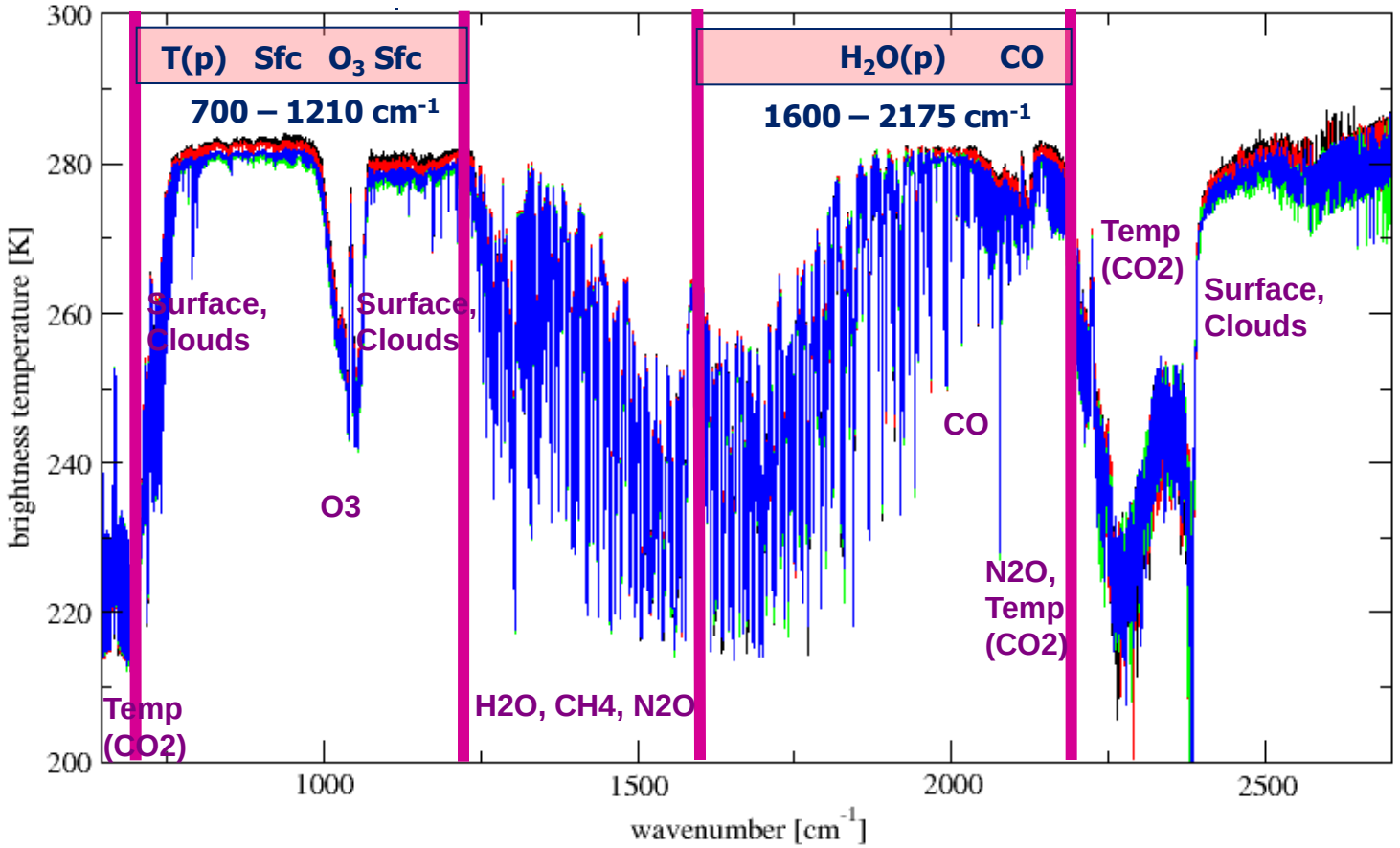
MTG-IRS to detect 'river like moisture flows'

MTG-IRS mission will deliver unprecedented information on horizontal and vertical gradients of moisture, wind and temperature between measurements of individual radiosondes and hyperspectral soundings from the polar orbiting satellites.



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MTG-IRS potential to detect high pollution events at urban and regional scales

Studies results investigating the capability of IRS to detect enhanced levels of carbon monoxide (CO) and ozone (O_3) at local and regional scales, in particular over Europe:

MTG-IRS will provide tropospheric columns of O_3 and CO with significant improvement on our prior knowledge

Cathy Clerbaux (CNRS/Service d'Aéronomie & ULB), Juliette Hadji-Lazaro, Anne Boynard, Solène Turquety (SA), Pierre-François Coheur, Oliver Scharf, Daniel Hurtmans (ULB).

ULB SA IPSL

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EUMETSAT LOW EARTH ORBIT PROGRAMMES

Polar-orbiting satellites – Metop and EPS

EUMETSAT Polar System (EPS)

Metop-A launched 19 October 2006

Metop-B launch planned 23 May 2012

Metop-C launch earliest in 2016

Partners:

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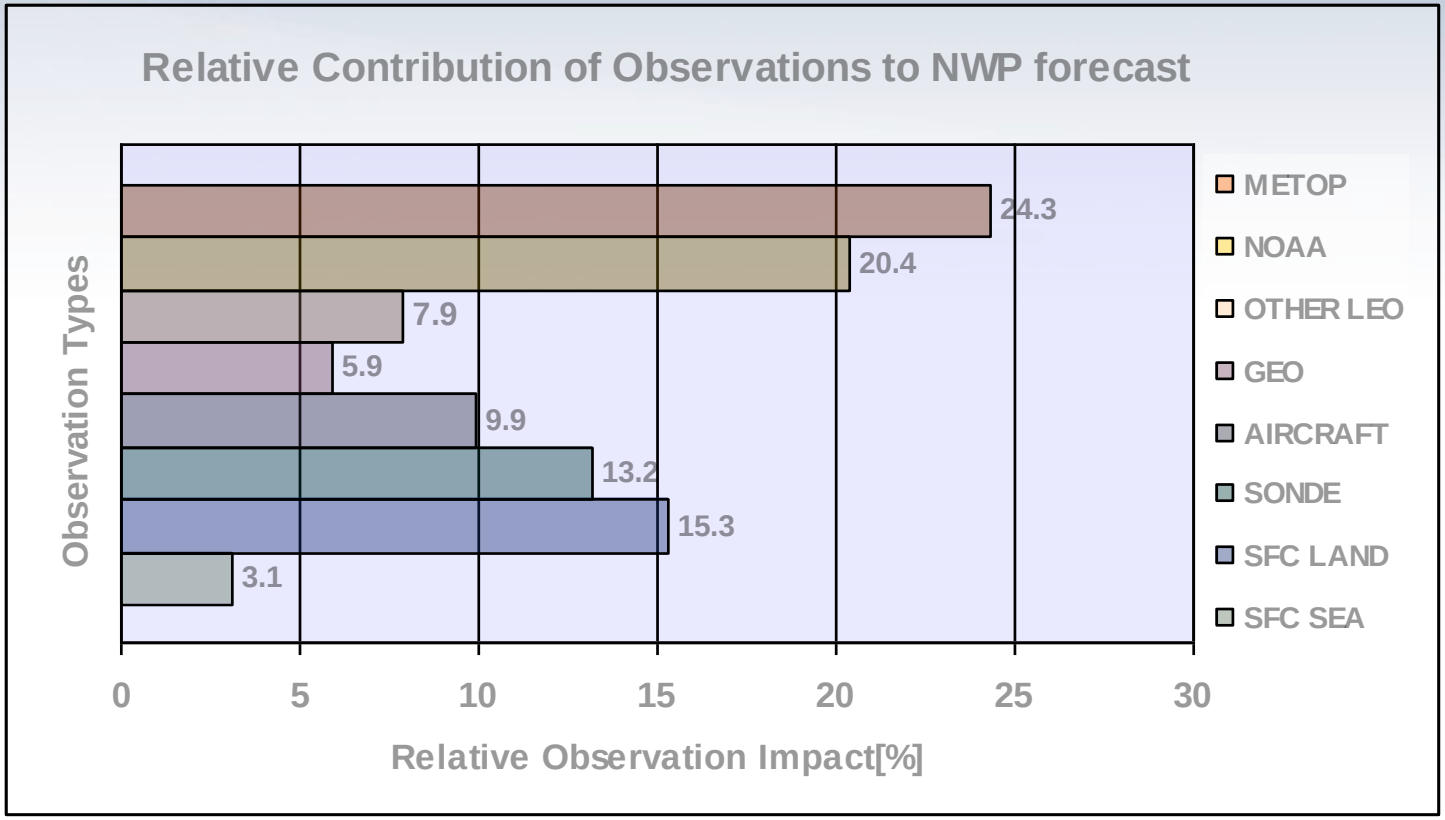
Impact of satellite data on short range NWP



(Source : Met Office)

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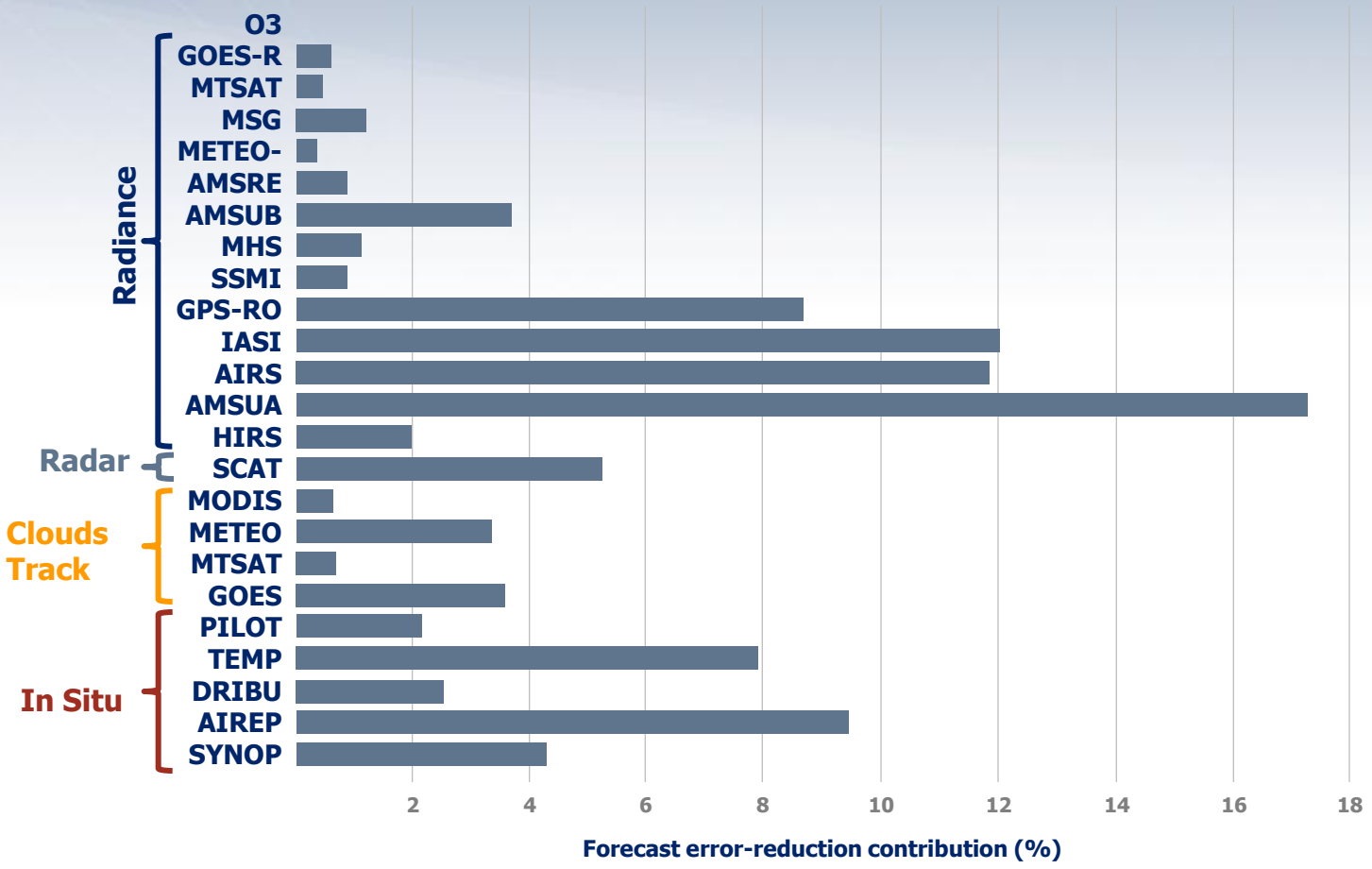
Instrument contribution to Numerical Weather Prediction error-reduction



Forecast sensitivity to observations
24-hour forecast error-reduction contribution (%) of the components (types) of the observing system during September – December 2008.
(Source: ECMWF)

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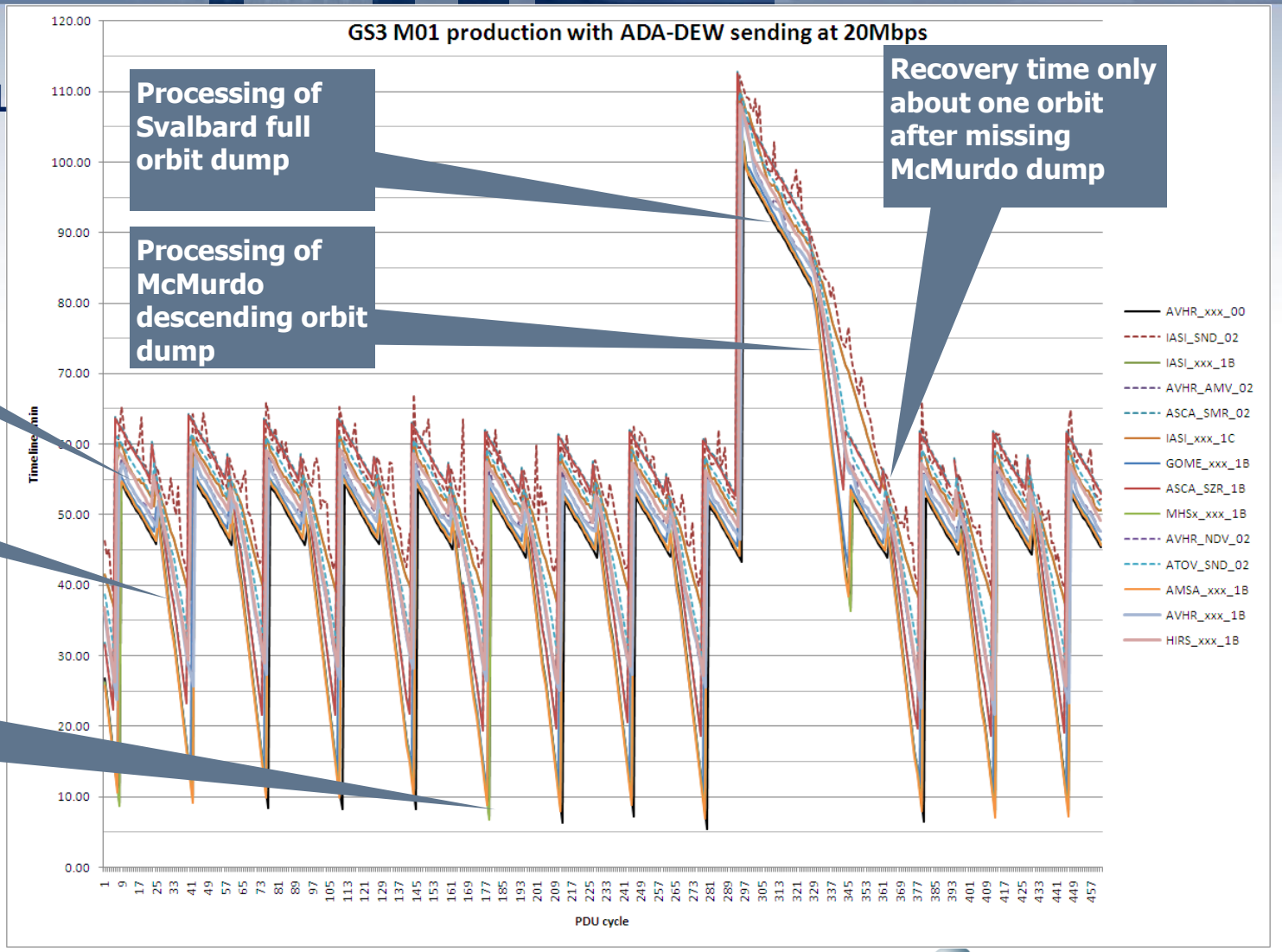
Metop Antarctic Dump Acquisition McMurdo Station

- 65 mn worst case timeliness achieved for L1 data (70 mn for IASI/ASCAT)

Processing of Svalbard ascending orbit dump

Processing of McMurdo descending orbit dump

Best case timeliness per orbit from McMurdo better than Svalbard due to fast data transfer from McMurdo



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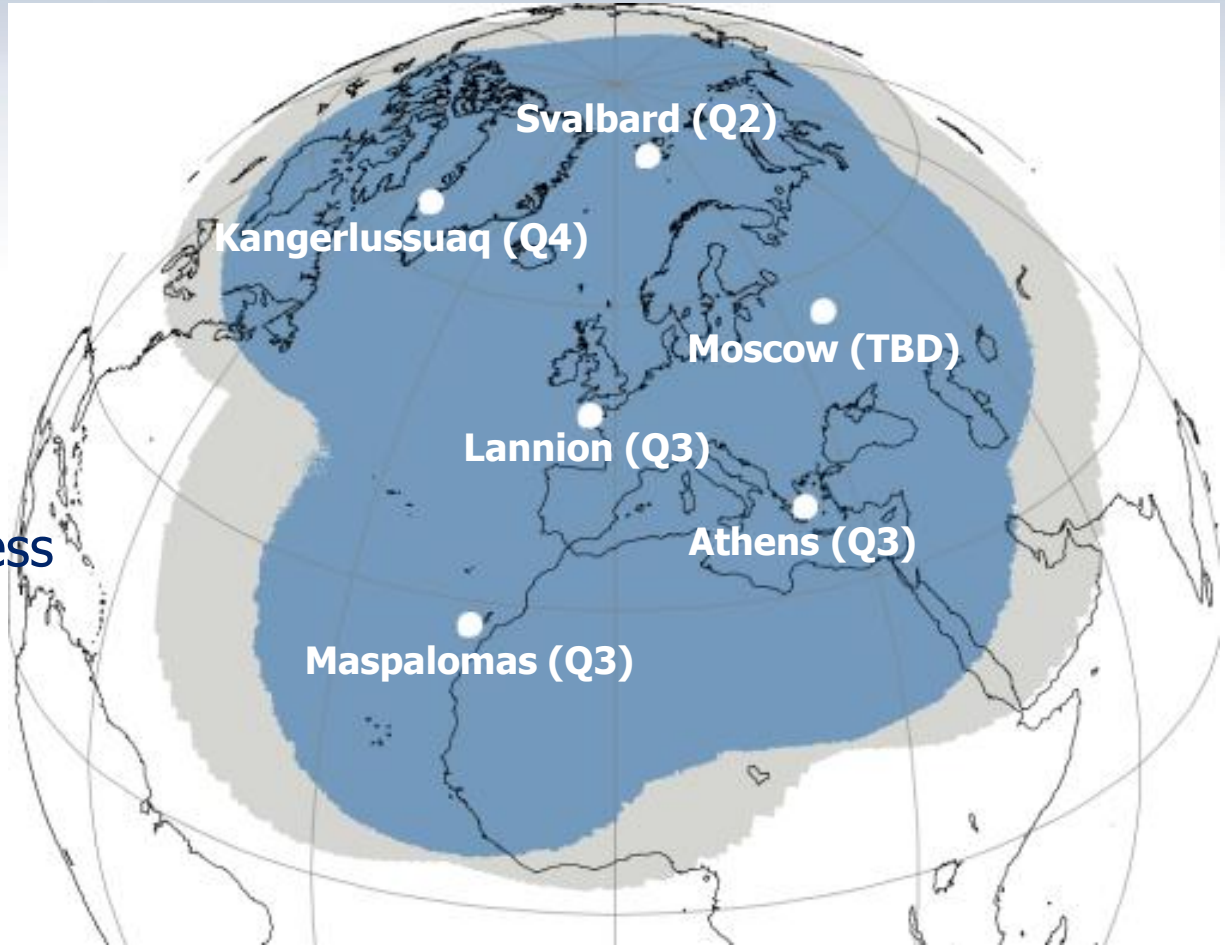
NPP Regional Service: Geographical Coverage

- 5 core European Stations plus potentially Moscow
- All station preparations have been Kicked Off
- Expected Operational Readiness in Quarter in 2012.



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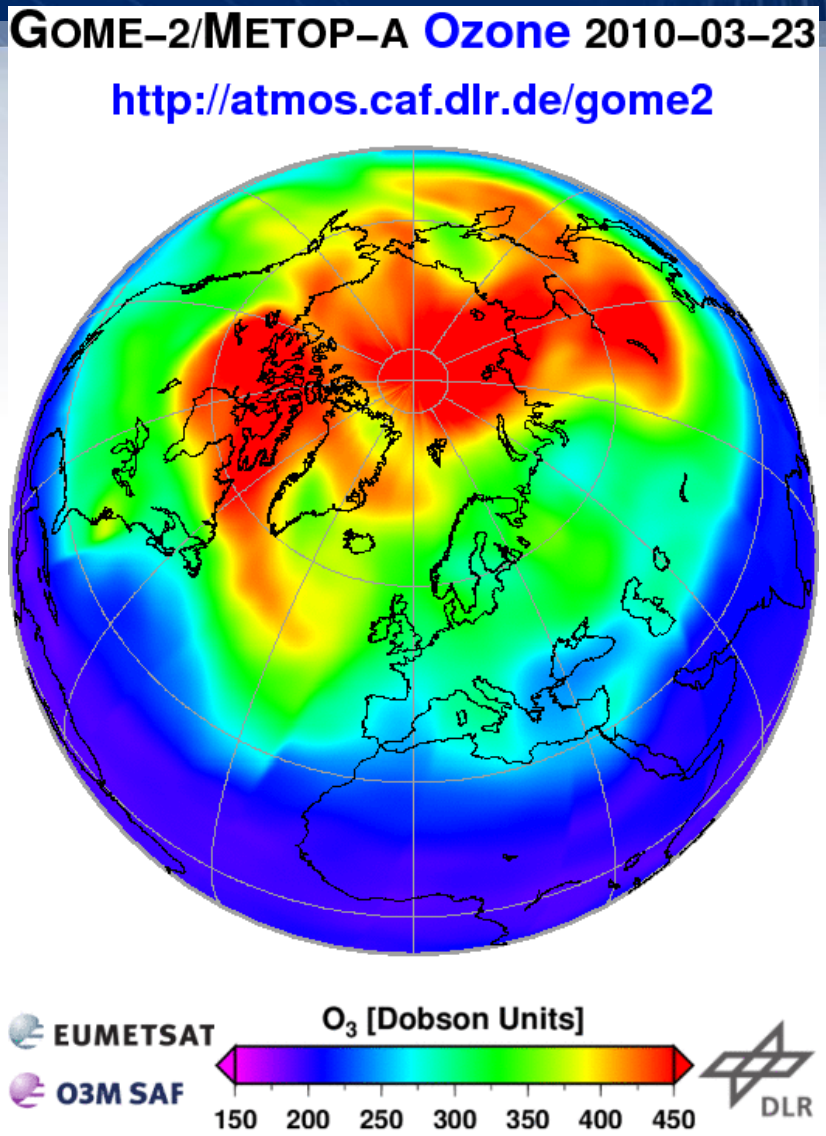
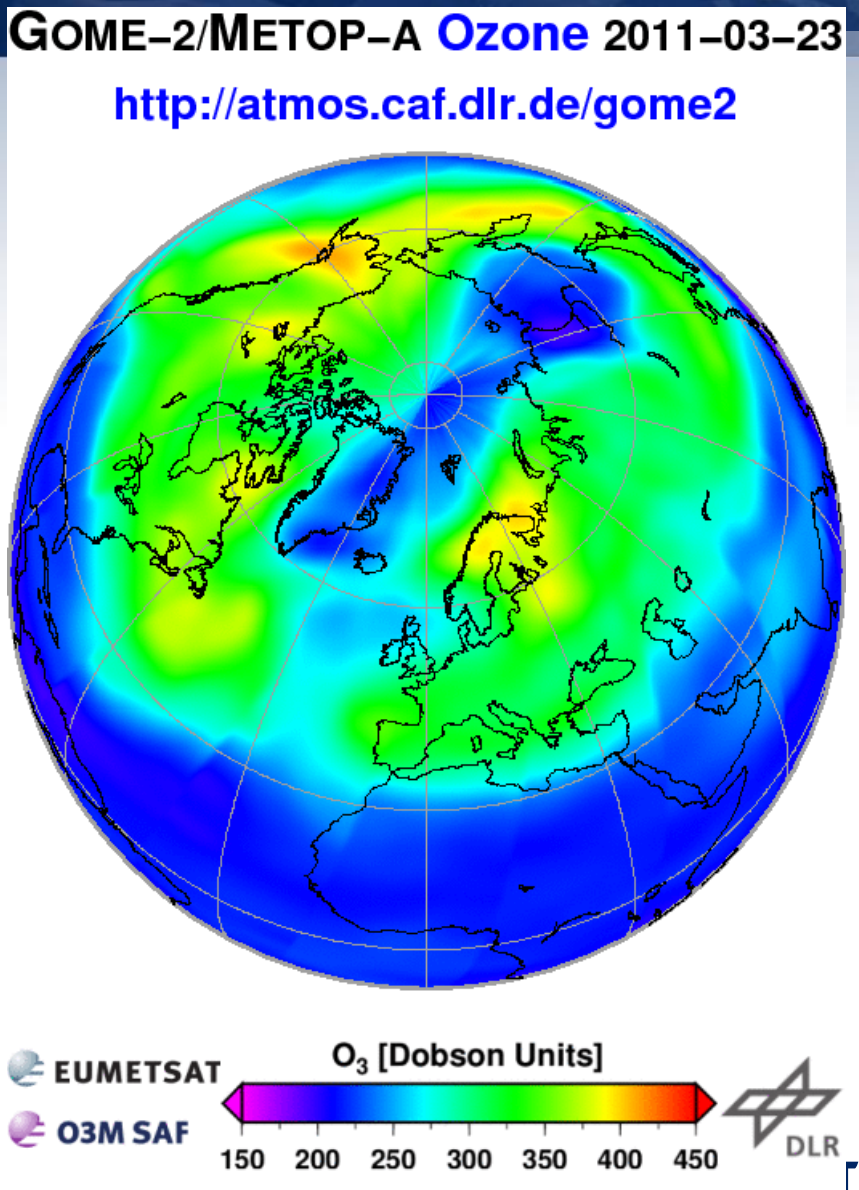
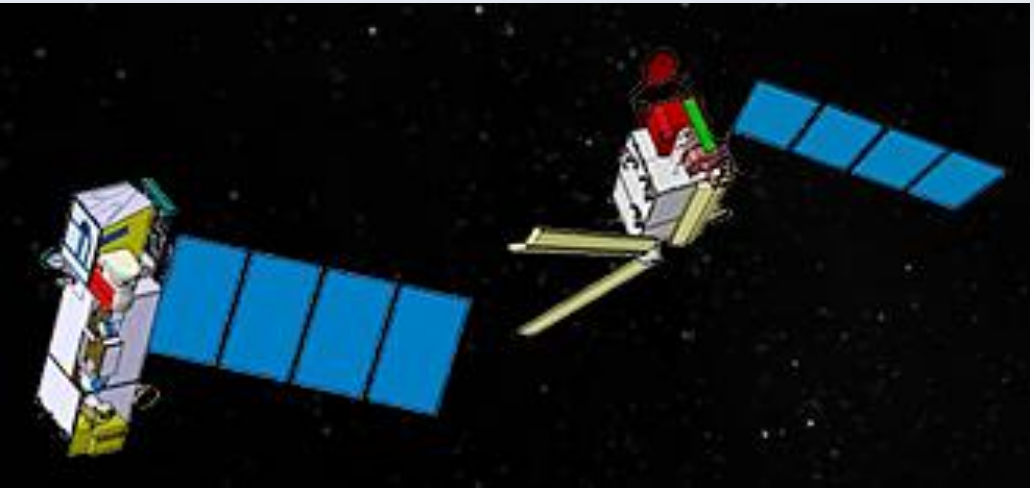
Arctic circulation, ozone and UV





Polar-orbiting satellites – EPS-SG

EUMETSAT Polar System – Second Generation (EPS-SG)



Partners:

Europe's series of second generation polar-orbiting satellites for operational meteorology to provide continuity of measurements in mid-morning orbit after the Metop series for a period of 20 years.

- **First satellite should be ready for launch in 2018 to avoid gap in coverage**
- **Two satellite configuration with distributed payloads**
- **Total 4 or 6 satellites**
- **GMES Sentinel-5 instrument hosted**
- **User Consultation completed**
- **Final Payload selection in early 2012**

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EPS-SG Observation Missions Priority

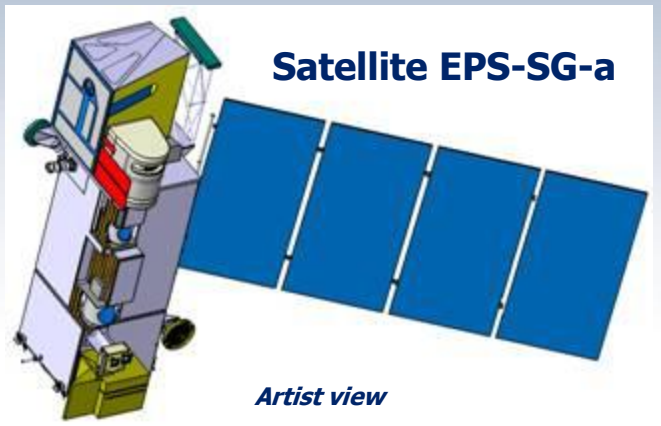
EPS-SG Missions and Priorities
as defined during the User Consultation Process

High-Resolution Infrared Sounding	IAS	Very high
Microwave Sounding	MWS	
VIS/IR Imaging	VII	
Scatterometry	SCA	
Radio Occultation Sounding	RO	High
Nadir-viewing UV/VIS/NIR/SWIR Sounding	UVNS	Medium
Multi-viewing, -channel, -polarisation Imaging	3MI	
Microwave Imaging	MWI	
Radiant Energy Radiometry	RER	Low
Ice Cloud Imaging	ICI	
Low Light Imaging	LLI	(not ranked)
ARGOS	DCS	
Search and Rescue	S&R	
Space Environment Monitoring	SEM	

EPS-SG In-orbit Configuration in Phase A

The EPS-SG Phase A System baseline is based on a Two-Satellite In-orbit Configuration.

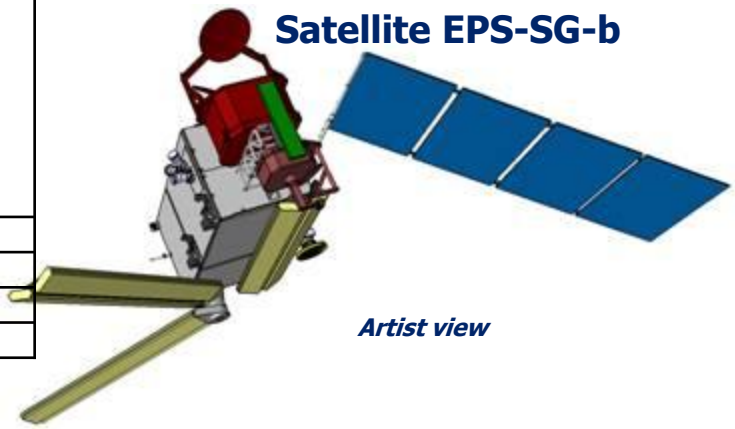
The EPS-SG Instruments are accommodated taking into account missions co-registration requirements *and* **continuity of Mid-morning observations within the JPS overall system.**



Artist view

Payload	METimage LLI IASI-NG ATMS (or MWS) 3MI Sentinel-5 CERES follow-on RO
Dry mass [kg]	~ 2500
Launch mass [kg]	~ 2900
Power [kW]	~ 2.2
P/L data rate [Mbit/s]	~ 60

Payload	SCA MWI-Precipitation MWI-Cloud ARGOS-4 S&R SEM RO
Dry mass [kg]	~ 2000
Launch mass [kg]	~ 2300
Power [kW]	~ 1.6
P/L data rate [Mbit/s]	~ 1.2



Artist view

Metop Second Generation Satellites (Metop-SG)

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OCEANS AND CLIMATE

Monitoring the oceans

Jason satellites

Partners: cnes NASA NOAA

Jason-2

- launched in June 2008 from Vandenberg, California
- EUMETSAT's first optional programme on ocean altimetry
- enabled EUMETSAT to extend its expertise in data and product dissemination for weather forecasting and climate monitoring
- inclusion of data in support of marine meteorology, operational oceanography, seasonal prediction and climate monitoring.

Jason-3

- programme under development
- will provide continuity after Jason-2
- satellite scheduled for launch in 2014

Jason-CS

- future programme under discussion
- to provide continuity after Jason-3

SAF Contribution to EUMETSAT CM

CM SAF: release of a **20-year** SSM/I Climate Data Record on ocean / atmosphere parameters and fluxes

The EUMETSAT Network of Satellite Application Facilities

CM SAF Climate Monitoring

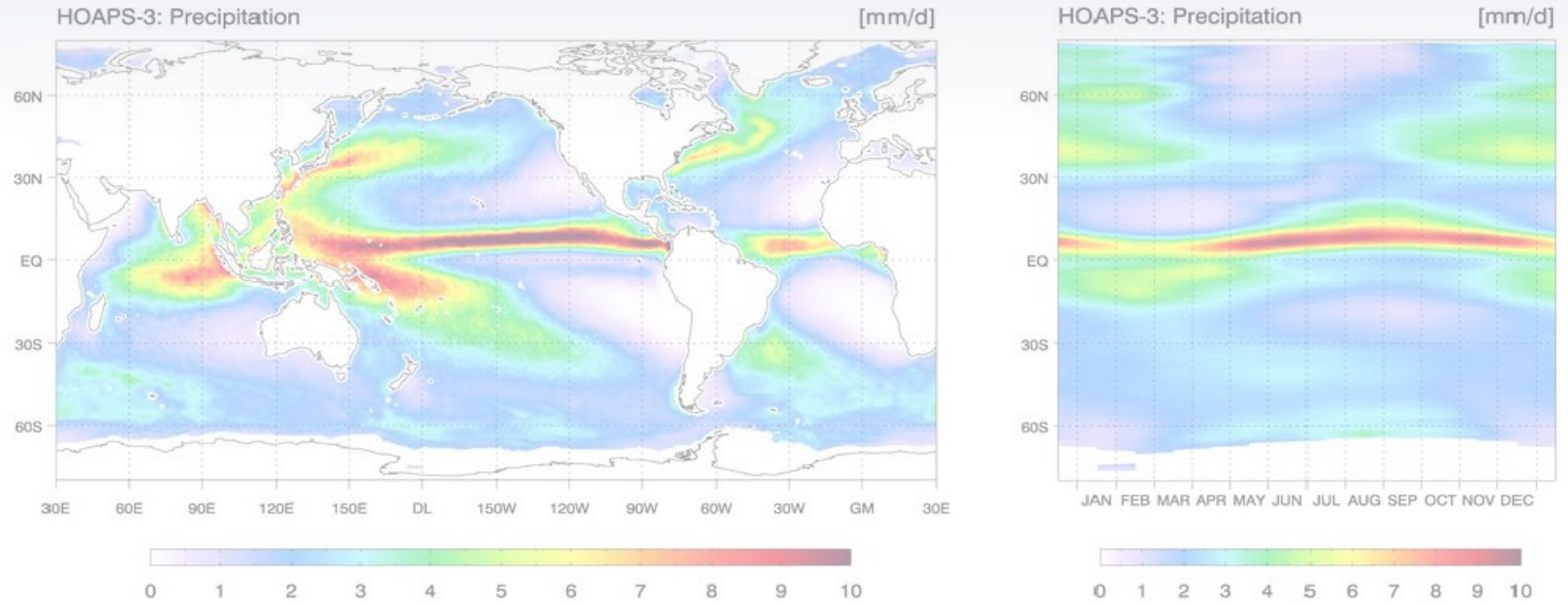

Figure 7: Climatological mean field (left) and zonal mean annual cycle (right) of HOAPS precipitation for the years 1988–2005

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Sharing Science Development within the CGMS Community

CGMS 37 recommended:

Recommendation 37.25:

On the basis of existing scientific prototype software for product retrievals, NOAA and EUMETSAT offer to other satellite operators existing prototype algorithm software for testing and further development.

This re-enforces established scientific cooperation among CGMS satellite operators.

Benefits are inter alia:

- **Joint development will widen the science basis and enhance the validation**
- **Close similarity between products will be welcome by global users and will improve coherent feedback to satellite operators**

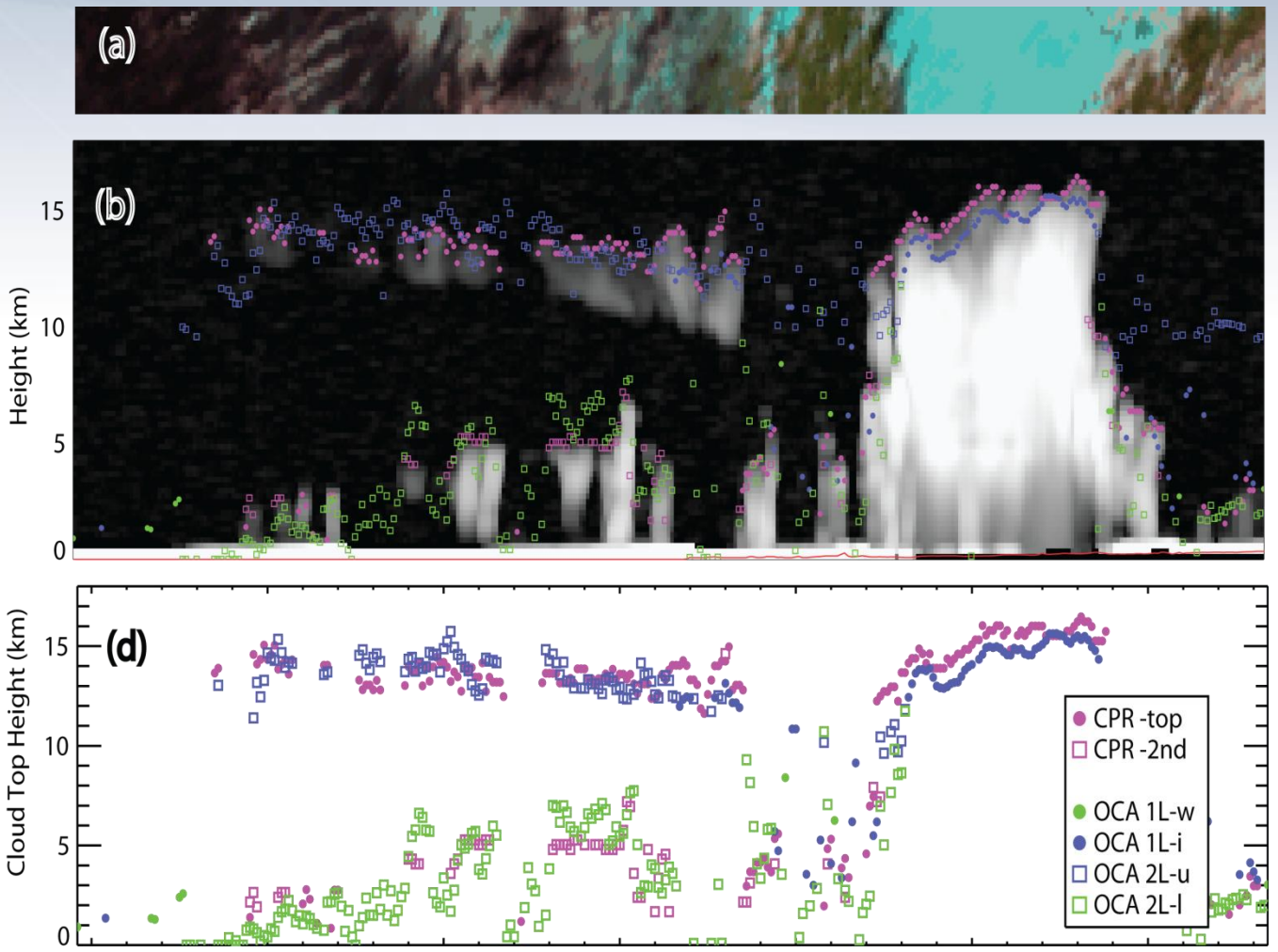
Example: Cooperation toward aligned utilization of future advanced geostationary imagers

- Many CGMS operators will fly advanced imagers on their next generation of geostationary satellites
- For instance: NOAA => ABI, JMA => Himawari-8/9 (ABI like), EUMETSAT => MTG/FCI, CMA and KMA

- EXAMPLE: Common objectives for JMA and EUMETSAT include improved and new operational products such as:

- **Cloud Analysis based on optimum estimation, e.g. for AMV height assignment**
- **Volcanic ash detection and estimation of ash density**
- **Implementation/Validation of EUMETSAT Global Instability Index (GII) over Japan (see also presentation by M. König)**

Retrieval of two cloud layers from SEVIRI on Meteosat
(from P. Watts et al. Journal of Geophysical Research, 2011)



Comparison of cloud top retrieval between: optimum estimation method using SEVIRI and space-based cloud radar on Cloudsat

=> Very good agreement for single layers

⇒ Also good agreement for two cloud layers

Only the thermal IR channels of SEVIRI (except 9.7 µm) have been used!

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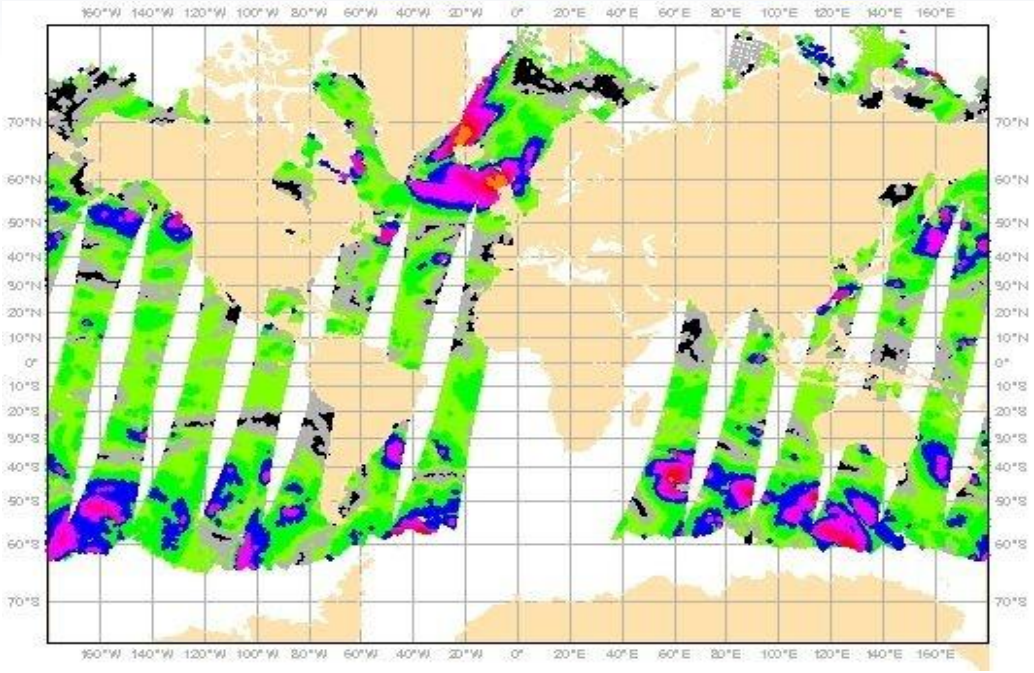
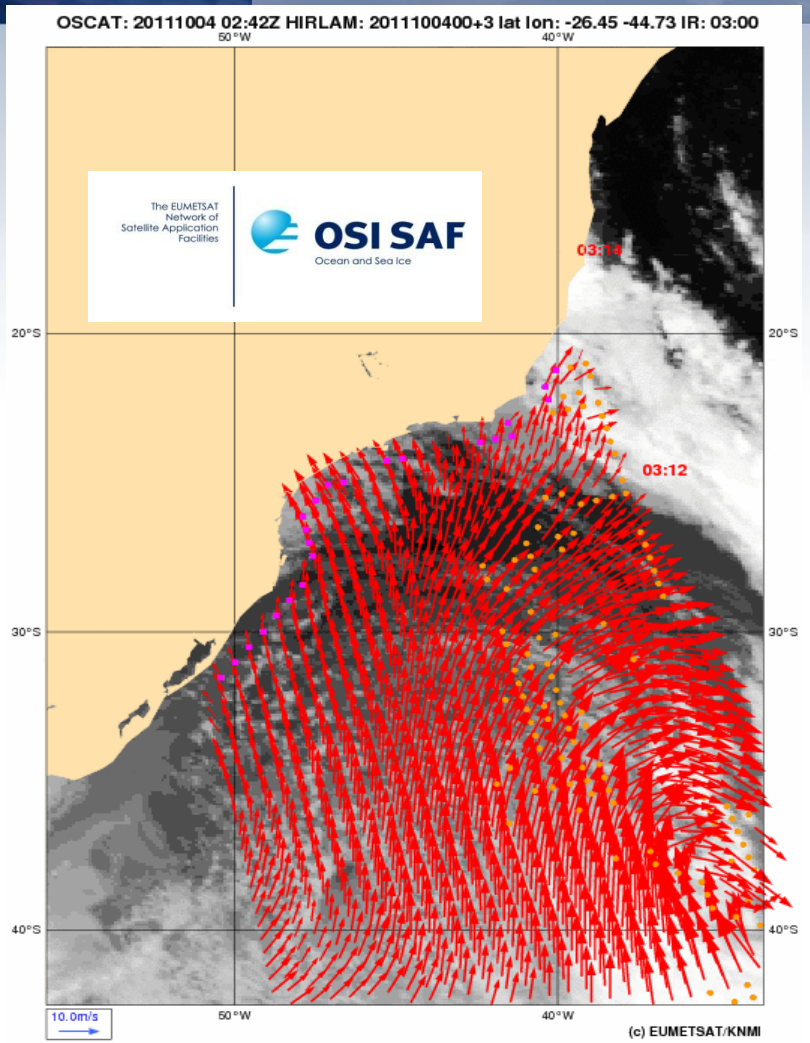
New SAF OSI products

OSI SAF: Oceansat-2 (ISRO) Scatterometer Wind products made available to users (development mode)





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Expanding user base: supprt to WMO AR6 DAWBEE Project

Local training in Montenegro

Local training in Yerevan, Armenia

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Expanding the user base: support to WMO AR1 MESA/AMESD project

Participants at the MESA Workshop which was held at EUMETSAT HQ, 9-12 May 2011

Mosaic of Africa made up of the images of the 111 EUMETCast stations in Africa
[courtesy of Telespazio]

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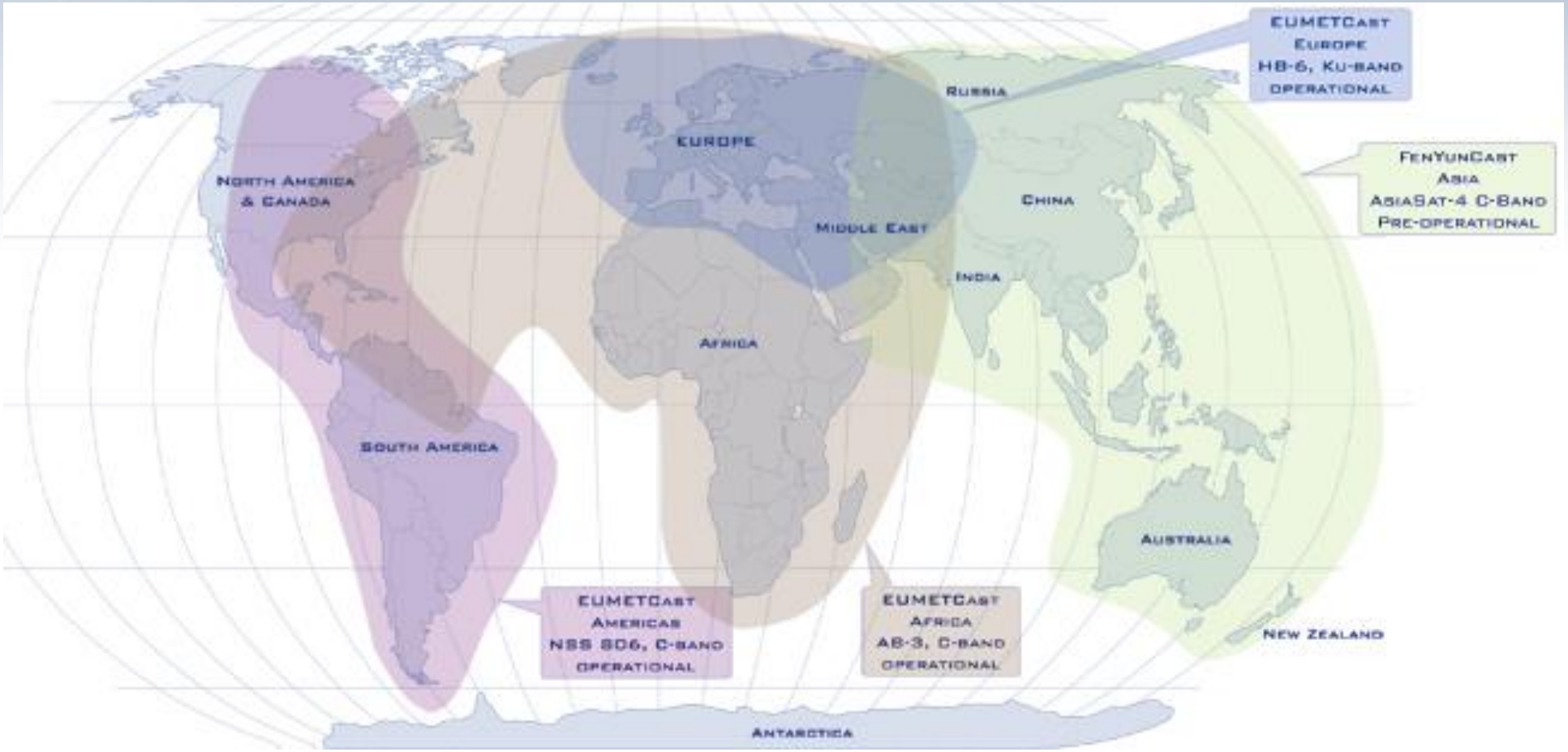
GEONETCast in support of Charter on disaster



Summary of planned Launches

2012:	MSG-3 and Metop-B
2013:	GMES Sentinel 3 A (ESA)
2014:	Jason 3
2015:	MSG-4
2016-2017:	Metop-C
2017:	GMES Sentinel 3B (ESA)
2018:	1st MTG-I
2017:	**1st** Jason CS (after Jason 3)
2019:	1st MTG-S (with GMES Sentinel 4 Instrument)
2019:	1st EPS-SG Satellite ready for launch (VII, IRS, MWS, S5, etc)
2021:	2nd EPS-SG Satellite mission ready for launch (ASCAT, MWI)
2022:	2nd MTG-I

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Monitoring weather and climate from space

THANK YOU FOR YOUR ATTENTION!

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