



2011

ANNUAL REPORT

TABLE OF CONTENTS

The word of the Director-General	2
2011 highlights	4
Member and Cooperating States	6
OPERATING COMPLEX SATELLITE SYSTEMS AROUND THE CLOCK	8
Three Meteosat satellites in geostationary orbit	8
Two operational satellites in low Earth orbit	9
An outstanding level of availability	10
A reliable and increasingly resilient ground infrastructure	11
DELIVERING SERVICES AND BENEFITS TO REAL TIME USERS 12	
Meteosat imagery at the core of nowcasting of high impact weather	12
Metop observations dramatically improve Numerical Weather Prediction forecasts	14
Improving access to data and timeliness of delivery	15
DELIVERING CLIMATE SERVICES	16
Recalibrating and reprocessing of physical measurements	17
Reprocessing geophysical products to deliver records of Essential Climate Variables	18
Adapting the EUMETSAT ground infrastructure to fulfil requirements of climate services	19
DEVELOPING NEW PRODUCTS IN PARTNERSHIP WITH MEMBER STATES	20
New operational products	21
Improvements to existing products	23
Progress in scientific developments targeting future products	23
SUPPORTING AND EXPANDING THE USER BASE	24
A comprehensive and collaborative training programme	24
EUMETSAT fellowships and visiting scientists	26
EUMETSAT user conference	26
Support to capacity building initiatives	26
SECURING SERVICE CONTINUITY IN THE MEDIUM TERM THROUGH THE DEPLOYMENT OF THE REMAINING METOP AND MSG SATELLITES	28
Preparations for the MSG-3 launch	28
Preparations for the Metop-B launch	29
PREPARING THE LONG TERM FUTURE WITH MTG AND EPS-SG 30	
The cooperation model with ESA	30
Meteosat Third Generation approved and work started	31
First steps towards the approval of EPS Second Generation	32
SUPPORTING THE DEVELOPMENT OF OPERATIONAL OCEANOGRAPHY	33
ENHANCING BENEFITS THROUGH COOPERATION WITH OTHER SATELLITE OPERATORS	34
Bilateral cooperation	34
Multilateral cooperation within CGMS	35
EUROPEAN AND GLOBAL PARTNERSHIPS	36
GMES and the European Space Policy	36
Architecture for climate monitoring from space	38
CEOS, GEO and the space charter for disaster monitoring	38
ADMINISTRATION AND MANAGEMENT	39
Financial processes	39
Procurement process	40
Human resources management	40
General infrastructure and services	41
Quality management	41
EUMETSAT mission planning, end of 2011	41
THE NEW STRATEGY: EUMETSAT, A GLOBAL OPERATIONAL SATELLITE AGENCY AT THE HEART OF EUROPE	42
KEY FIGURES	44
The EUMETSAT user base at the end of 2011	44
Operational performance indicators	45
Human resources	48
Financial information	48
APPENDIX	50
Organisation 2011	50
EUMETSAT Council and Delegate Body chairpersons, end of 2011	51
EUMETSAT Council Delegates and Advisors, end of 2011	52
Participation in major external events in 2011	54
Scientific and technical publications in 2011	55
Glossary of terms and acronyms	58

THE WORD OF THE DIRECTOR-GENERAL



2011 was undoubtedly a special year for EUMETSAT, with the celebration of its 25th anniversary, coinciding with the publication of a new strategy and the hand-over from Lars Prahm to myself.

Both the 25th anniversary and the elaboration of the strategy were unique opportunities to look back at the past EUMETSAT development and also into our future.

Looking back, the consistent guidance of our Council over the last decades has made EUMETSAT a global player, with currently five satellites in orbit delivering global observations of the Earth system to users worldwide. Partnerships have also played a key role in this success, and I wish to refer in particular to our cooperation with ESA in the development of innovative satellites, to the Initial Joint Polar System shared with the US National Oceanic and Atmospheric Administration and to cooperation within the Coordination Group for Meteorological Satellites and the World Meteorological Organization. Last but not least, the integration of EUMETSAT in the global value adding chain formed by the European Meteorological Infrastructure, which also includes the European Centre for Medium-range Weather Forecasts, the European National Meteorological Services and their EUMETNET grouping, has been invaluable in enhancing our benefits to European citizens.

Looking into the next decades, these solid foundations give me confidence that EUMETSAT can realise its new strategy and be “a global operational satellite agency at the heart of Europe”, with ambitious new satellite programmes shaping the future of operational meteorology and climate monitoring, and stimulating the development of additional operational environmental services in the context of the European

Global Monitoring for Environment and Security initiative. I was pleased to see that this expectation is shared by Estonia and Lithuania, which signed their accession agreements in December 2011 to soon become our 27th and 28th Member States.

2011 itself has to be seen as the first year of the implementation of the strategy and, for this purpose, the structure of this annual report has been aligned with strategic objectives.

Regarding operational services to users, the “*raison d’être*” of EUMETSAT, our personnel can be proud of the outstanding availability of our five operational satellites and our ground systems throughout 2011. This has enabled the organisation to exceed its operational targets for the delivery of full disc and rapid scanning imagery from the Meteosat constellation and global observational inputs to Numerical Weather Prediction models from our Metop-A polar-orbiting satellite, and to expand further the critical sea level climate record from the Jason-2 altimetry mission.

Moreover, EUMETSAT has been able to deliver more and better in 2011. The acquisition of Metop-A data at McMurdo in Antarctica, through our partnership with the US, has cut by half the time for our users to access products in real time. Our portfolio of products and services has further expanded with contributions from our central facilities and Satellite Application Facilities, with more third party data services becoming available to users as a result of the development of cooperation with China and India.

Last year was also decisive for the preparation of the medium and long term future.

First, as regards the medium term, significant progress was achieved with our partners towards the launches of the third Meteosat Second Generation and the second Metop satellites, both required in 2012 to secure continuity of our services for the next five years. I also wish to stress the significance of the successful launch of the Suomi NPP satellite by the United States, on 28 October 2011, which promises a major upgrade of our Initial Joint Polar System in 2012.

Second, for the long term, our Council approved on 25 February the Meteosat Third Generation (MTG) programme, the first pillar of EUMETSAT's long term future, in the 2020-2040 timeframe. This triggered the start of the development with ESA of the most complex geostationary satellite system ever built in support of nowcasting and short range forecasting of high impact weather. The challenge will be not only improved imagery but also, for the first time, vertical profiles of temperature and moisture on an hourly basis.

Progress could also be achieved towards the approval of the next generation polar system - called EPS-Second Generation - expected to deliver global observations to Numerical Weather Prediction models in the same timeframe. The content of the Preparatory Programme was agreed by the Council on 5 October and the voting process was opened on that basis. Recognising the challenge of deciding on strategic EPS-SG investments in the economic crisis, EUMETSAT commissioned a cost-benefit analysis which showed that the benefit-to-cost ratio to be expected from the EPS-SG programme was at least 20 under very conservative assumptions.

All these achievements were only possible through the involvement and commitment of all EUMETSAT teams, with essential contributions from our administrative sector. Likewise, our ISO 9001:2008 recertification was a collective achievement, confirming our commitment to continuously improve our management processes in a changing environment.

I cannot conclude without expressing my gratitude to the EUMETSAT Council and advisory bodies for their guidance, to our European and international partners for their support, and to all EUMETSAT employees, past and present, including my predecessors, without whom none of the above could have been achieved. Their support will continue to be essential as we have moved forward into a very challenging year 2012.



Alain Ratier
Director-General
EUMETSAT



2011 HIGHLIGHTS

The year 2011 was marked by the celebration of the 25th anniversary of the organisation, the adoption of a new strategy "EUMETSAT, a global operational satellite agency at the heart of Europe", the approval of the Meteosat Third Generation programme, the definition of the EPS-Second Generation preparatory programme, and promising developments for the use of EUMETSAT capabilities in Africa.

JANUARY

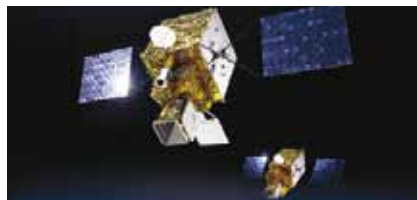


Start of MSG-3 satellite final destorage activities with ESA

Extension of geographic coverage of direct read-out of Metop-A data to Advanced High Resolution Picture Transmission (AHRPT) user stations

EUMETCast expands global dissemination to include data from the Chinese FY-3A satellite

FEBRUARY



Approval and entry into force of the EUMETSAT Meteosat Third Generation programme

New release of MSG Meteorological Products Extraction Facility (MPEF), introducing new and enhanced Meteosat products

MARCH



Cornerstone laid for EUMETSAT's Technical Infrastructure Building

JULY



EUMETSAT celebrates 25th anniversary

Second AMESD Forum takes place in Port Louis, Mauritius, after 111 new EUMETCast stations have been deployed in Africa

EPS Second Generation (EPS-SG) Space Segment Preliminary Concept Reviews held for the two parallel ESA studies

AUGUST



Alain Ratier takes up duties as EUMETSAT's new Director-General

Reprocessing of operational MSG image data for climate monitoring applications is completed

Meteosat high-rate DCP facility reaches operational status, offering enhanced capacities to users of the real-time data collection system

SEPTEMBER



2011 EUMETSAT Meteorological Satellite Conference takes place in Oslo, Norway

Third User Consultation meeting on EPS-SG is held in Darmstadt

Fourth Amendment of Joint Transition Activity agreement is signed with NOAA

First phase of MSG-3 satellite destorage activities is completed, and 15 June-14 July 2012 is agreed with Arianespace as slot for Ariane 5 launch



APRIL



Successful completion of DAWBEE project giving operational access to EUMETSAT data and products to NMHSs of the Western Balkan and Eastern European countries, with high level workshop held in Skopje, Former Yugoslav Republic of Macedonia

After record breaking 17 years of service, Meteosat-6 is moved to a graveyard orbit

MAY



Preparation workshop for Monitoring Environment and Security in Africa (MESA) project held at EUMETSAT headquarters

Metop-A collision avoidance manoeuvre on the night of 30 April - 1 May to avoid debris from COMOS 2251

JUNE



Start of routine acquisition of Metop-A data by the US station in McMurdo, Antarctica, (Antarctic Data Acquisition), cutting latency of level 1 products by two

Successful first Metop-B Satellite System Validation Test, involving commanding of the satellite by the EUMETSAT control centre

Successful completion of tests of MSG ground segment upgrades required to support MSG-3

EUMETSAT holds MTG system Preliminary Design Review

The Council approves the new EUMETSAT strategy

OCTOBER



Content of EPS-SG Preparatory Programme is approved by Council, opening voting process

Successful launch of Suomi NPP satellite by the US, preparing for major upgrade of Initial Joint Polar System shared with NOAA

Successful System Integration, Verification and Validation Review for Metop-B

CGMS agrees upgraded baseline for space component of WMO Integrated Global Observing System (WIGOS)

Board of International Charter on Space and Major Disasters accepts EUMETSAT as member

NOVEMBER



Date of launch of Metop-B by Soyuz from Baikonur is set to 23 May 2012

DLR confirms the intention of the German federal government to develop the Metimage instrument for flight on Metop-SG satellites

EUMETSAT receives ISO 9001 recertification

DECEMBER



Signature of accession agreements with Estonia and Lithuania and of cooperation agreement with ACMAD

Successful completion of Metop-B flight acceptance review with ESA, followed by beginning of launch and operational readiness review

CNES confirms the intention of the French government to develop the IASI-NG instrument for flight on Metop-SG satellites

Decision to launch MSG-4 in January 2015, for in orbit storage, to minimise risks and costs

Release of revised financial planning for approved programmes and of study on socio-economic benefits to be expected from EPS-SG

Application of EUMETSAT for full membership of Coordinated Organisations (CCR)

MEMBER AND COOPERATING STATES

In 2011, EUMETSAT had 26 Member States and 5 Cooperating States expected to become Member States in the coming years. The signature of Accession Agreements by Estonia and Lithuania, in December, paved the way for a further expansion of membership.



Mrs. Keit Pentus, Minister of the Environment of the Republic of Estonia, and Alain Ratier, Director-General of EUMETSAT at the signature of the Accession Agreement for Estonia to become a full Member State, 14 December 2011

In the year of EUMETSAT's 25th anniversary, the total number of Member States remained stable. However, further steps were achieved towards membership of Central and Eastern European countries that have already joined or are candidates for joining the European Union, with Estonia and Lithuania initiating transition from their interim status of Cooperating State to full membership.

In June, the EUMETSAT Council approved the accession of Estonia, expected to take effect in 2012, and of Lithuania, expected to take effect in 2014 following a second extension of the Cooperating State Agreement covering the period 2012-2013.

The government authorities of each country then authorised signature of their respective Accession Agreement. The Director-General signed the Accession Agreement with Estonia with the Estonian Minister of the Environment, Mrs Keit Pentus, on 14 December. One week later, he signed both the extension of the Cooperating State Agreement and the Accession Agreement with Lithuania with Mr Gediminas Kazlauskas, the Lithuanian Minister of the Environment. The accession of both countries will take effect after parliamentary ratification.

In November, the EUMETSAT Council approved a second extension of the Cooperating State Agreement with Bulgaria, to cover the period 2012-2013, with the expectation that accession will follow in 2014.

Discussions with Iceland and Serbia concerning their possible accession in the 2014 timeframe also made progress throughout the year.



Mr. Gediminas Kazlauskas, Lithuanian Minister of the Environment, signing the Accession Agreement for Lithuania to become a full Member State, 23 December 2011








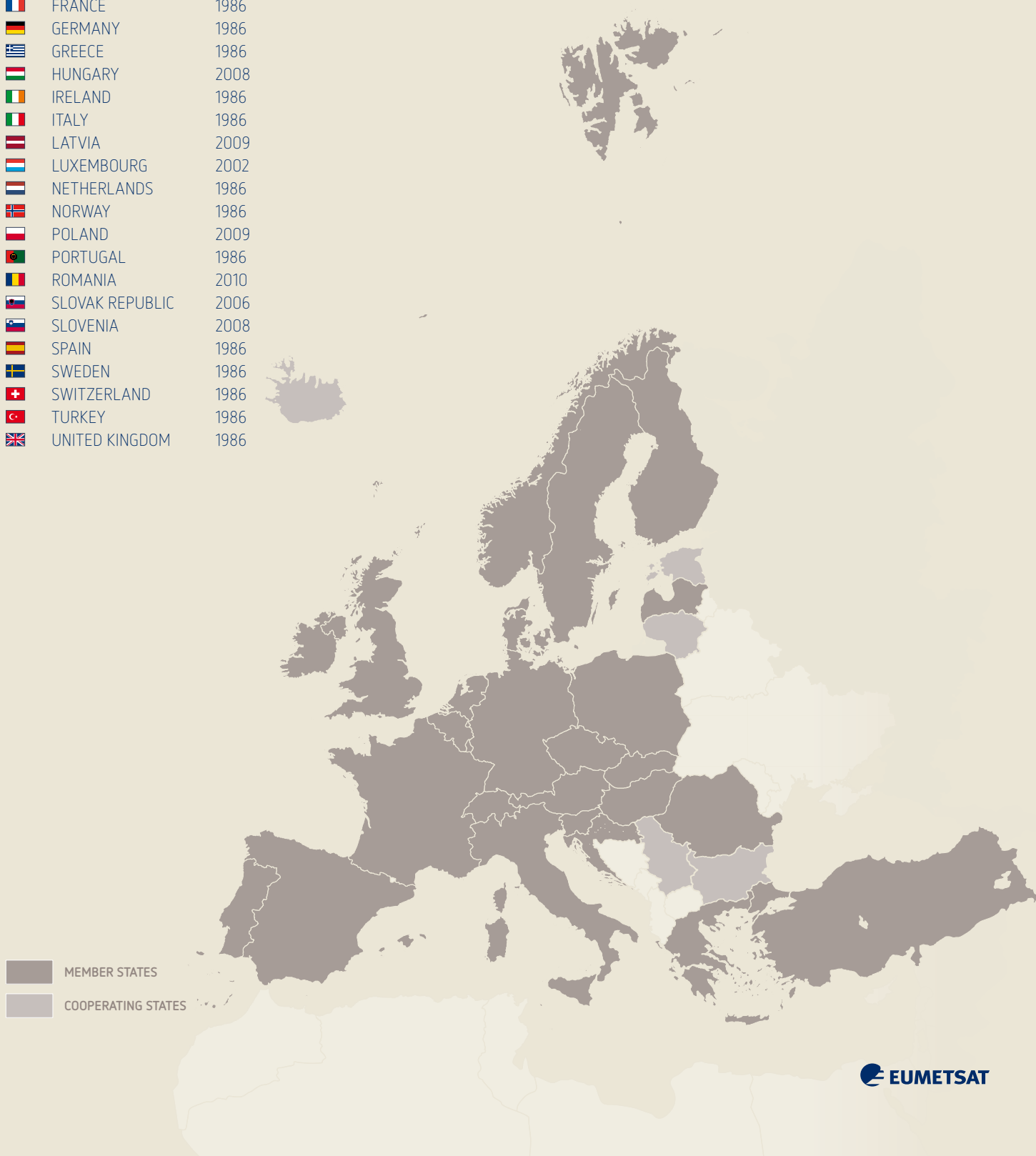
EUMETSAT MEMBER AND COOPERATING STATES



MEMBER STATES

	SINCE
	AUSTRIA 1993
	BELGIUM 1986
	CROATIA 2006
	CZECH REPUBLIC 2010
	DENMARK 1986
	FINLAND 1986
	FRANCE 1986
	GERMANY 1986
	GREECE 1986
	HUNGARY 2008
	IRELAND 1986
	ITALY 1986
	LATVIA 2009
	LUXEMBOURG 2002
	NETHERLANDS 1986
	NORWAY 1986
	POLAND 2009
	PORTUGAL 1986
	ROMANIA 2010
	SLOVAK REPUBLIC 2006
	SLOVENIA 2008
	SPAIN 1986
	SWEDEN 1986
	SWITZERLAND 1986
	TURKEY 1986
	UNITED KINGDOM 1986

COOPERATING STATES

	SINCE
	BULGARIA 2005
	ESTONIA 2006
	ICELAND 2006
	LITHUANIA 2005
	SERBIA 2009



 MEMBER STATES
 COOPERATING STATES

OPERATING COMPLEX SATELLITE SYSTEMS AROUND THE CLOCK

In 2011, EUMETSAT exploited five operational satellites in three different orbits to deliver observations of the weather, atmospheric composition, ocean and land surfaces and our changing climate. The availability of all satellite systems and supporting ground infrastructure has been excellent, with only a few hours outage.

THREE METEOSAT SATELLITES IN GEOSTATIONARY ORBIT

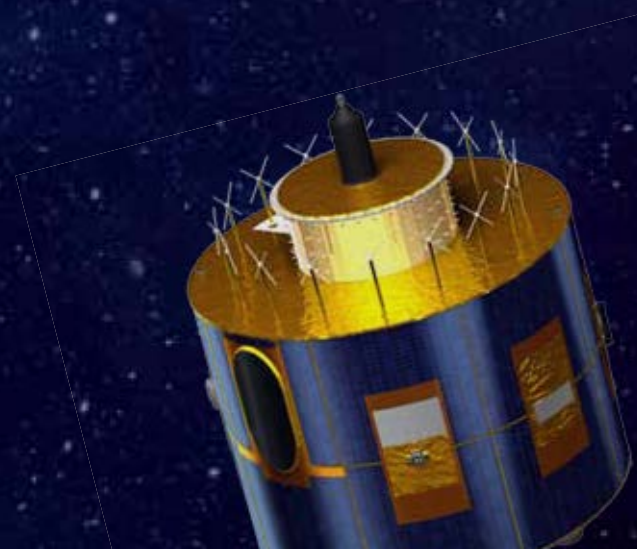
After the safe de-orbiting of Metosat-6, in April, Meteosat-7 became the last first generation Meteosat satellite still in operation. It continued to deliver the Indian Ocean Data Coverage mission, bridging an important observation gap over this region. Image data are provided in three spectral channels, every 30 minutes delivering important information that is used to monitor tropical cyclones and dust storms and to extract wind products used by global forecast models. Furthermore, the Data Collection System, which collects and relays environmental data gathered from data collection platforms to users,

is an important element of the Indian Ocean Tsunami Warning System. It relays in real time measurements of sea bed pressure variations to tsunami warning centres which are transmitted by some 50 moored buoys.

Over Europe and Africa, the Meteosat Second Generation satellites are operated as a two-satellite system, with Meteosat-8 providing the Rapid Scanning Service, delivering images of Europe and adjacent seas every five minutes, and Metosat-9 delivering full disc images every 15 minutes in support of nowcasting and forecasting of high impact weather up to 12 hours in advance.

FIG.1

Meteosat-8 rapid scan (right) and Meteosat-9 full disc (left) RGB composite images of 1 October 2011, when a large area of high pressure brought cloud-free, unusually warm weather conditions with some parts of Europe experiencing record-breaking temperatures for the time of year



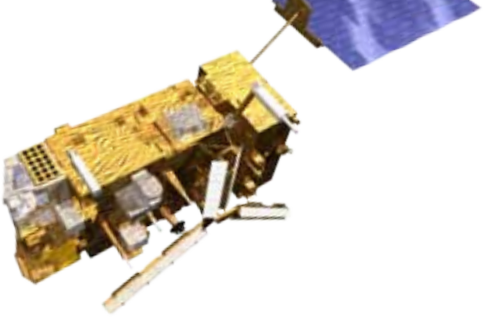


FIG. 2

New Metop-A Scatterometer coastal wind product (red vectors), from the OSI SAF, superimposed with a Meteosat infrared image and NWP model wind forecasts (blue vectors), 6 December 2011, (Source: KNMI, OSI SAF)



TWO OPERATIONAL SATELLITES IN LOW EARTH ORBIT

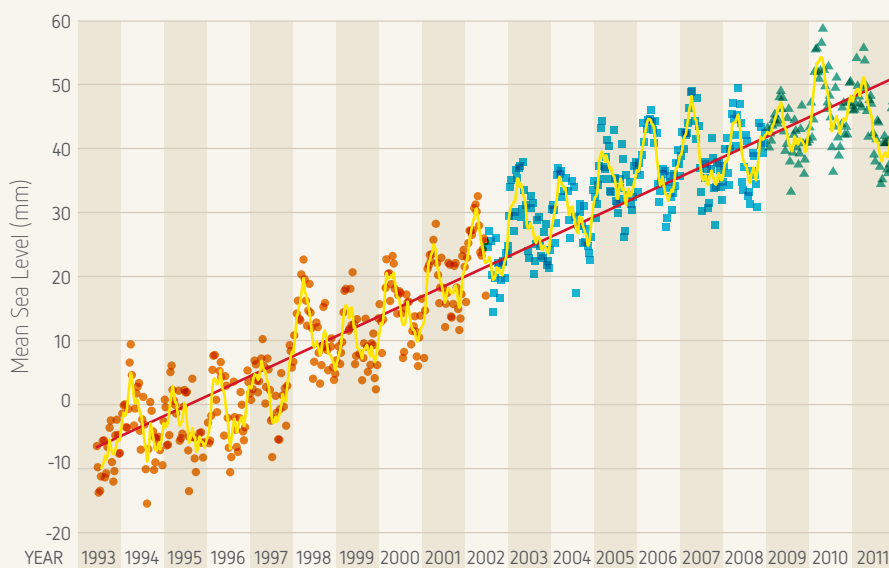
EUMETSAT also continued to exploit Metop-A from its sun-synchronous mid-morning orbit as part of the Initial Joint Polar System (IJPS) shared with the United States. Metop-A continued to deliver highly accurate global observations of unique atmospheric, land and ocean parameters that are only accessible from the low Earth orbit, providing critical inputs to Numerical Weather Prediction models used for all short- to medium-range forecasts.

From a different, non-synchronous orbit inclined at 66 degrees, Jason-2 continued to deliver high-precision altimetry observations of wave height, mean sea level

and ocean currents, in support of marine meteorology, operational oceanography and climate monitoring. The unique sea level data series accumulated since 1992 by Topex/Poseidon and Jason-1 has thus been expanded by another year, forming an invaluable Climate Data Record.



GLOBAL MEAN SEA LEVEL TIME SERIES



- ▲ JASON-2
- JASON-1
- TOPEX/POSEIDON
- 60-day smoothing
- Average trend
Average rate of increase over data record: 3.1 ± 0.4 mm/yr

Source: University of Colorado, LEGOS/CNES

OPERATING COMPLEX SATELLITE SYSTEMS AROUND THE CLOCK

CONTINUED

METOP-A (98.7° incl.)

EUMETSAT POLAR SYSTEM

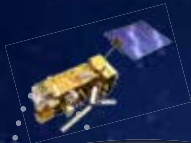
Kept in its nominal mid-morning sun synchronous orbit at 817km altitude as part of the EUMETSAT Polar System (EPS)

JASON-2 (66° incl.)

OCEAN SURFACE TOPOGRAPHY

Kept in its nominal non-synchronous low Earth orbit at 1,336km altitude, in support of the Ocean Surface Topography Mission.

METOP-A



JASON-2



AN OUTSTANDING LEVEL OF AVAILABILITY

The availability of all EUMETSAT satellites – which is one of the prerequisites for the provision of a reliable high quality service – has been very stable, with a performance close to 100% exceeding targets.

The few incidents encountered in orbit were due to the harsh radiation environment in space or necessary satellite manoeuvres and were managed with minimal service interruptions of a few hours over the year.

After Meteosat-8 went into safe mode on 21 August, the Rapid Scanning Service could be recovered on 23 August at 09:00 UTC. Given that a scheduled interruption of 48 hours was subsequently cancelled, the net service outage was ultimately reduced to just around four hours.

Likewise, the impact of the spontaneous Metop-A payload switch-off which occurred on the night of 22-23 October resulted in an overall service interruption of 19 to 66 hours, with most services recovered within one day. The first collision avoidance manoeuvre performed by the Metop-A satellite, on 30 April, did not impact operations. It was based on space debris conjunction warnings provided to EUMETSAT by the US Air Force Joint Space Operations Center (JSPOC), in the context of the IJPS cooperation with the US National Oceanic and Atmospheric Administration (NOAA).

Based on this outstanding level of availability, all EUMETSAT satellites have also continued to harvest consistent observations for climate monitoring. The Meteosat series of satellites celebrated three decades of climate records on 16 August 2011, and these records will be further expanded until at least 2038 by Meteosat satellites of the second and third generations.



METEOSAT-7

METEOSAT-9

METEOSAT-8

METEOSAT-9 (0°)

METEOSAT FULL DISC IMAGERY

Positioned at 0° in support of the prime Meteosat full disc imagery service over the European continent, Africa and parts of the Atlantic and Indian oceans.

METEOSAT-8 (9.5° EAST)

RAPID SCANNING SERVICE (RSS)

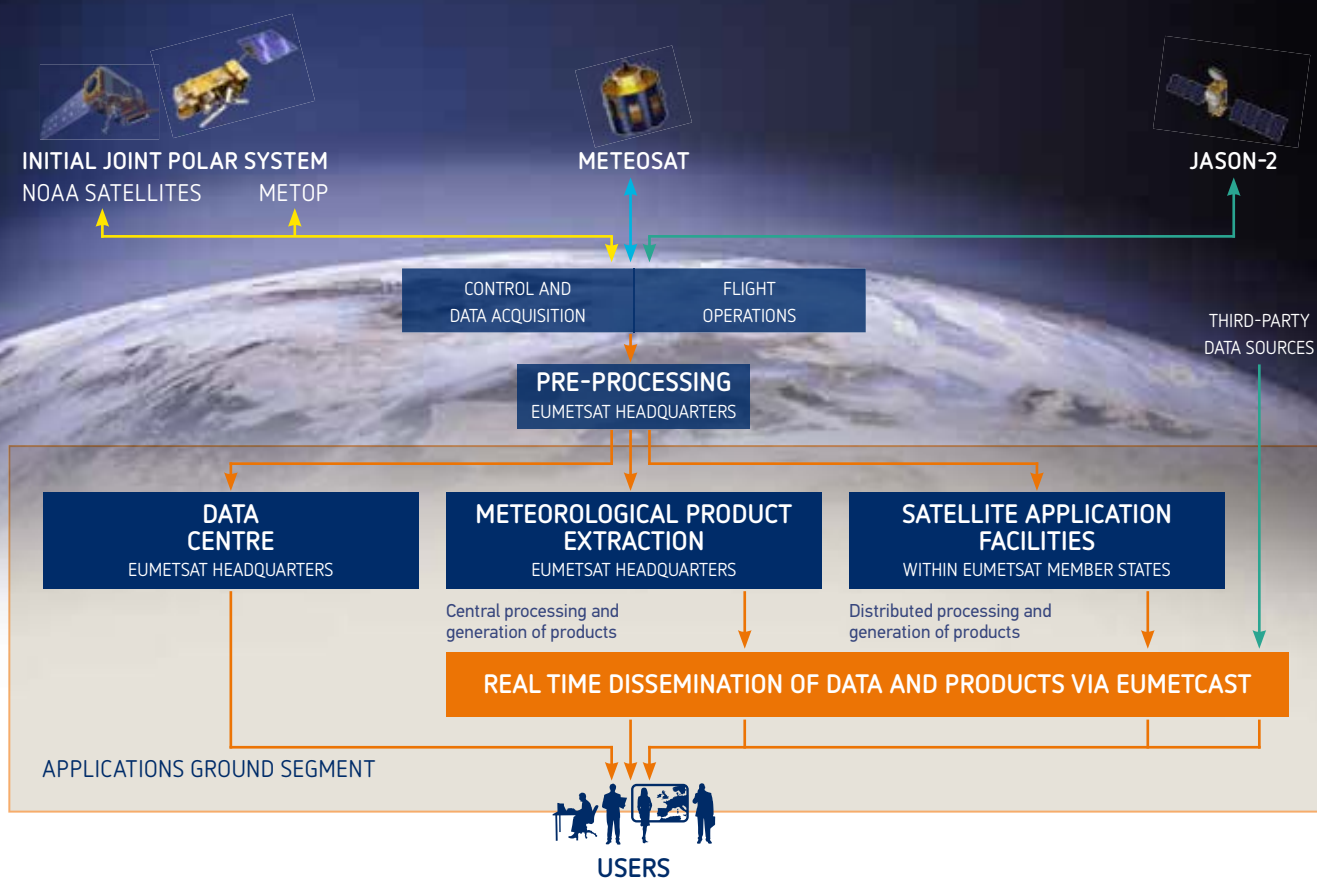
Positioned at 9.5° East delivering the Rapid Scanning Service (RSS) over Europe and adjacent seas.

METEOSAT-7 (57.5° EAST)

INDIAN OCEAN DATA COVERAGE

Operated at 57.5° East in support of the Indian Ocean Data Coverage (IODC) mission, bridging an observation gap in this region

EUMETSAT GROUND SEGMENT OVERVIEW



A RELIABLE AND INCREASINGLY RESILIENT GROUND INFRASTRUCTURE

The performance of the complex EUMETSAT ground segment which controls the satellites, acquires their data, extracts and delivers products to users was in line with the excellent performance in space, ensuring reliable delivery of products and services at the user end. One key indicator of ground segment robustness is the EUMETCast system, whose non-availability amounted to less than eight hours for the whole year.

Looking into the future, further improvements to the resilience of systems in case of disruptive circumstances were prepared under the Operations Service Continuity project. The project established an off-site back-up coordination room and the capability to reconstruct systems after a disaster, also improving the protection of critical source software and data bases. Construction work on the Technical Infrastructure Building (TIB), where all EUMETSAT ground systems will be migrated in the forthcoming years, also progressed within schedule and



budget towards its inauguration in spring 2012. The optimised installation of systems in this building will increase their security, resilience and efficiency, and will reduce the carbon footprint of EUMETSAT, using green computing technology.

EUMETSAT's Technical Infrastructure Building under construction

DELIVERING SERVICES AND BENEFITS TO REAL TIME USERS

Capitalising on its own satellites and on cooperation with other operators, EUMETSAT delivers time critical data to National Meteorological Services of its Member and Cooperating States and to users worldwide. In 2011, its EUMETCast satellite-based dissemination service delivered in real time to over 3,900 low cost terminals over three continents, with an average availability above 99%.

The MSG Rapid Scanning Service provides a vital service, in particular in support of nowcasting of rapidly developing high impact weather events like thunderstorms.

The primary mission of EUMETSAT is the real-time delivery of critical information extracted from observations of its own and other satellites to the National Meteorological Services of its Member and Cooperating States and the European Centre for Medium range Weather Forecasts (ECMWF), in support of the official duties of the former, and to authorised users worldwide.

As in previous years, the EUMETSAT inputs were essential for forecasting and managing a number of high impact weather situations across Europe, and to further reduce errors in Numerical Weather Prediction models, bringing great benefits to European citizens, decision makers and the weather sensitive sectors of the economy.



FIG. 3

Meteosat-8 High Resolution Visible (HRV) rapid scanning image of a storm over the Mediterranean Sea, 8 November 2011, 10:00 UTC. The Meteosat-8 images delivered every five minutes helped to monitor the storm which started to develop on 4-6 November. As the storm moved slowly westwards, it strengthened significantly, with convection increasing, and on 7 November, it had some features of a tropical storm. At peak intensity, the storm had a minimum low pressure of 991 hPa and wind speeds were estimated to have reached 45 knots. Overall, the storm caused severe flooding in parts of Spain, Italy and France, producing up to 600mm of rain over the 6-8 November timeframe.

METEOSAT IMAGERY AT THE CORE OF NOWCASTING OF HIGH IMPACT WEATHER

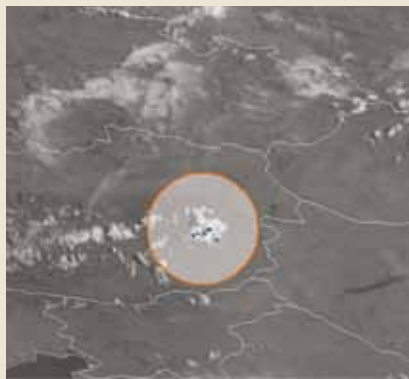
Frequent images from Meteosat are used directly by forecasters for the prediction of rapidly developing high impact weather up to a few hours ahead or to check in real time their previous forecasts against actual observations.

The Meteosat-8 Rapid Scanning Service was again critical to follow and anticipate the evolution of exceptional storms, like the one encountered over the Mediterranean Sea on 6-8 November 2011.

Forecasting the initiation of atmospheric convection is another challenge for forecasters because processes that determine when and where a thunderstorm will form are still often only poorly resolved by Numerical Weather Prediction models. Forecasters therefore rely on information from geostationary satellites and weather radars to precisely locate and follow mature convective storms. In particular, Meteosat infrared imagery helps detect precursor signals of initiation of convection using a nowcasting algorithm that relates satellite information to attributes of growing

FIG. 4

On 21 May 2011, convective initiation, marked in red in left figure (background image is the Meteosat-9 High Resolution Visible channel) could be detected by Meteosat at 07:15 UTC over Austria, 45 minutes before the first occurrence of convection was depicted by weather radar signal above 35 dbZ (centre picture at 08:00 UTC, blue for 35-40 dbZ and green for 40-45 dbZ). The right figure is the satellite view of the fully developed storm at 11:30 UTC.



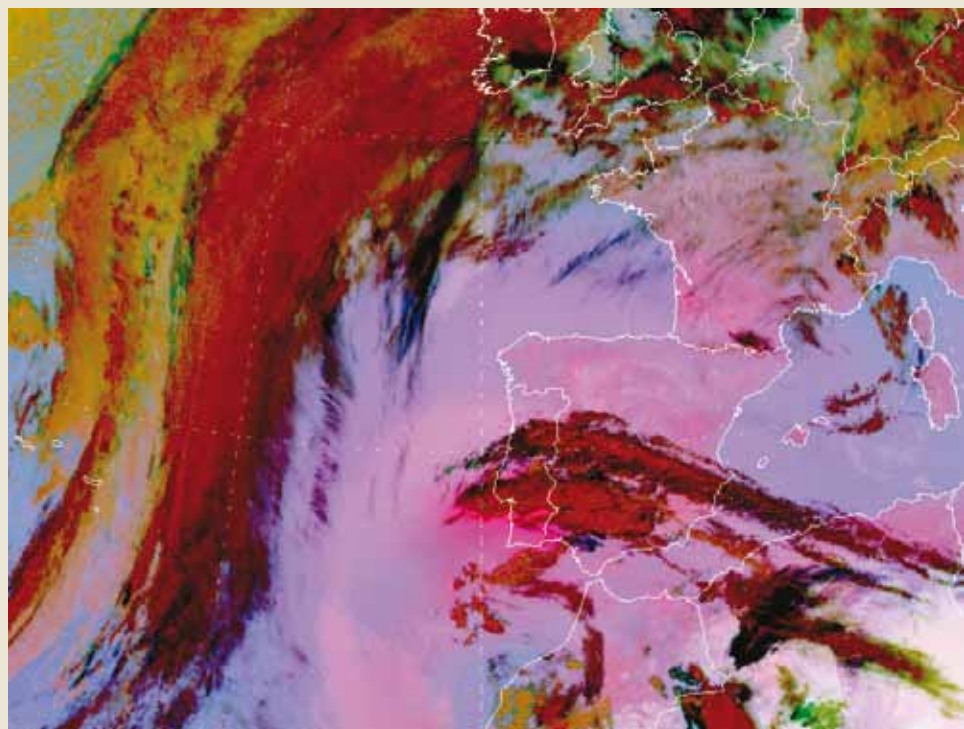
convective clouds, thus increasing the warning lead time with respect to radar observations, as was the case on 21 May over Austria.

Meteosat observations of aerosols and atmospheric composition are also critical for monitoring and forecasting air quality and the transport and dispersion of atmospheric pollution or volcanic ash.

One of the most useful products to monitor the evolution of dust clouds and storms is the dedicated RGB image product from the MSG satellite.

FIG. 5

On 5-9 April 2011, the Iberian Peninsula was affected by thick dust clouds. Although it was night time and the dust cloud could not be observed from the ground, this image from 00:00 UTC on 6 April shows an impressive dust cloud in strong magenta colour over the region of Lisbon, to the south of thick high clouds in dark red/brown. In Portugal, air quality dropped to poor, with a sharp increase of concentration of particles of different sizes (PM_{2.5} and PM₁₀) as well as aerosol optical thickness.



DELIVERING SERVICES AND BENEFITS TO REAL TIME USERS

CONTINUED

METOP OBSERVATIONS DRAMATICALLY IMPROVE NUMERICAL WEATHER PREDICTION FORECASTS

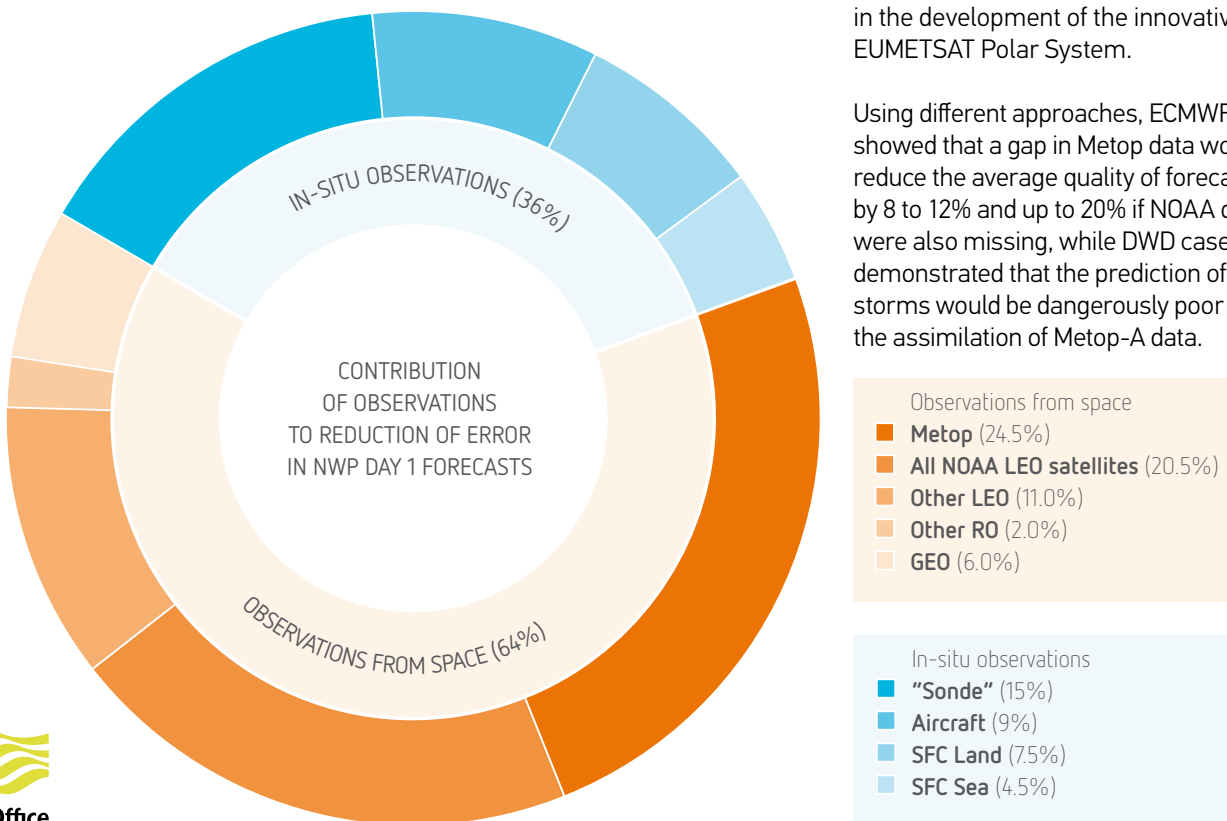
Global observations from polar orbiting satellites like Metop are ingested, together with some observations from all Meteosats, into the global and regional Numerical Weather Prediction models that are used by forecasters as the main source of information for forecasts from 12 hours up to 10 days. In addition, observations of the ocean from Metop and Jason-2 are used for forecasting sea state and dispersion of marine pollutants and for seasonal forecasting.

The positive impact of Metop products on global Numerical Weather Prediction was reassessed in 2011 by studies performed by ECMWF, the Deutscher Wetterdienst (DWD), the Met Office (UK) and Météo-France. The study conducted by the Met Office (UK) evaluated the contribution of satellite observations to the reduction of Day 1 forecast errors, showing that these observations account for 64% of the error reduction brought together by all observations available in real time, with the EUMETSAT Metop-A satellite alone contributing 24.5%. Moreover, Metop-A data account for 40% of the error reduction due to all satellite observations, which is 2.5 times more than NOAA-19, the last polar-orbiting satellite of the previous generation. This demonstrates the high return on the European investment made in the 1990s in the development of the innovative EUMETSAT Polar System.

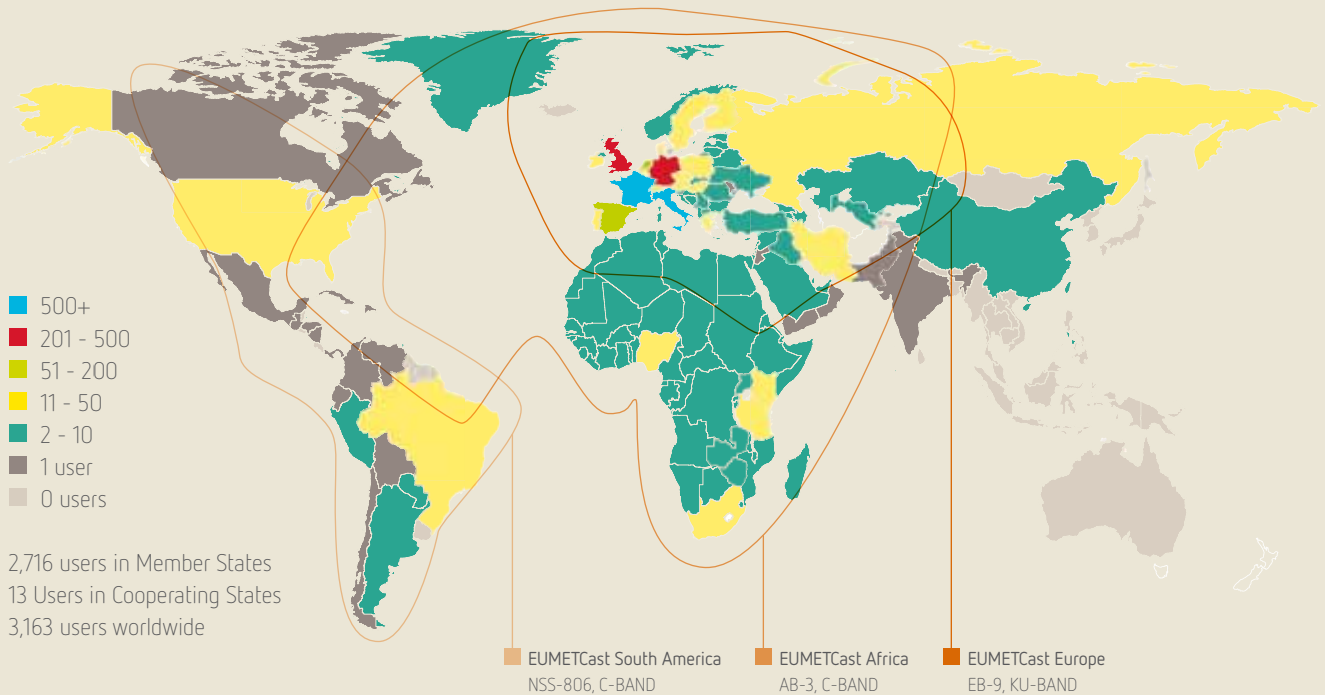
Using different approaches, ECMWF studies showed that a gap in Metop data would reduce the average quality of forecasts by 8 to 12% and up to 20% if NOAA data were also missing, while DWD case studies demonstrated that the prediction of major storms would be dangerously poor without the assimilation of Metop-A data.

FIG. 6

Contribution of Metop data (24.5%), relative to other data sources, to Numerical Weather Prediction forecasts (Source: Met Office (UK))



EUMETCast coverage and worldwide user distribution, December 2011



IMPROVING ACCESS TO DATA AND TIMELINESS OF DELIVERY

One challenge for EUMETSAT is to deliver observational products as quickly as possible after sensing - because the value of observations for forecasting diminishes with increasing latency - and to offer the easiest possible access to users worldwide.

In June, a major breakthrough was the improvement to the timeliness of the delivery of global Metop-A data following the start of the Antarctic Data Acquisition demonstration service in the framework of IJPS cooperation with NOAA. The acquisition of Metop-A data by NASA/NSF at McMurdo, Antarctica, in addition to Svalbard, has cut by half the latency of level 1 products to around 60 minutes from sensing.

In addition, the EUMETSAT Advanced Retransmission Service (EARS) has started to deliver more products from Metop-A instruments, following the expansion of the activation zone of the Metop direct read-out capability (HRPT). EARS enables quicker access (between 15-30 minutes from sensing) to regional level 1 and 2 products derived from data acquired directly from polar satellites at selected direct read-out ground stations.

The EUMETCast satellite-based dissemination service has continued to deliver all EUMETSAT real-time data streams to low cost user terminals distributed across three continents, with an average system availability of 99.9% and only one significant six-hour outage on 4-5 September.

EUMETCast was also the vehicle for delivering new third party data services introduced in 2011 as a result of data exchange partnerships with China and India. Vertical profiles of humidity and temperature from the Microwave Humidity Sounder (MWS) and Microwave Temperature Sounder (MWS) instruments on board the FY-3A and FY-3B satellites started to be disseminated in real time, as well as observations of ocean surface wind vectors from the OSCAT scatterometer flown on the Indian Oceansat-2 satellite. Last but not least, following the successful launch of the Suomi NPP satellite on 28 October, work started with NOAA to prepare for global and regional near-real-time data services to EUMETSAT users.

On the Internet, the Product Navigator (<http://navigator.eumetsat.int>) was updated in August to provide improved search capabilities, including enhanced search options using the map functionality.

DELIVERING CLIMATE SERVICES

The emerging Global Framework for Climate Services calls for the development of climate services in synergy with weather services. Meteorological satellites have already accumulated unique records of our changing climate over more than 30 years and will play a major role in climate monitoring. Therefore, EUMETSAT is developing capabilities to ensure the best possible exploitation of its assets for this purpose.



Jörg Schulz
Climate Product Expert
EUMETSAT

"With more than 30 years of consistent data, meteorological satellites are an invaluable asset for the analysis of inter-annual climate variability. Exploiting this requires dedicated international efforts for recalibrating and reprocessing data, extracting climate records and making them available to researchers and decision makers"

EUMETSAT climate monitoring activities involve the Central Facilities in Darmstadt, the network of Satellite Application Facilities (SAFs), with a leading role for the SAF on Climate Monitoring, and contributions to selected cooperation projects involving international partners. They rely on the archiving and data processing infrastructure available at EUMETSAT headquarters and at the SAFs.

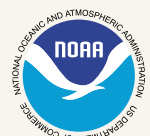
The activities encompass recalibration and inter-satellite calibration, reprocessing of physical measurements (level 1) from different satellite instruments generating Fundamental Climate Data Records, downstream reprocessing of geophysical products (level 2) generating Thematic Climate Data Records for selected Essential Climate Variables, and validation. These climate records can then be used

directly or included in atmospheric reanalysis aiming at producing physically consistent climate data records through the assimilation of reprocessed observations into the best available Numerical Weather Prediction models.

Progress has been achieved in 2011 in the context of two major cooperative projects, the WMO Sustained, Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM) initiative and the EC/FP-7-funded European Reanalysis of Global Climate Observations (ERA-CLIM) research project led by ECMWF aimed at preparing input data and assimilation systems for a future global atmospheric reanalysis covering the 20th century. Both initiatives require recovery and extensive reprocessing of early satellite observations at EUMETSAT.



SCOPE-CM aims to establish a coordinated international network to produce Climate Data Records (CDRs) operationally from multi-agency mission data, in response to Global Climate Observing System (GCOS) requirements.



RECALIBRATION AND REPROCESSING OF PHYSICAL MEASUREMENTS

Acknowledging that re-calibration and cross calibration are prerequisite steps in the reprocessing of satellite data for climate monitoring applications, as shown in the figure below, EUMETSAT contributes to the Global Space-based Inter-Calibration System (GSICS) project, which provides an international platform to create calibration products to improve the consistency of the data received from various satellites.

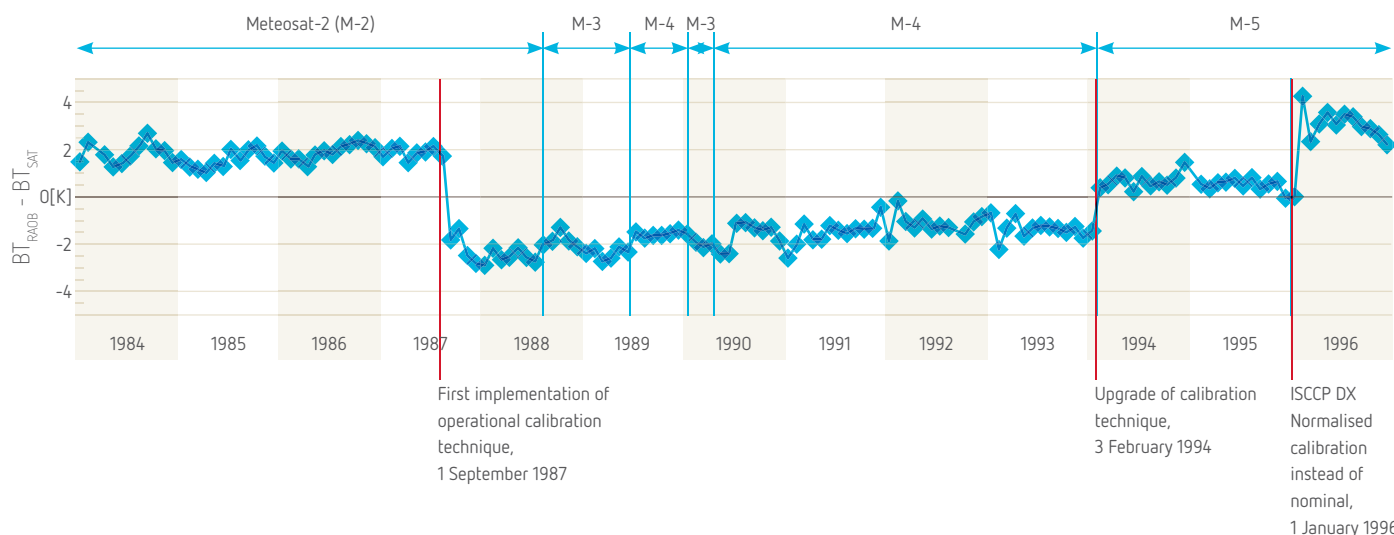
Cross-calibration and reprocessing of level 1 products, as a prerequisite for assimilation at ECMWF, form the major contribution by EUMETSAT to ERA-CLIM.

Preparations for the reprocessing of almost all EUMETSAT archived Meteosat and Metop data began in February following the kick-off of the ERA-CLIM project, and, in August, the reprocessing of operational MSG image data was completed and the data distributed to users. The SAF and ESA Climate Change Initiative (CCI) projects will also benefit from these activities as they ensure the best possible input data for the reprocessing of geophysical products.

A second reprocessing of GOME-2 level 1 products (GOME-2-R2) started in August in support of the analysis of instrument ageing and of the ESA-CCI ozone and trace gas projects. The reprocessing increases data quality by introducing corrections for instrument degradation over time.

FIG. 7

Differences between clear sky infrared Brightness Temperatures at 6.2 μm (from the ISCCP DX data set) from successive Meteosat satellites and those calculated from night-time radiosonde data available each month. The difference (in Kelvin) is plotted as a function of time, showing the need to cross-calibrate data from successive missions. (Source: Remy Roca, LMD)



DELIVERING CLIMATE SERVICES

CONTINUED

REPROCESSING GEOPHYSICAL PRODUCTS TO DELIVER RECORDS OF ESSENTIAL CLIMATE VARIABLES

Regarding geophysical products, the reprocessing of surface albedo extracted from geostationary imagery (GSA) is one of the SCOPE-CM projects involving the Japan Meteorological Agency (JMA), NOAA and EUMETSAT. The aim is to deliver a quasi global surface albedo product derived from a total of five geostationary satellites.

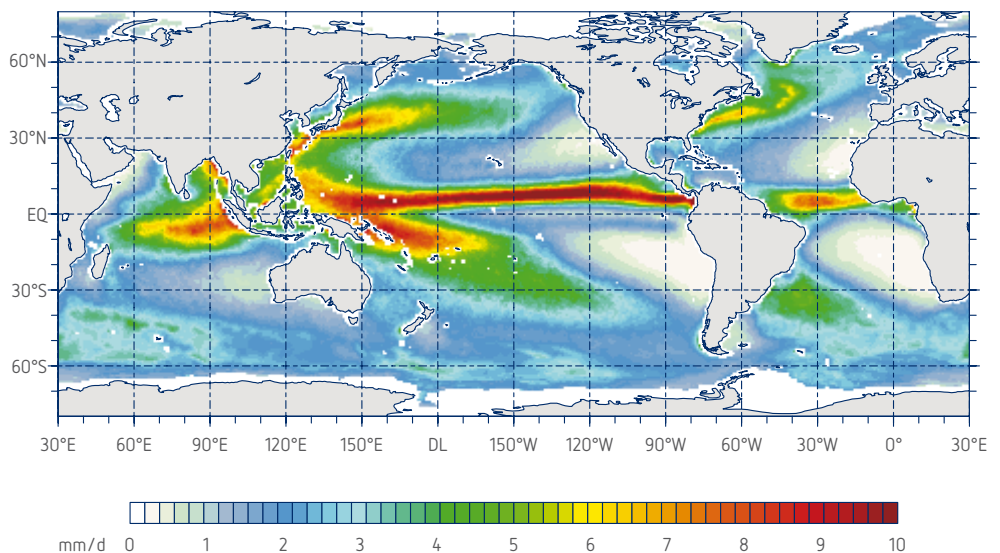
EUMETSAT has supported implementation and testing of its algorithm at NOAA, and reprocessed GSA for Meteosat first generation, over the Indian Ocean, Atlantic Data Coverage and Extended Atlantic Data Coverage.

In December, EUMETSAT initiated a validation project that compares GSA results to surface albedo data sets from other satellite instruments and surface-based measurements to establish an improved estimate of product uncertainties.

The SAF on Climate Monitoring has delivered a new 20-year climate data record, extracting water balance variables such as precipitation and evaporation from the Special Sensor Microwave Imager (SSM/I) imaging microwave radiometers flown as part of the US Defense Meteorological Satellite Program. This delivery marks the successful transition of a data record from a research environment to a sustained operational environment. This is an important step towards the provision of climate services in the context of the architecture for climate monitoring from space.

FIG. 8

Mean field of precipitation for the years 1988–2005 derived from SSM/I microwave imagery (Source CM SAF)



ADAPTING THE EUMETSAT GROUND INFRASTRUCTURE TO FULFIL REQUIREMENTS OF CLIMATE SERVICES

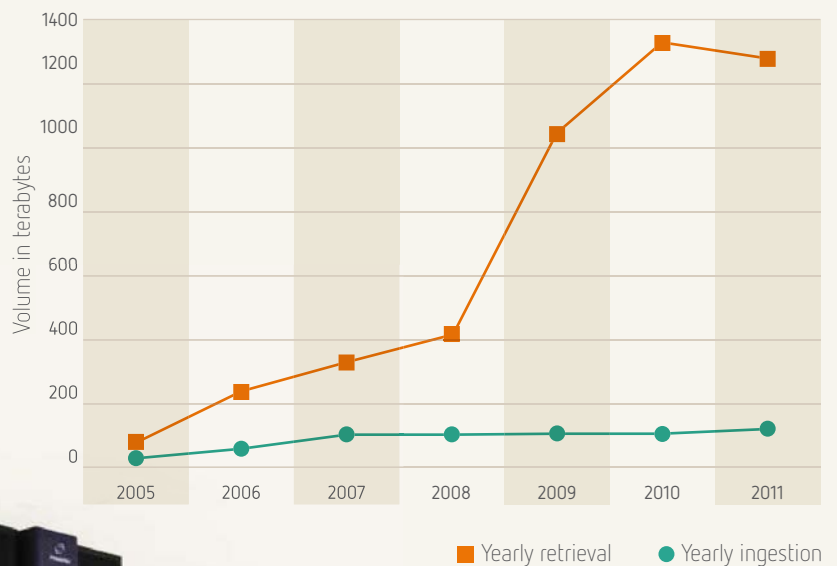
Fulfilling requirements of climate services calls for adapting and developing infrastructure to perform recalibration, massive reprocessing, archiving and long term preservation of data and products and delivery of services to users. Within EUMETSAT, this effort is shared between the Data Centre available at the central facilities and the network of Satellite Application Facilities.

In 2011, three dedicated reprocessing systems for Meteosat images and meteorological products and for Metop products were deployed, and a number of technical developments were finalised in the Data Centre to offer operational accessibility to GSICS calibration data sets from various partners.

*EUMETSAT Data Centre Archive
Darmstadt, Germany*

The EUMETSAT Data Centre archive contains the full Meteosat and Metop data and products, representing approximately 32.5 million files totalling 648 terabytes at the end of 2011. Data access remains at a high level, with volume retrieved from the archive 10 times higher than the amount of ingested data on an annual basis. A total of nearly nine million files were delivered to users in 2011. This corresponds to an average archive retrieval/delivery performance of one file every three seconds, including optional data processing such as spatial or spectral sub-setting and reformatting.

EUMETSAT DATA CENTRE: A LIVING ARCHIVE



DEVELOPING NEW PRODUCTS IN PARTNERSHIP WITH MEMBER STATES

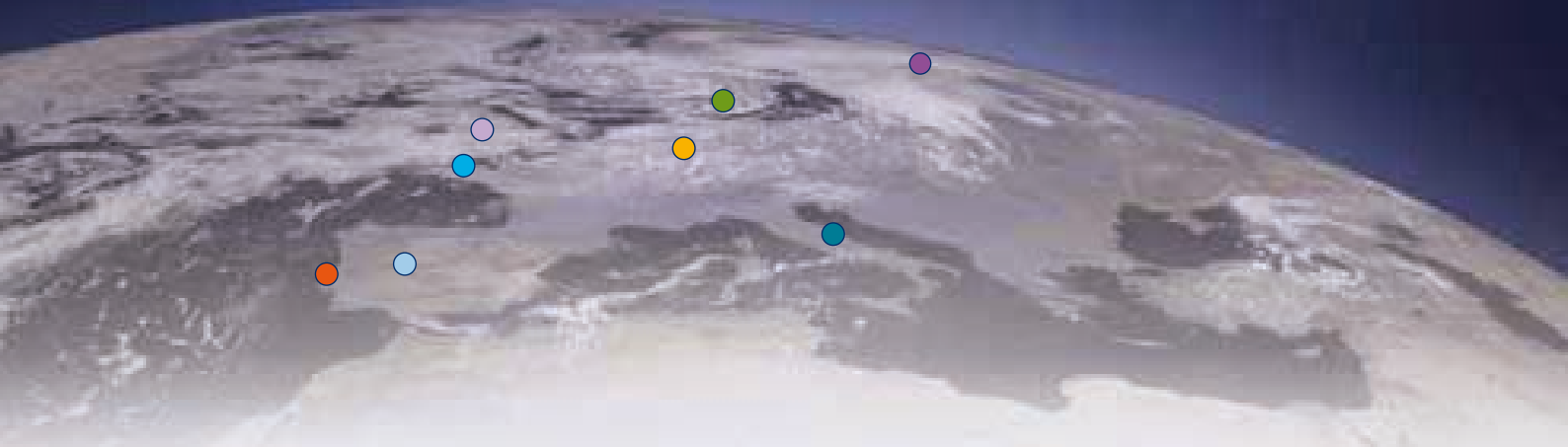
Cooperative development across the EUMETSAT distributed application ground segment, which includes the central facilities and eight Satellite Application Facilities, has again brought a number of new products to operational status and prepared for more in the future, addressing the needs of a broad range of applications.

In order to exploit the full potential of its satellites in a broader range of meteorological and environmental applications, EUMETSAT in the 1990s adopted a distributed architecture for its application ground segment, involving central facilities in Darmstadt and a network of Satellite Application Facilities (SAFs), each specialised in one application area (see below). Each SAF is a consortium of institutes from Member States, led by a National Meteorological Service. Today, this network allows the best use of distributed resources for the development and delivery of innovative products, capitalising

on critical masses of specialised scientific expertise, closer interactions with application experts and cross network cooperation.

In June, a new impulse was given to the development of the SAF network, with Council approval of the second Continuous Development and Operations Phase (CDOP-2) for the eight SAFs, covering the next five years and strengthening the collaboration within the distributed application ground segment, including the central facilities. The eight related agreements between EUMETSAT and each SAF-led entity were signed during the June Council.

EUMETSAT NETWORK OF SATELLITE APPLICATION FACILITIES



NWC SAF

Support to Nowcasting and Very Short Range Forecasting

Led by Agencia Estatal de Meteorología, Spain

OSI SAF

Ocean and Sea Ice

Led by Météo France

CM SAF

Climate Monitoring

Led by Deutscher Wetterdienst, Germany

NWP SAF

Numerical Weather Prediction

Led by Met Office (UK)

LSA SAF

Land Surface Analysis

Led by Portuguese Meteorological Institute

O3M SAF

Ozone and Atmospheric Chemistry Monitoring

Led by Finnish Meteorological Institute

ROM SAF

Radio Occultation Meteorology (formerly GRAS SAF)

Led by Danish Meteorological Institute

H SAF

Support to Operational Hydrology and Water Management

Led by Italian Meteorological Institute



In 2011, EUMETSAT further expanded its product portfolio, bringing new products and enhancements to existing products to operational status in response to requirements in the fields of meteorology, hydrology, and monitoring of atmospheric composition, ocean, sea ice and land surfaces.

NEW OPERATIONAL PRODUCTS

Meteorology: new products included an advanced Meteosat image processing software package for nowcasting applications (NWC SAF), near-real-time products (profiles of temperature, pressure, specific humidity) from GRAS radio-occultation observations (ROM SAF), and further development of the NWP SAF data quality monitoring capabilities based on comparisons with model outputs.

Hydrology: the dissemination of new precipitation products from various microwave imagers started, along with the production of precipitation products from microwave radiometers supported by geostationary infrared information (H SAF).

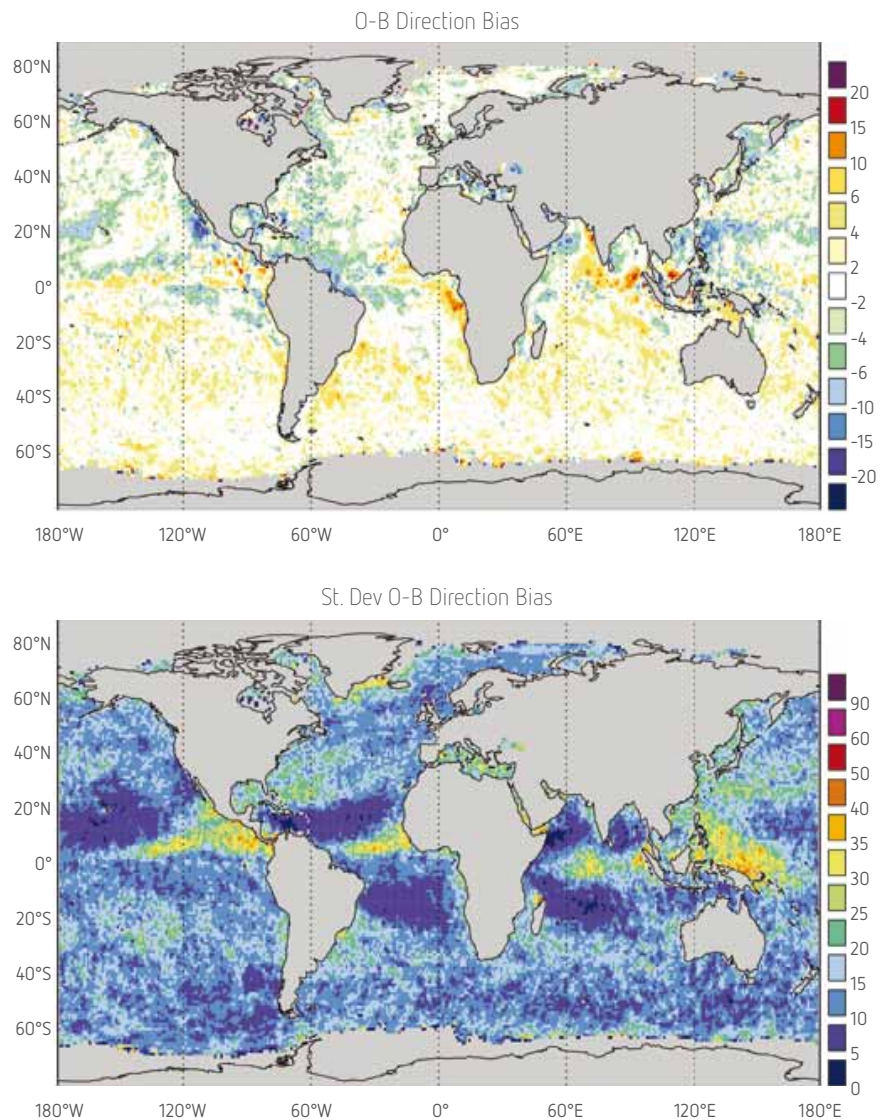


FIG. 9

Data monitoring service of the NWP SAF: differences between observed ASCAT wind direction against model outputs, mean (upper graph) and standard deviation (lower graph) both in degrees (Source: NWP SAF)

DEVELOPING NEW PRODUCTS IN PARTNERSHIP WITH MEMBER STATES

CONTINUED

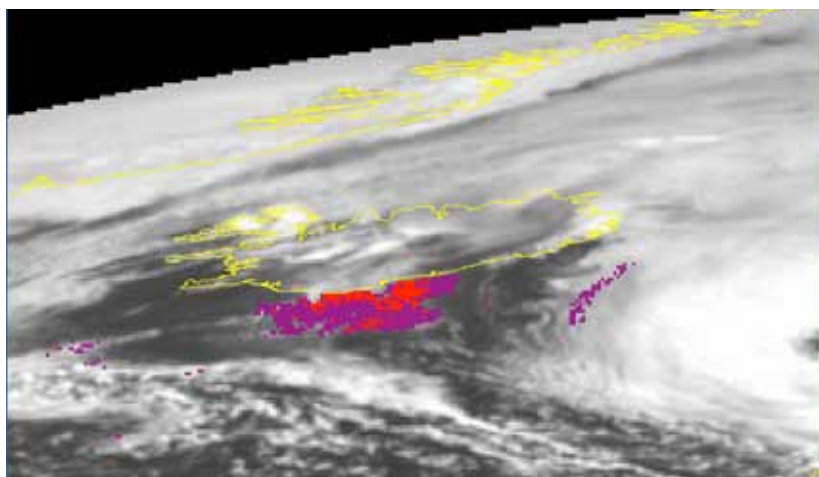


FIG. 10

Volcanic Ash Detection over ocean on 22 May 2011 at 12:00 UTC following the eruption of the Grimsvotn volcano in Iceland, showing background VIS0.8 image with overlay of ash index from new algorithm where red indicates thick ash and purple thin ash

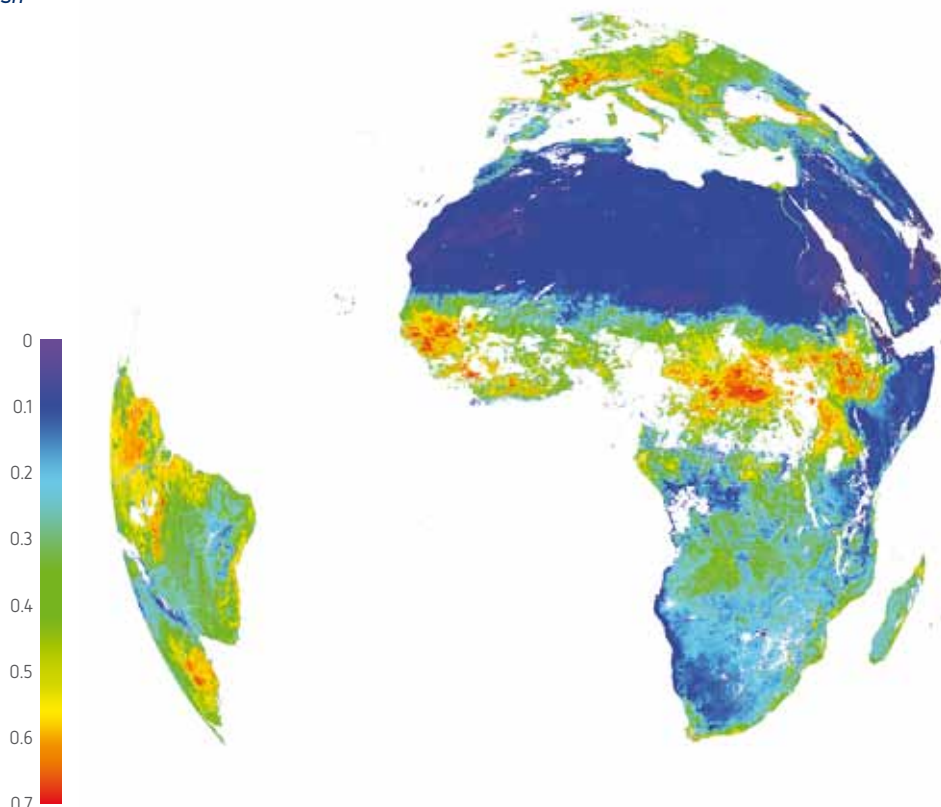
Atmospheric composition: new products included Aerosol Properties over Sea and Volcanic Ash Detection, both extracted from Meteosat observations, and an offline GOME-2 water vapour product (O3M SAF).

Ocean and sea ice: a new ASCAT coastal wind vector product was delivered and additional ocean surface wind vector products were extracted from the Indian OSCAT scatterometer. In addition, a sea surface temperature product from IASI was introduced.

Land surfaces: new products included the Normalised Difference Vegetation Index, Meteosat composite products (albedo and radiative fluxes), Fire Detection and Monitoring products and a Fire Risk Map (LSA SAF).

FIG. 11

NDVI daily composite from Meteosat imagery for 31 August 2011. This index increases with the amount of visible light absorbed by the vegetation. For SEVIRI, it saturates at 0.7 for dense vegetated areas like tropical forests. Land surfaces in white were permanently covered by clouds on that day.



IMPROVEMENTS TO EXISTING PRODUCTS

A number of existing processing software and products were also improved throughout 2011, including core meteorological products and software:

- The Radiative Transfer Programme (NWP SAF).
- The ATOVS and AVHRR pre-processing software package (NWP SAF).
- The Regional Instability Index product from Meteosat had its coverage extended and its dissemination frequency increased to 5 minutes.
- Vertical profiles of temperature and humidity from IASI, now available also in partly cloudy situations (central facility).
- Ozone and carbon monoxide columns extracted from IASI, now available with increased coverage and resolution.
- ASCAT level 1 products (backscatter cross-sections) to include calibration updates from an external calibration campaign using the three transponders deployed in Turkey.
- ASCAT soil moisture products, now extracted using an ASCAT-specific parameter database, replacing the heritage database from ERS scatterometer data.

PROGRESS IN SCIENTIFIC DEVELOPMENTS TARGETING FUTURE PRODUCTS

A number of scientific developments were carried out that are expected to lead to new or enhanced operational products in the future.

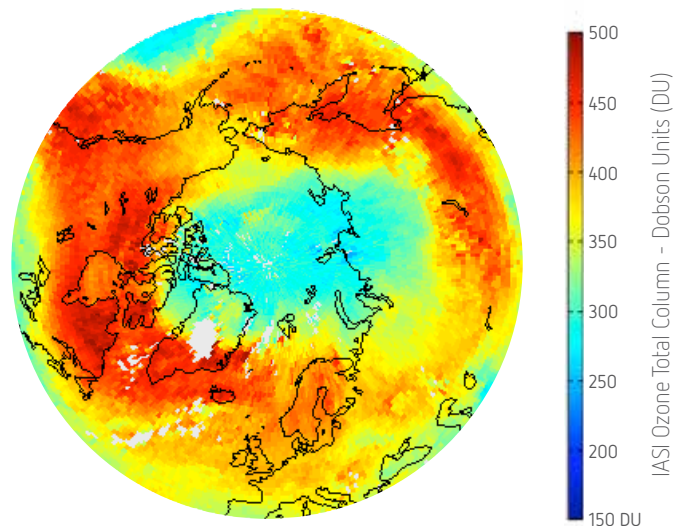


FIG. 12

Prototype of future O3 product developed with O3M SAF. The image depicts the ozone columnar amount in Dobson units for the 18–20 March 2011 period. Red and yellow indicate high ozone concentrations, whereas the blue colour indicates low concentrations. The specific meteorological situation in the stratosphere led to unprecedented ozone depletion over the Arctic in spring 2011. An extremely cold stratosphere in winter that persisted for a long time led to the intensification of the ozone depletion process as a consequence of the accumulation of chloride and bromide concentration. (Source: LATMOS/ULB)

The development of a new GRAS level 1 processor based on wave optics processing has continued and resulted in the availability of a prototype processor and first data sets for testing. Wave optics processing is required to overcome the shortcomings of the current operational geometric optics (GO) processing in the lower, moist troposphere and to derive vertical profiles of temperature and humidity through the whole troposphere.

Work also progressed on trace gas retrieval together with Université Libre de Bruxelles (ULB), Belgium, and Laboratoire Atmosphères, Milieux, Observations Spatiales (LATMOS), France.

Further developments of the Volcanic Ash Detection product were initiated following a study by the Norwegian Institute for Air Research demonstrating the feasibility of extracting total mass loading information from MSG imagery.

SUPPORTING AND EXPANDING THE USER BASE

The full value of strategic investment in advanced operational satellite systems can only be realised with appropriate support to user communities. This includes training, a fellowship programme and sustained interactions with users aimed at capturing their feedback and evolving needs. EUMETSAT dedicates significant efforts in these areas, in response to requirements of its Member States and WMO, while also supporting major capacity building initiatives, in particular in Africa.

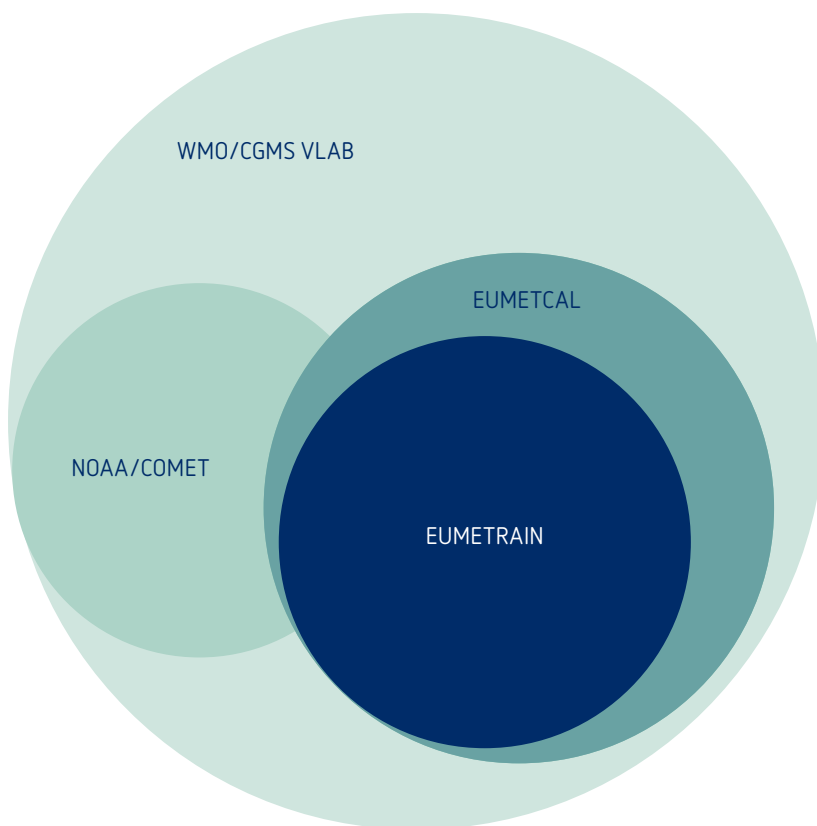


FIG. 13

EUMETSAT's training activities are part of a nested strategy of cooperation involving EUMETSAT Member States (EUMeTrain project) and commitment to the EUMETCAL (a EUMETNET project) and the WMO Virtual Laboratory for Education and Training (VLab). Bilateral cooperation with NOAA/COMET is also included as part of the IJPS cooperation

A COMPREHENSIVE AND COLLABORATIVE TRAINING PROGRAMME

User training is critical for the development of the use of EUMETSAT data and services for an increasing variety of meteorological, environmental and climate applications, but also for the expansion of the user communities wherever EUMETSAT data are accessible. This requires close cooperation between the experts of satellite products and those, in particular in the National Meteorological Services and in the Satellite Application Facilities, who are familiar with the various applications and the associated techniques for using satellite data.

Therefore, EUMETSAT training activities are being developed under an integrated and cooperative approach with EUMETNET and other international partnerships and involve a full network of international training experts in the context of the WMO Virtual Laboratory (VLab). Efficiency dictates that training relies on computer-aided learning techniques and has a regional focus through the involvement of centres of excellence.

Participants at the Eight Iberoamerican training course on satellite meteorology, Santa Cruz Bolivia, October 2011



In 2011, a number of user training events were organised or supported, with different application focuses and regional settings, involving around 650 participants and instructors from 114 countries.

FEBRUARY

7th EUMETSAT Satellite Application Course for the Middle East, co-organised with the Directorate General of Meteorology and Air Navigation and Sultan Qaboos University in Oman.

Support of the training course on “Meteorological Services, Sand and Dust Storms Forecast and Early Warning System” and “Erosion Preventing Techniques and Controlling Methods and Forestry”, organised in Istanbul, Turkey, by the Turkish State Meteorological Service.

MARCH

Participation in the 21st session of the Intergovernmental Oceanographic Commission (IOC) Committee on International Oceanographic Data and Information Exchange in Liege, Belgium.

APRIL

Support of first official European Meteorological Computer Aided Learning (EUMETCAL/EUMeTrain) satellite course.

Second Data Access for Western Balkan and Eastern European Countries (DAWBEE) satellite application workshop in Ohrid, former Yugoslav Republic of Macedonia.

Second SALGEE (Satellite Applications in Land surface analyses Group for Eastern Europe) satellite workshop on MSG Land Surface Applications: Drought & Fires in Antalya, Turkey.

MAY

Support of annual Nordic Meteorological Post-graduate Education (NOMEK) course at the Finnish Meteorological Institute in Helsinki, Finland.

Training course on “Using Satellite Products to Tackle the Tasks of Hydrology and Meteorology” at the Russian State Hydrometeorological University (RSHU), St. Petersburg, Russia.

AUGUST

Annual satellite course in Nairobi, Kenya.

AUGUST-SEPTEMBER

Third Meeting of Brazilian EUMET-Cast-Americas users in Maceió, Alagoas, Brazil.

SEPTEMBER

New summer school on remote sensing, with experts from the Cooperative Institute for Meteorological Satellite Studies (CIMSS) in Bracciano, Italy.

OCTOBER

Joint training course with the Climate Monitoring SAF on using satellite data for climate monitoring in Langen, Germany.

Remote lecture event week on monitoring dust and ash clouds using satellite data in the context of the WMO VLab.

Eighth Iberoamerican Training course on Satellite Meteorology in Santa Cruz, Bolivia.

Nowcasting training course in Casablanca, Morocco.

NOVEMBER

First workshop on the use of satellite data for hydrological applications organised with the Institute of Meteorology and Water Management (IMGW) in Krakow, Poland.

Second training course on dust monitoring in support of the WMO Sand and Dust Storm Warning Advisory and Assessment System in Antalya, Turkey, with the support of experts from AEMET and the Barcelona dust monitoring centre.

Annual satellite course in Niamey, Niger.

DECEMBER

Second course for marine forecasters organised together with the International Oceanographic Data Exchange System (IODE) in Oostende, Belgium.

SUPPORTING AND EXPANDING THE USER BASE

CONTINUED



Stephanie Guedj
EUMETSAT Fellow
Météo-France/CNRM

“My selection as a EUMETSAT fellow created a very favourable environment for my research on the assimilation of satellite imagery in high resolution models, with day-to-day interactions with satellite and modelling experts.”

EUMETSAT FELLOWSHIPS AND VISITING SCIENTISTS

The EUMETSAT fellowship programme aims to attract young talented scientists in research on the use of satellite data, with a view to consolidating the expertise and science base on the user side.

In 2011, there were 10 fellowships in place, six at National Meteorological Services and four at ECMWF. While the fellows at ECMWF focused on the assimilation of satellite observations in the global NWP model of the Centre, those placed at National Meteorological Services contributed to the development of innovative techniques for the use of satellite data for nowcasting and for their assimilation in regional high resolution models. Thus, beyond its contribution to the education of suitably qualified graduates, the fellowship programme promotes a better understanding and use of satellite data in various applications and supports the definition, implementation and operation of EUMETSAT's programmes.

EUMETSAT and its SAF network also have a visiting scientist programme offering opportunities for more experienced scientists to contribute to targeted scientific developments or projects, taking advantage of the EUMETSAT and SAF technical environment.

EUMETSAT USER CONFERENCE

The 2011 EUMETSAT Meteorological Satellite Conference took place in Oslo, Norway, on 5–9 September, attracting 438 participants from 38 countries. In addition to the cornerstone themes on weather, ocean and climate observations, particular prominence was given to presentations on the assimilation of data into global and



Anton Eliassen, Director-General of met.no and Alain Ratier, EUMETSAT Director-General at the 2011 EUMETSAT Meteorological Satellite Conference, Oslo, Norway

regional Numerical Weather Prediction models and, reflecting Norway's geographical location, on Arctic-related topics.

SUPPORT TO CAPACITY BUILDING INITIATIVES

In line with the strategy of WMO, EUMETSAT is supporting the development of the use of satellite data, mainly in WMO Regional Association VI (RA VI), where all EUMETSAT Member and Cooperating States are located, and in Regional Association I, centred on Africa, which is best observed by the Meteosat satellites. This involves facilitating real-time access to data through EUMETCast, training of trainers and users, and support of relevant capacity building projects, in particular those supported by the National Meteorological Services (NMSs) of Member States and those funded by the European Development Fund (EDF) in cooperation with the African Union Commission.

SUPPORTING NMHSs OF NON-MEMBER STATES IN THE PERIPHERY OF EUROPE

In WMO AR VI, EUMETSAT supported the National Meteorological and Hydrological Services of non-member states in the western Balkan and eastern European region through the Data Access for Western Balkan and Eastern European

Countries (DAWBEE) project, involving also the NMSs of Slovenia, Croatia, Slovakia, Bulgaria and Romania. The project was successfully completed in 2011 following the installation of 11 EUMETCast stations and a number of training sessions. Capitalising on this experience, EUMETSAT has begun discussions with the Turkish State Meteorological Service on a similar project, called Satellite Data Access in Central Asia (SADACA), aimed at providing access to EUMETSAT data and products to five countries in Central Asia belonging to WMO AR VI and AR II (Asia).

NEW MILESTONES IN THE SUCCESS STORY OF COOPERATION WITH AFRICA

The commitment of EUMETSAT to cooperation with Africa has been sustained over the past decades and is considered a success story, with the User Fora organised every second year in Africa with WMO and African organisations, and the contribution to the EDF-funded PUMA (Preparation for Use of MSG in Africa) and AMESD (African Monitoring of the Environment for Sustainable Development) projects established in cooperation with the African Union Commission and the African Regional Economic Communities.

In 2011, the AMESD project was completed, with the deployment of 111 new EUMETCast receiving stations, bringing to 384 the total number of stations in Africa, making this the most comprehensive Earth observation data distribution infrastructure of the continent. Thus, all sub-Saharan African National Meteorological and Hydrological Services and regional centres now have state of the art equipment enabling them to access and use the EUMETCast data flow, which includes satellite information from EUMETSAT and other sources, NWP forecasts from ECMWF and European



NMSs, and other environmental data. This new capacity, together with user training, is a key asset for the development of meteorological and other applications in Africa, at continental, regional and national levels, the key goal of the AMESD project.

Preparation workshop for Monitoring Environment and Security in Africa (MESA) project held at EUMETSAT headquarters, 9-12 May 2011

This effort is expected to further develop in the forthcoming years, following EDF approval of the funding of the follow-on MESA project for Monitoring of Environment and Security in Africa, which will increase capacity in information management, planning and decision-making relevant to environment, climate, and food security policies by enhancing access to and exploitation of relevant Earth observation applications in Africa. In November, the EUMETSAT Council endorsed the EUMETSAT contribution to this project, to be formalised by relevant agreements in 2012.

Agreements with the Centre régional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle (AGRHYMET) in Niamey, Niger, and with the African Centre of Meteorological Applications for Development (ACMAD), were signed in 2011.

The 10th EUMETSAT User Forum to be held in Addis Ababa, Ethiopia, on 1-5 October 2012 was actively prepared in the second half of 2011. It will be a unique opportunity to look into the future of the cooperation with Africa, taking into account MESA and other major African programmes, including ClimDevAfrica funded by the African Development Bank.

SECURING SERVICE CONTINUITY IN THE MEDIUM TERM THROUGH THE DEPLOYMENT OF THE REMAINING METOP AND MSG SATELLITES

The preparations for the launches of Metop-B and MSG-3 mobilised much effort throughout EUMETSAT. This included the testing of the EUMETSAT ground segments, satellites and full systems, the preparation of operations teams, and complex interactions with partners and contractors.



The destored MSG-3 satellite at the ThalesAlenia cleanroom in Cannes, France

Launching two spacecraft in the same year – 2012 – is not without risk, as the overall success depends on many factors, many of them outside EUMETSAT's direct control. This required a high level of mobilisation at organisational level to manage these risks and be prepared to respond to the unexpected.

The preparations for the two launches reached full momentum, involving technical, contractual and management activities at EUMETSAT and complex interactions with partners, in particular ESA, the launch service providers and other contractors. The goal was to achieve readiness for launch on all accounts, which means not only having the satellite and the launcher ready, but also to ensure preparedness to take control of the satellite in orbit and to proceed with in-orbit check out, calibration and validation activities, and ultimately, routine operations. This applied not only to the systems but also all the teams involved in the various phases, prior to and after the launch.

Planning for the launch of the last MSG and EPS satellites, MSG-4 and Metop-C, was revised at the end of 2011. The launch of Metop-C was re-planned from 2016 to October 2017 and the Council agreed to launch MSG-4 in January 2015 and to store it in orbit until it is needed to replace an ageing spacecraft, in order to save costs of on ground storage/destorage and minimise technical and financial risks.

PREPARATIONS FOR THE MSG-3 LAUNCH

During 2011, most of the MSG-3 destorage sequence was performed with ESA and arranged in such a fashion that maximum flexibility was preserved against launch planning so that required work on MSG-4 could be conducted in parallel. The first part of activities consisted of all scheduled critical tests, culminating in the verification of SEVIRI performance in vacuum, which showed particularly good results. This first part of the satellite destorage sequence was successfully completed by the end of September.

A major contractual milestone was then achieved in mid-September with the agreement with Arianespace of a 15 June–14 July 2012 launch slot for the dual launch of MSG-3 and a telecommunication satellite known as Jupiter by an Ariane 5 ECA rocket. At the same time, suitable measures were agreed with Arianespace to ensure proper shock damping for the MSG satellite during the launch.

On that basis, the second part of the destorage activities could start in October, focusing on preparations for the 2012 launch campaign.

The upgrade of the ground segment required to operate and commission up to four MSG satellites was completed and tested in June, and work then focused on pre-launch validation and testing, as well as putting the commissioning infrastructure in place. The upgrade included the addition of an imaging chain and the installation of an additional antenna at the Usingen ground station, allowing MSG-3 operations



preparation to be carried out in parallel with Meteosat-8 and Meteosat-9 routine operations without interruptions to the Meteosat-8 Rapid Scanning Service that would otherwise have been unavoidable.

The preparation of the systems and activities required to ensure the MSG-3 launch and early orbit phase (LEOP) service contracted out to ESA's European Space Operations Centre (ESOC) also progressed smoothly.

PREPARATIONS FOR THE METOP-B LAUNCH

The preparation of the Metop-B launch from Baikonur was a specific management challenge, considering the complexity of the satellite and the variety of players involved both from partner agencies - not only ESA but also CNES and NOAA, which provide major instruments - and industry in a variety of simulations, tests, rehearsals, and preparation of satellite in-orbit verification and subsequent calibration and validation.

ESA and EUMETSAT started the satellite activities with the testing of the two main parts of the satellite, the Service Module (SVM) and the Payload Module (PLM) carrying all the Metop-B instruments. Their integration and full satellite testing followed, ultimately leading to the formal acceptance of the satellite for flight in December. This included successful tests of the SVM in thermal vacuum, mounting and testing all instruments on the PLM, as well as satellite integration and checking at Astrium.

All technical development required of the EUMETSAT Polar System ground segment to support the launch and commissioning of Metop-B and dual operations with Metop-A was completed in the first half of 2011. This enabled all necessary system level verification and validation activities in the second half of the year, involving communication with the satellite, all of which were prerequisites to meet the target launch date.

In November, the launch date of 23 May 2012 was agreed with Starsem, the provider of the Soyuz launch service, and the final launcher mission analysis was completed in December. Throughout the year, EUMETSAT participated in selected launcher reviews, and in the organisation of the launch campaign with ESA, Starsem and industry.

The Metop-B testing team at the Astrium cleanroom in Toulouse, France



PREPARING THE LONG TERM FUTURE WITH MTG AND EPS-SG

As an operational agency, EUMETSAT needs to plan and develop the future satellite systems required to deliver and further improve observational inputs to forecasting and climate monitoring in the 2020-2040 timeframe. This is carried out in cooperation with ESA. Following the approval of the Meteosat Third Generation programme in February, the development commenced, in parallel with the definition of the EPS Second Generation system.



Jean-Jaques Dordain
Director-General
European Space Agency

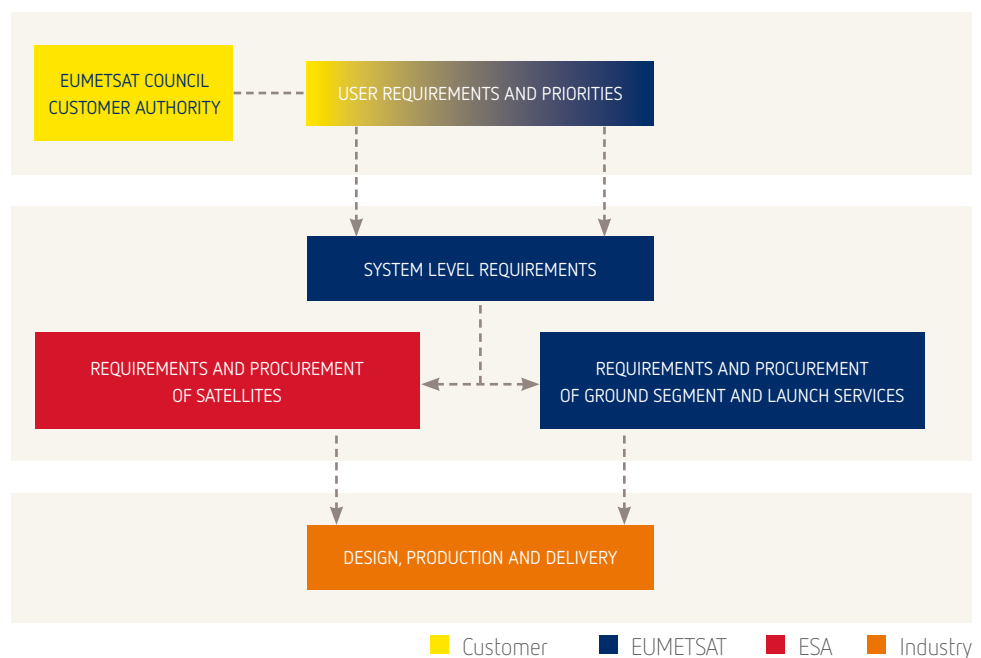
“Cooperation between ESA and EUMETSAT has evolved with dedicated people on both sides working closely towards a common goal and, moreover, achieving remarkable results.”

THE COOPERATION MODEL WITH ESA

For its mandatory programmes, EUMETSAT relies on the successful cooperation model with the European Space Agency (ESA), which has made Europe a world leader in satellite meteorology, making best use of respective competencies: ESA is responsible for the development of satellites fulfilling user and system requirements defined by EUMETSAT and for the procurement

of recurrent satellites on its behalf. EUMETSAT develops all ground systems required to deliver products and services to users and to respond to their evolving needs, procures launch services and operates the full system for the benefit of users. This process also involves European industry through contracts with ESA and EUMETSAT, capitalising on upstream European research and development, and stimulates the competitiveness and growth of European industry.

ESA-EUMETSAT COOPERATION MODEL



METEOSAT THIRD GENERATION APPROVED AND WORK STARTED

When approving the new strategy in June, Member States reaffirmed that the new MTG and EPS-SG mandatory programmes have to be considered necessary strategic investments, despite the European economic crisis. From that perspective, full approval of the MTG programme in February 2011 established the first pillar of EUMETSAT's future in the 2020-2040 timeframe. This is a promise for the future of operational meteorology in Europe and Africa, in particular as regards nowcasting and very short range forecasting of high impact weather.

The MTG system will comprise two separate lines of geostationary satellites to be operated simultaneously. The first line, MTG-I, will continue and improve the Meteosat Second Generation imagery mission and add a lightning imaging capability, while the second line, MTG-S, will, for the first time, implement hyper-spectral infrared sounding (IRS) capabilities in geostationary orbit to deliver vertical profiles of temperature and moisture on an hourly basis. The synergy between this infrared sounder and the GMES Sentinel-4 ultraviolet sounding instrument on the same MTG-S spacecraft will also bring a unique capability to observe ozone, carbon monoxide, sulphur dioxide and other trace gases in support of air quality, pollution and climate monitoring.

In 2011, EUMETSAT, ESA and industry started the demanding development process for this satellite system of unprecedented complexity.

EUMETSAT concentrated on system and ground segment requirements and design, passing the system Preliminary Design Review in June, producing preliminary specifications at overall ground segment and facility levels, and submitting to Council the first related procurement proposals. Work with ESA also started on the requirements for the processing of Sentinel-4 data and the operations of this instrument as part of the MTG system.

In addition, EUMETSAT supported ESA satellite development activities focused on progressing towards a coherent technical baseline across the industrial consortium, including consolidation of satellite specifications, specifications for lower tier procurements, interface requirements, design, development and verification plans.

Artist's impression of the MTG-I and MTG-S satellites
(Source: ThalesAlenia Space)



PREPARING THE LONG TERM FUTURE WITH MTG AND EPS-SG

CONTINUED



The EUMETSAT Council, meeting on 5 October in a special session, agrees the content of the EPS-SG Preparatory Programme and a revised roadmap for further decisions expected in 2012

FIRST STEPS TOWARDS THE APPROVAL OF EPS SECOND GENERATION

EPS Second Generation is the second pillar of the future of EUMETSAT, expected to continue the global observations of EPS in the 2020-2040 timeframe, and to enhance the critical inputs delivered to Numerical Weather Prediction models.

The Metop-SG satellites forming the space segment of the EPS-SG system will be developed and procured by ESA on behalf of EUMETSAT, with two major instruments provided by CNES and DLR. Therefore, the programme's approval process requires coordinated decisions, starting on the EUMETSAT side with Council decisions on the required instruments and approval of an EPS-SG Preparatory Programme addressing EUMETSAT phase B activities, and on the ESA side by the approval of its Metop-SG programme covering development of the prototype satellites.

In 2011, ESA and EUMETSAT progressed on the definition and feasibility studies of the targeted system built around the space segment configuration agreed in 2010 by the EUMETSAT Council, consisting of two medium size satellites together fulfilling all EUMETSAT mission requirements, based on an optimal distribution of the candidate instruments.

The Space Segment Preliminary Concept Reviews for the two parallel ESA studies were performed with industry in June–July, followed in November by the confirmation by DLR and CNES of the intention of their respective governments to develop the Metimage and IASI-NG instruments. The 3rd User Consultation Workshop took place in September, where feedback was sought from users and experts on the

consolidation of mission requirements and priorities and on proposed simplifications of some instruments with the aim of reducing costs.

This process fed the definition of the EPS-SG Preparatory Programme proposed to Council in June, where the first discussions were not conclusive because of the great uncertainty associated with the economic crisis. The Director-General then proposed, at a special meeting on 5 October, a new roadmap towards a Council decision on the scope of the space segment to be developed by ESA, together with a de-scoped, lower cost Preparatory Programme which preserves a minimum but meaningful set of preparatory activities in 2012-2014.

Following Council agreement, voting on the Preparatory Programme could be opened, and, at the end of 2011, the level of financial commitment to the EPS-SG Preparatory Programme was nearly 55%, with further positive votes expected during the special Council at the end of January 2012, where Council will also be invited to decide on the payload complement and scope of the EPS-SG space segment.

To prepare these further decisions, the Secretariat, with the support of economists and meteorological experts, produced a robust cost-benefit analysis, including a summary for decision makers, showing that the benefit to cost ratio of the EPS-SG programme was in the order of 20 under very conservative assumptions, and up to 60 under less conservative yet credible assumptions. EUMETSAT's financial planning was also revised based on a critical analysis of the technical planning of the already approved programmes, in order to give maximum financial visibility to Member States.

SUPPORTING THE DEVELOPMENT OF OPERATIONAL OCEANOGRAPHY

Stimulated by GMES, operational oceanography is rapidly developing in Europe, with monitoring and forecast information now delivered on global, basin and coastal scales, used also in marine meteorology, seasonal forecasting and climate monitoring. EUMETSAT responded to this opportunity with its Jason optional programmes, and is now expanding its role, preparing itself to be the operator of the GMES Sentinel-3 satellite.

After ENVISAT and Jason-2, the Sentinel-3 and Jason-3 satellites will form the backbone of the European contribution to the space-based component of the global ocean observing system, as part of GMES.

The Jason-3 mission will expand, into a third decade, the high precision altimetry observations required to monitor sea level and serve as a unique reference for other altimeter missions aimed at monitoring ocean circulation at various scales, including the altimeter mission of Sentinel-3. In addition to altimetry, Sentinel-3 will also deliver highly accurate measurements of sea surface temperature and ocean colour, also key for oceanographic applications and climate monitoring and complementary to ocean observations already available from the Meteosat and Metop satellites.

In 2011, the integration of the Jason-3 satellite and system was replanned with CNES, NOAA and NASA to a revised launch date of April 2014, taking into account delays in the selection of the US-provided launch service. This launch date is still expected to ensure proper overlap and cross-calibration with Jason-2, subject to confirmation of the EC funding of Jason-3 operations. In this regard, the inclusion of a dedicated “GMES high precision ocean altimetry activity” (HPOA) in the ESA GMES Space Component Long Term Scenario, which combines Jason-3 operations and the Jason-Continuity of Service (Jason-CS) programme, was welcomed by the EUMETSAT Council and users of the GMES Marine Core Service.

EUMETSAT has also been designated as the operator of the Sentinel-3 satellite developed by ESA as part of the GMES initiative led and co-funded by the European Union and ESA. EUMETSAT’s contribution to the development of the ground segment is covered by the organisation’s first third party programme, and will reuse EUMETSAT infrastructure and the Multi-Mission Elements (MME) of its ground segment.

In 2011, the ESA-EUMETSAT joint team made steady progress in the design of the Sentinel-3 ground segment, which at the end of the year was nearing the ground segment Critical Design Review.



Ewa Kwiatkowska
Sentinel-3 Optical Scientist
joined EUMETSAT in 2011

“For an ocean remote sensing scientist, joining an operational satellite agency like EUMETSAT meant a unique opportunity to be part of the challenge of developing operational oceanography in Europe, in the context of GMES.”

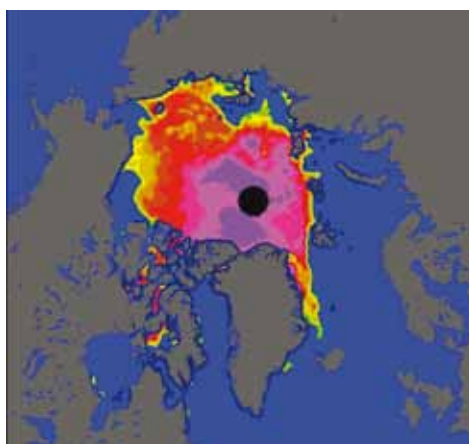
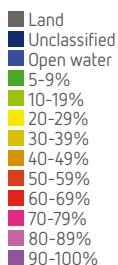


FIG. 14

OSI SAF Sea Ice Concentration product over the Northern Hemisphere (Source: OSI SAF)

ENHANCING BENEFITS THROUGH COOPERATION WITH OTHER SATELLITE OPERATORS

EUMETSAT is one of the operators of meteorological satellites contributing to the space component of the WMO Integrated Global Observing System. Within this global endeavour, EUMETSAT strives to increase benefits to the user community through bilateral and multilateral cooperation with other satellite operators.

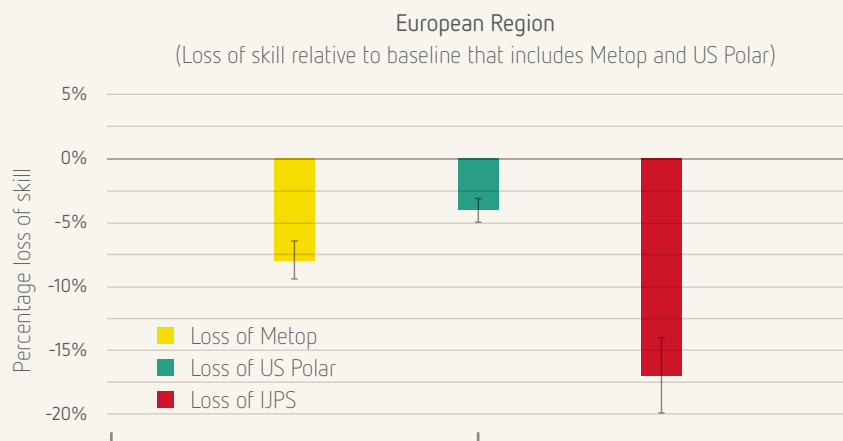


Erland Källén
Director of Research
ECMWF

“IJPS data play a critical role in maintaining the current rapid rate of improvement of our medium range numerical weather forecasts.”

FIG. 15

Simulated loss of observations of polar-orbiting satellites clearly shows that the positive impact of the IJPS on NWP forecasts is greater than the sum of the respective impact (Source: ECMWF)



BILATERAL COOPERATION

The first official visit of the new Director-General took place at NOAA at the beginning of September, in recognition of the strategic importance of the cooperation with the United States. The two organisations share the Initial Joint Polar System (IJPS), are operational partners in the Jason programmes, and are preparing for the continuation of this strategic partnership into the next decades.

The year 2011 saw major achievements in cooperation on the IJPS, with NOAA support of the preparation of the launch of Metop-B – the satellite carries five NOAA instruments – the start of acquisition of Metop-A data in McMurdo, Antarctica, which has cut data latency by a factor of two, and, last but not least, the successful launch of the US Suomi NPP satellite on 28 October. After commissioning, Suomi NPP is expected to replace NOAA-19 as a major upgrade of the IJPS, which will then comprise two satellites of the most recent generation, with an additional impact expected on performance of weather forecasts.

EUMETSAT and NOAA have continued to work on the draft cooperation agreement on their future Joint Polar System (JPS). Although NOAA had to announce in December that it could not deliver US instruments for EPS-SG satellites, this cooperation will remain critical for mutual benefits, as illustrated by a recent ECMWF study showing that the impact of the current IJPS on NWP is more than the addition of the respective contributions of EUMETSAT and NOAA.

NOAA and EUMETSAT have also continued to cooperate on the exploitation of Jason-2 and contributed, together with CNES and NASA, to the development of the follow-on Jason-3 satellite to be launched by a US rocket in 2014. NOAA has also confirmed the US interest to continue US-European cooperation on high precision altimetry with the proposed Jason-CS programme.

Cooperation has also developed with China, and is recognised by the White Paper on China’s current and planned space activities published in December 2011. Data exchange has intensified with the China Meteorological Administration (CMA), leading to the dissemination of microwave soundings from the FY-3A satellite to EUMETSAT users. Technical developments have also been finalised to achieve interoperability between EUMETCast and CMACast allowing cross distribution of data to EUMETSAT and CMA users.

Formal discussions on data exchange have also been initiated with the State Oceanographic Administration of China, following the successful launch of its HY-2A oceanographic satellite on 16 August.



EUMETSAT and the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet) also confirmed their interest in further cooperating on the exchange of data and on scientific matters at their annual bilateral meeting, held in October in Saint Petersburg.

Cooperation on data exchange with the Indian Meteorological Department (IMD) and the Indian Space Research Organisation (ISRO) bore new fruit in 2011, leading to the start of dissemination of observations of wind at the surface of the ocean from the ISRO Oceansat-2 satellite. In addition, a draft agreement was successfully negotiated with CNES and ISRO on the real-time redistribution to European users of products from their Megha-Tropiques satellite launched on 12 October.

Exchange of data from geostationary satellites has continued with the Japan Meteorological Agency. Furthermore, exploratory discussions took place with the Japan Aerospace Exploration Agency (JAXA) on possible scientific cooperation in the area of atmospheric composition, using data from their GOSAT satellite and the GOME-2 and IASI instruments on Metop-A.

A memorandum of understanding was signed with the Korea Meteorological Administration (KMA) leading to first discussions on cooperation on the development of Meteosat nowcasting software and tailoring it for use with data from the KMA COMS satellite.

EUMETSAT and Environment Canada extended their memorandum of understanding for five years beyond February 2012.

MULTILATERAL COOPERATION WITHIN CGMS

The Coordinating Group for Meteorological Satellites (CGMS) is a forum in which satellite agencies' plans are harmonised to meet common objectives and produce compatible data and products from meteorological satellites for the benefit of users around the world.

At the 39th plenary session hosted by Roshydromet and the Russian Federal Space Agency (Roscosmos) in Saint Petersburg in October and also involving GCOS and WMO, CGMS agreed to support the revised baseline for the space component of the WMO Integrated Global Observing System (WIGOS). This is a further step towards the realisation of the WMO "Vision for the Global Observing System in 2025" for both polar and geostationary orbits. The planned evolution assumes the first flights of hyperspectral infrared sounders on CMA and EUMETSAT geostationary satellites, while further discussions will address the distribution of instruments over three different polar orbits with a view to improving the capabilities from the early morning orbit to complement EUMETSAT and NOAA assets in the mid-morning and afternoon orbits.

Steps were also taken to address standards for direct read-out of future polar-orbiting satellites, as well as space collision avoidance by operational meteorological agencies.

Participants of the 39th CGMS meeting, Saint Petersburg, Russian Federation, 3-7 October 2011

EUROPEAN AND GLOBAL PARTNERSHIPS

EUMETSAT participates in European and global partnerships, with emphasis on GMES, identified as a key opportunity for developing satellite data services beyond and in synergy with meteorology. In 2011, EUMETSAT has continued to prepare itself to operate relevant GMES missions in the context of the EU Space Policy and supported the definition of an architecture for climate monitoring from space within WMO, CGMS and CEOS.



Artist's impression of the GMES Sentinel-3 satellite (Source: ESA)

GMES AND THE EUROPEAN SPACE POLICY

Following the entry into force of the Lisbon Treaty, space has become a shared competence between the European Union and its Member States, and Galileo and GMES have been identified as the two flagship programmes.

"GMES is an Earth monitoring programme, jointly initiated by the European Union and ESA, that allows for the collection of information about planet Earth's physical, chemical and biological systems. GMES provides crucial information for managing our environment in a more sustainable manner, enhancing the protection of biodiversity, monitoring and forecasting the state of the oceans and the atmosphere composition, understanding the drivers and the impacts of climate change, responding to natural and man-made

disasters, supporting the development policies and strengthening the security of European citizens. It helps to improve decision-making and the implementation of a wide range of Union policies (transport, agriculture, environment, energy, regional policy, humanitarian aid, civil protection, development assistance to third countries ...) GMES services provide benefits to a wide range of users, from local to international levels!."

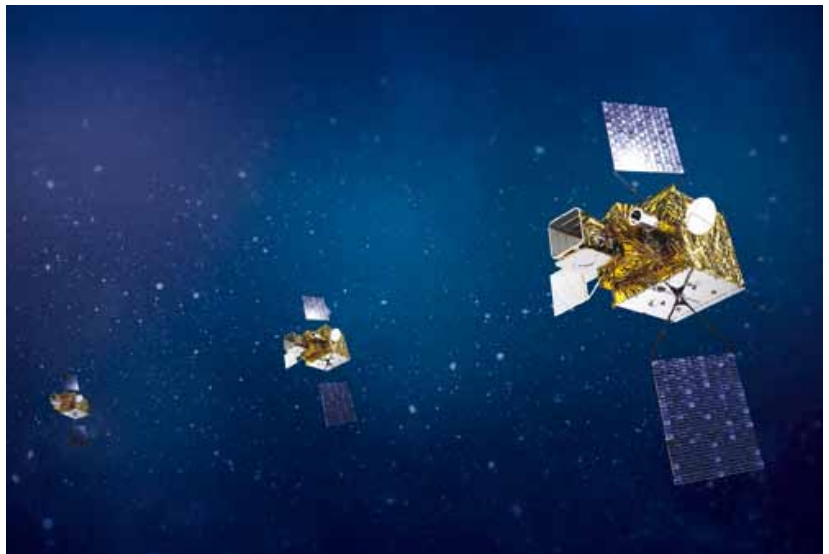
The successful implementation of GMES services for monitoring the ocean, the composition of the atmosphere and the changing climate requires the integration of in situ and space observations and numerical modelling, with new operational Earth observation satellites being indispensable. The efficient implementation of these GMES services calls for maximum synergy with operational meteorology and the capabilities and investments already made within the European Meteorological Infrastructure, composed of EUMETSAT, ECMWF, the National Meteorological Services of their Member and Cooperating States, and their EUMETNET grouping.

As regards satellites, this message was conveyed by the Director-General to the 8th Space Council meeting in Brussels on 6 December in a statement stressing the huge benefits of meteorological satellites to EU citizens and its economy and the additional benefits to be expected through EUMETSAT involvement in GMES. This message was propagated to European decision makers in different fora, including the annual meeting of the European Interparliamentary Space Conference in Berlin, together with the proposal to tailor



the ESA-EUMETSAT cooperation model to the GMES operations phase. This model, which focuses EUMETSAT on interaction with and delivery of services to users, while ESA is responsible for the procurement of recurrent satellites, is believed to be the lowest risk and most appropriate option for the governance of operations of relevant GMES satellite missions.

The Long Term Scenario for the GMES Space Component proposed in May by ESA to the EC confirmed that the operational ambition of GMES for monitoring atmospheric composition would be best fulfilled through the flight of GMES Sentinel instruments on board the approved Meteosat Third Generation (Sentinel-4) and the proposed EPS Second Generation satellites (Sentinel-5). For ocean monitoring, in addition to EUMETSAT being the operator of the dedicated GMES Sentinel-3 satellite, this will be achieved through a GMES High Precision Ocean Altimetry activity combining the operations of the Jason-3 satellite and the proposed Jason-CS programme.



This is consistent with the Communication on the European Earth monitoring programme (GMES) and its operations from 2014 onwards released by the EC in November, which proposes to entrust EUMETSAT with the operations of the GMES satellite missions needed for systematic and global observations of the atmosphere and oceans. This is also in accordance with the new strategy adopted in June and the set of principles governing EUMETSAT's involvement in GMES activities approved by the Council. The latter stipulate that EUMETSAT could use up to 25% of its resources for GMES activities funded by the EC, thus enabling a significant contribution of the organisation while securing that operational meteorology and climate monitoring remains its primary focus.

Two Sentinel-4 instruments will be flown on board the Meteosat Third Generation sounding satellites (MTG-S) to monitor atmospheric composition from geostationary orbit
(Source: ThalesAlenia Space)



European Interparliamentary Space Conference, Berlin, 17-18 October 2011
(Source: Shirley Karnowski)

EUROPEAN AND GLOBAL PARTNERSHIPS

CONTINUED



Opening ceremony of the 16th WMO Congress, Geneva, 16 May - 3 June 2011

ARCHITECTURE FOR CLIMATE MONITORING FROM SPACE

Following the third World Climate Conference organised by WMO in September 2009, the subsequent definition of a Global Framework for Climate Services (GFCS) by a high level task force, and the decisions made at the WMO Congress in June, work is now progressing on the international level towards the GFCS Implementation Plan, to be presented to an Extraordinary WMO Congress in 2012. It already appears that observation will be one pillar of the GFCS and that satellites will provide a unique global contribution.

Therefore, discussions started in January under the aegis of WMO with space agencies - CGMS, the Committee on Earth Observation Satellites (CEOS) - on the possible development of an architecture for sustained, space-based climate monitoring as a component of the future GFCS. A "Strategy Towards an Architecture for Climate Monitoring from Space" was then elaborated by a drafting team chaired by Dr Mark Dowell of the EC Joint Research Centre and involving WMO, CEOS and CGMS representatives. Starting from GCOS requirements, the architecture defines the functional breakdown of all activities required for climate monitoring from space, including inter-calibration, archiving, reprocessing and analysis, providing a framework against which all space agencies can map their current and planned contributions and a basis for gap analysis.

The document was reviewed and supported by CGMS, CEOS and WMO and by the EUMETSAT Council, which acknowledged the relevance of EUMETSAT contributions under agreed programmes and climate monitoring plans.

On that basis, CGMS members took action to start mapping their contributions, taking advantage of more than 30 years of cumulated observations from operational meteorological satellites.

CEOS, GEO AND THE SPACE CHARTER FOR DISASTER MONITORING

The main focus of EUMETSAT's contribution to CEOS was its participation in the CEOS Working Group on Climate, aimed at coordinating climate-related activities across the CEOS agencies. At the CEOS Plenary meeting in Lucca, Italy, EUMETSAT agreed to take over the chairmanship of CEOS in 2013, as it is Europe's turn to chair.

EUMETSAT's main contribution to the GEOSS implementation plan is through the operation of European, African and South American GEONETCast regional broadcasts, supported by cooperation between Europe, China, the United States and Russia.

EUMETSAT demonstrated GEONETCast at the eighth GEO Plenary session in Istanbul, Turkey, on 16-17 November, in cooperation with the Turkish State Meteorological Service.

EUMETSAT also took an active role in the discussions of the GEO 2012-2015 work plan.

EUMETSAT applied to join the International Charter on Space and Major Disasters and was formally accepted as a member by the Charter board in October. In addition to the provision of EUMETSAT data to the charter, the contribution of EUMETSAT will consist of using GEONETCast to disseminate information on disaster-affected areas through the charter mechanism.

ADMINISTRATION AND MANAGEMENT

EUMETSAT is committed to continuous improvement in a changing environment, marked by the current economic crisis. In 2011, the Secretariat was recertified against ISO 9001 standards for a period of three years, achieved further progress towards full compliance with IPSAS accounting standards and improved its financial planning process.

FINANCIAL PROCESSES

The Annual Accounts 2011 received an unqualified opinion by the external auditors from the French Cour des Comptes. The project to implement International Accounting Standards for the Public Sector (IPSAS) at EUMETSAT progressed as planned towards delivery of fully compliant financial statements from 2012 onwards, achieving the introduction of a set of standard accounting rules accepted as best practice for non-profit organisations.

The financial planning process was fully revisited in the last quarter to improve the visibility of Member States over funding requirements in the forthcoming years in support of their decisions on the

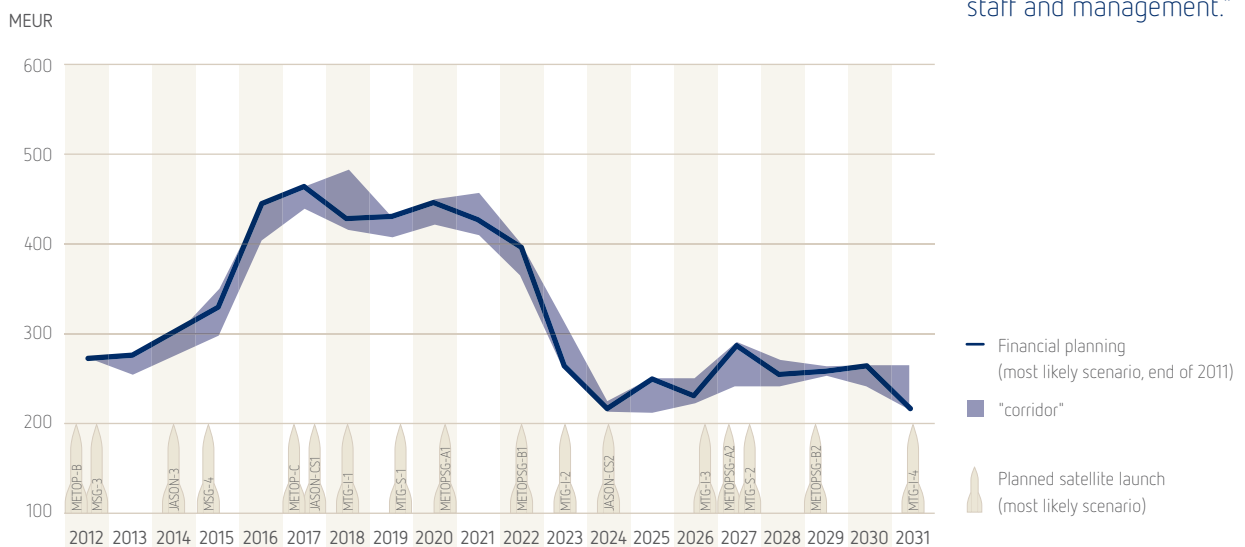
EPS-SG programme. This was based, for each approved programme, on a critical review of planning assumptions and the definition of up to three likely scenarios, including one designated the “most likely”. The outcome is a baseline financial planning built on the most likely scenarios, leading to a decrease in planned Member State contributions of more than MEUR 100 in the critical period 2012-2016. A “corridor” representing the departure from this baseline associated to less likely programme scenarios. In this context, the launch of Metop-C was rescheduled from 2016 to 2017 and Council agreed that the last MSG satellite (MSG-4) would be launched in early 2015 for in-orbit storage to minimise technical and financial risks and to achieve savings of MEUR 12 in the same period.



Helder Moreira
Head of Budget Section
EUMETSAT

“The financial planning process had to be revisited within two months. This was an exciting challenge, involving brainstorming and a more integrated team work with technical staff and management.”

FINANCIAL PLANNING (CONTRIBUTIONS) 2012-2031



ADMINISTRATION AND MANAGEMENT

CONTINUED

PROCUREMENT PROCESS

The electronic bidding process for consultancy invitations to tender introduced in December 2010 has proven successful, with industry reacting favourably and the majority of consultancy bids now received in this manner.

Industry days held in Portugal, Romania and Estonia were well attended by industry, academia and government bodies.

HUMAN RESOURCES MANAGEMENT

Following an analysis of the costs and benefits, the Council decided that EUMETSAT, which has been a formal observer in the Coordinated Organisations (CCR) since 2010, would apply for full membership to participate more actively in discussions on the evolution of the coordination system.

A working time registration system ("Flexitime") was introduced in July to offer staff more flexibility with working times while fulfilling the constraints of an organisation focused on operations around the clock and delivery of large development projects.

Possibilities for saving travel costs were investigated by a working group involving the Staff Association Committee, resulting in a number of decisions, including the use of the cheapest economy ticket for short haul flights. In anticipation of their implementation, mission costs across the organisation were cut by 10% for the 2012 fiscal year.

CONTRACT PROPOSALS APPROVED BY COUNCIL IN 2011

- Arrangements for the MSG-3 Launch Campaign Activities
- Launch and Early Orbit Phase Service for the Metop-C satellite
- Operational Internet Service
- Security and Reception Services
- Electric Power Supply
- Maintenance Service Extension for the MSG Primary Ground Station
- Service Extension for the EPS Svalbard Site Infrastructure
- Maintenance Service Extension for the EPS Front End Processing and Product Generation Facility
- EUMETCast Europe Dissemination Bandwidth Upgrade
- First Authorisation to Proceed with the implementation of the cooperation with ESA on the MTG space segment
- Agreements for the second Continuous Development and Operations Phase of the eight Satellite Application Facilities





GENERAL INFRASTRUCTURE AND SERVICES

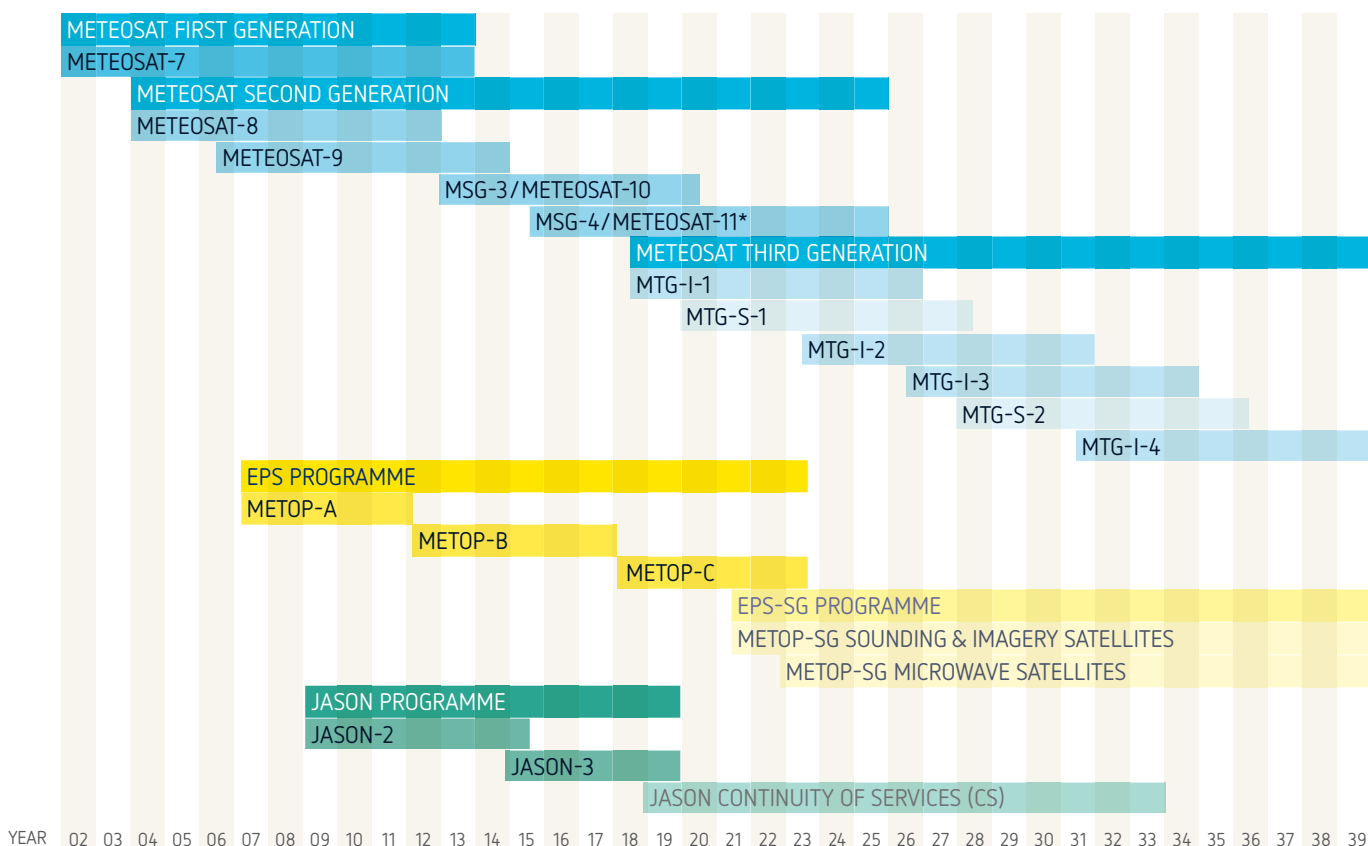
The construction of a new office building, including a canteen, was proposed to Delegate Bodies. This building is required to cover the increased accommodation needs from 2014 onwards, in particular those related to new programmes. It is also financially more attractive than the current rental of office space. This new building would be largely funded by the available and expected entry fees of the new Member

States. Council agreed to task a working group of experts to review requirements and prepare decisions in 2012.

QUALITY MANAGEMENT

Following a full recertification audit against ISO9001:2008 standards on 21-23 November, EUMETSAT was recertified for three years by DQS GmbH - Deutsche Gesellschaft zur Zertifizierung von Managementsystemen.

EUMETSAT MISSION PLANNING, END OF 2011



ONLY THE FULL OPERATIONAL PHASE OF EACH MISSION IS REPRESENTED, EXCLUDING COMMISSIONING

* MSG-4/METEOSAT-11 WILL BE STORED IN ORBIT, BEFORE REPLACING METEOSAT-10

THE NEW STRATEGY: EUMETSAT, A GLOBAL OPERATIONAL SATELLITE AGENCY AT THE HEART OF EUROPE

In June, the Council endorsed a new strategy providing direction and scope for EUMETSAT activities in the coming decades.

The vision of the new strategy calls for EUMETSAT to become the leading user-governed operational agency for European Earth Observation satellite programmes that are consistent with the objectives of its Convention. Stressing the increasing importance of international cooperation, it also requires EUMETSAT to be a trusted global partner for the provision of satellite data from geostationary and low Earth orbits.

The strategy identifies two main priorities for the realisation of the vision: the first priority is to continue to fulfil the essential requirements of the EUMETSAT Member States for operational weather forecasting and climate monitoring, while the second calls for the development of new environmental monitoring capabilities to meet additional needs of EUMETSAT Member States.

THE EUMETSAT STRATEGY DEFINES EIGHT STRATEGIC OBJECTIVES:

- 1 Deliver satellite programmes which meet the needs of EUMETSAT Member States;
- 2 Provide services based on cost-effective ground and space segment infrastructures which respond to evolving user requirements;
- 3 Meet additional needs of EUMETSAT Member States for global space-based observations through international cooperation;
- 4 Secure new opportunities in areas that are complementary to EUMETSAT's programmes and meet EUMETSAT Member States requirements;
- 5 Extend the user base for EUMETSAT data, products and services in EUMETSAT Member and Cooperating States and WMO Members;
- 6 Be an active Partner in European and global initiatives of relevance to space-based weather, climate and environmental monitoring;
- 7 Deliver continuously improved management processes
- 8 Recruit and maintain a core resource of talented and engaged people with relevant skills.

Download the full strategy from the publications area of the EUMETSAT website:
<http://www.eumetsat.int/Home/Main/AboutEUMETSAT/Publications/Brochures>



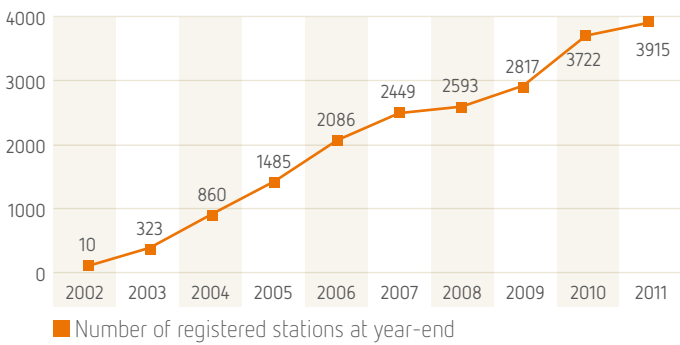
KEY FIGURES

THE EUMETSAT USER BASE AT THE END OF 2011

The EUMETSAT user base is composed of the NMS of its Member and Cooperating States, who use EUMETSAT data to fulfil their official duty obligations, ECMWF, international

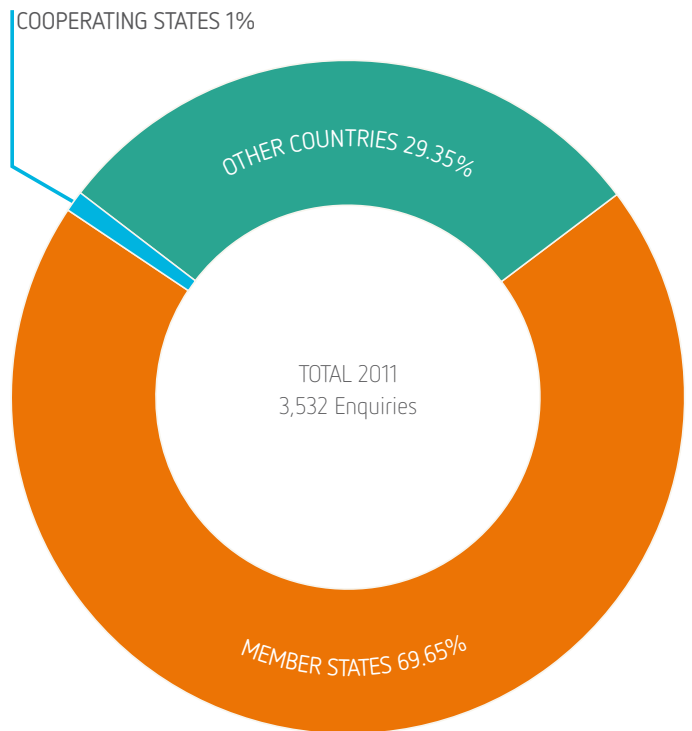
partners and a number of licensed users. At the end of 2011, the number of licensed users was 2,216.

EUMETCAST STATIONS 2002-2011



At the end of the year there were 3,915 registered EUMETCast reception stations, of which 85% were located in Member and Cooperating States

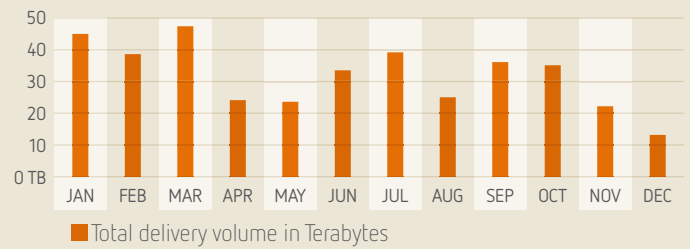
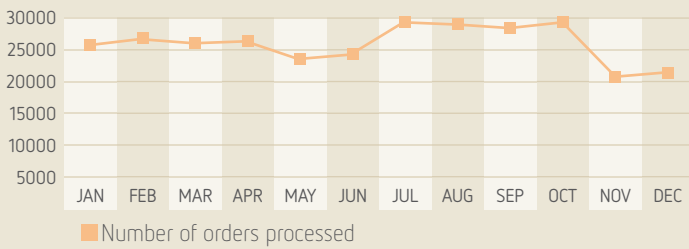
NUMBER OF USER ENQUIRIES IN 2011



The EUMETSAT User Helpdesk processed a total of 3,532 requests from the user community, 70.65% of which originated from Member and Cooperating States.



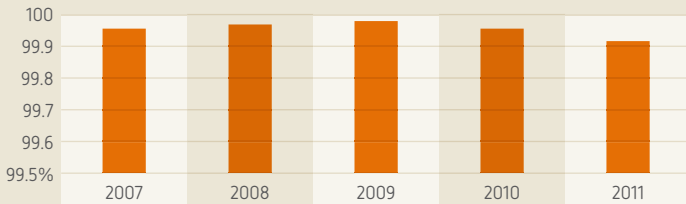
DATA CENTRE USERS AND ORDERS IN 2011



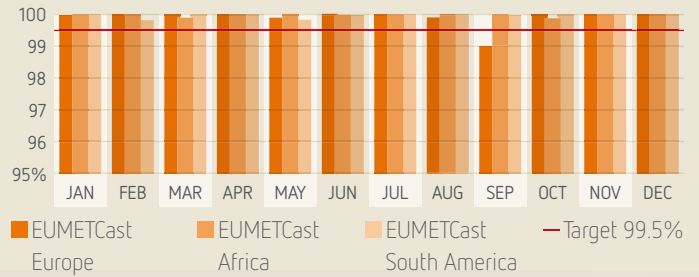
More than 1,500 registered users signed up to acquire archived data. On average, there are 38 new registrations per month and 42 users access the Data Centre Online Ordering Tool for search and ordering on a daily basis.

OPERATIONAL PERFORMANCE INDICATORS

EUMETCAST EUROPE AVAILABILITY 2007-2011



EUMETCAST AVAILABILITY 2011



The availability of the EUMETCast system remained extremely high throughout the year, with only two incidents.

Between 4-5 September the European uplink component of EUMETCast suffered a ~6-hour outage due to a partial failure of equipment at the uplink station. All systems were affected, but to varying degrees of severity. (4-5 Sep)

Between August and October a recurrent but intermittent delay problem impacted some data and products with more demanding timeliness requirements in an unpredictable manner. A solution to the problem was implemented on 13 October.

KEY FIGURES

CONTINUED

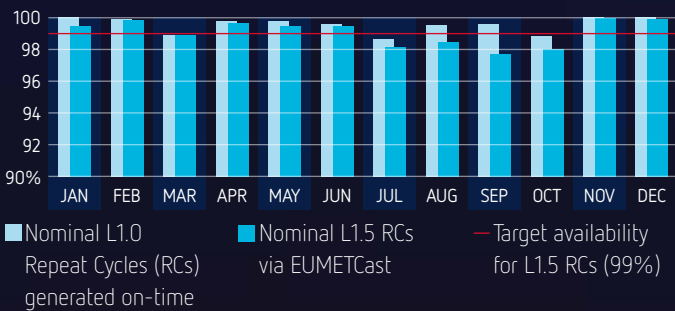
All Services: Impacted by short outages of EUMETCast (Jan, May, Aug, Sep, Oct).

Meteosat SEVIRI Full Disc Service: availability impacted by SEVIRI outage (16 Mar), and an inclination manoeuvre (5 Jul)

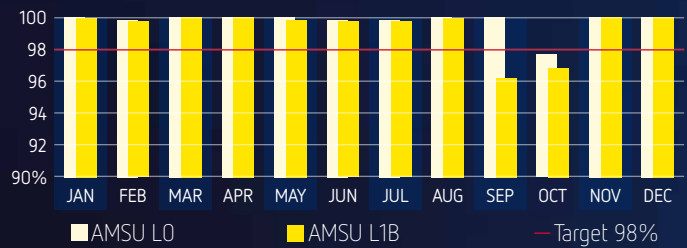
Meteosat SEVIRI Rapid Scan Service: availability impacted mainly by Meteosat entering into safe-mode (21-23 Aug)

OPERATIONAL PERFORMANCE INDICATORS (CONTINUED)

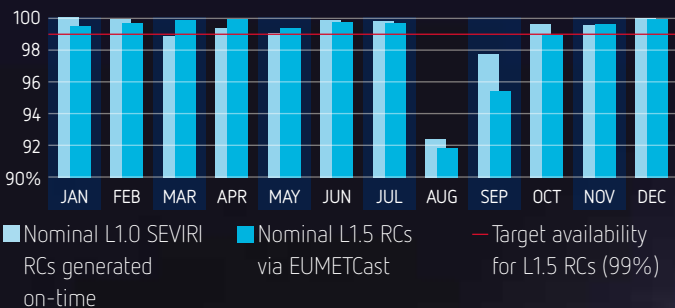
AVAILABILITY OF METEOSAT SEVIRI FULL DISC IMAGE DATA (0°) IN 2011



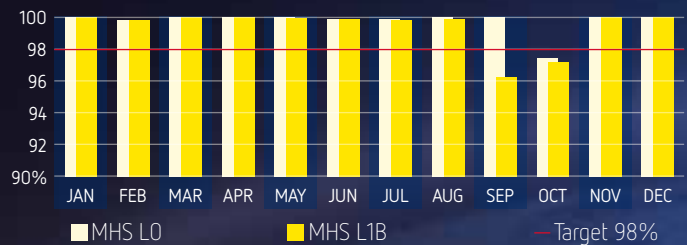
AVAILABILITY OF METOP AMSU LEVEL 1B BUFR DATA IN 2011



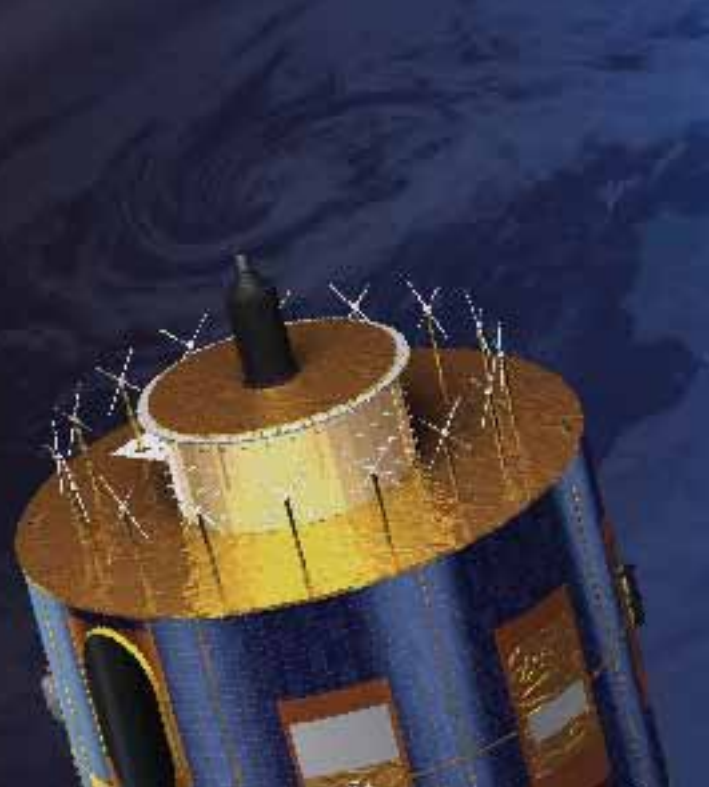
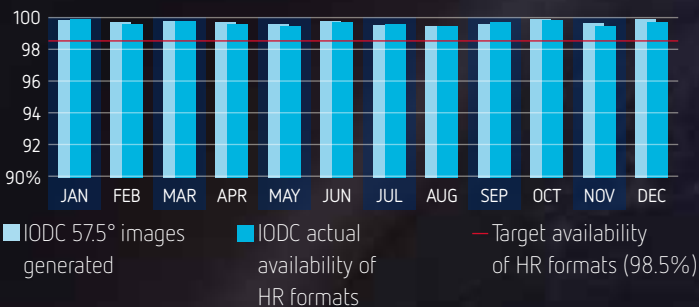
AVAILABILITY OF METEOSAT SEVIRI RAPID SCAN DATA (9.5°E) IN 2011

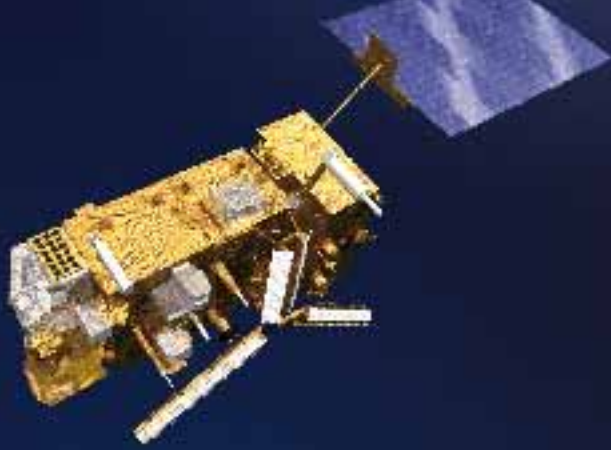


AVAILABILITY OF METOP MHS LEVEL 1B BUFR DATA IN 2011



AVAILABILITY OF METEOSAT IODC IMAGE DATA (57.5°E) IN 2011

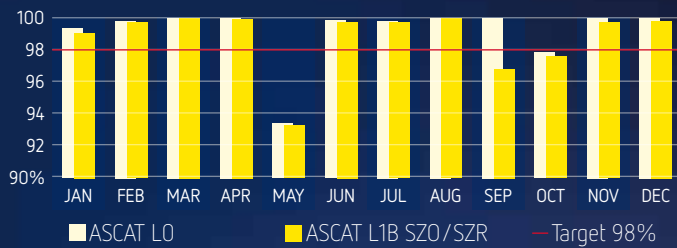




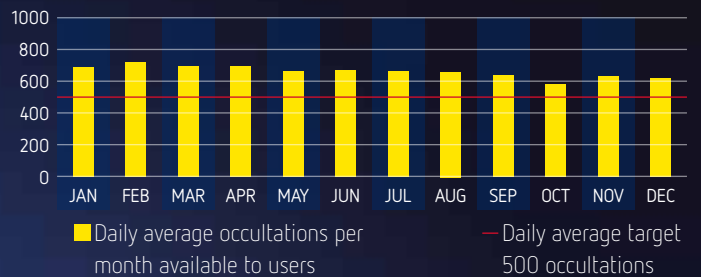
Metop Services: Outage of most services due to an out-of-plane manoeuvre of Metop-A (28-29 Sep) and a spontaneous payload switch off (22-23 Oct)

Jason Service: Data latency impacted by an antenna and building relocation activities at the Fairbanks ground station (Aug)

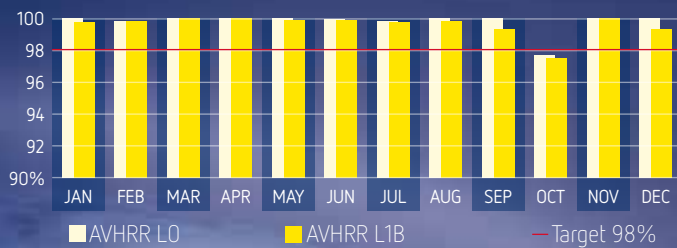
AVAILABILITY OF METOP ASCAT LEVEL 1B SZO & SZR DATA IN 2011



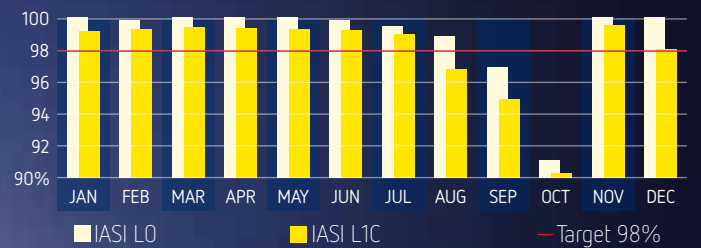
AVAILABILITY OF METOP GRAS LEVEL 1B DATA IN 2011



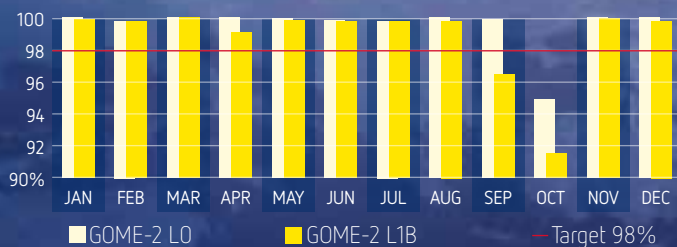
AVAILABILITY OF METOP AVHRR LEVEL 1B DATA IN 2011



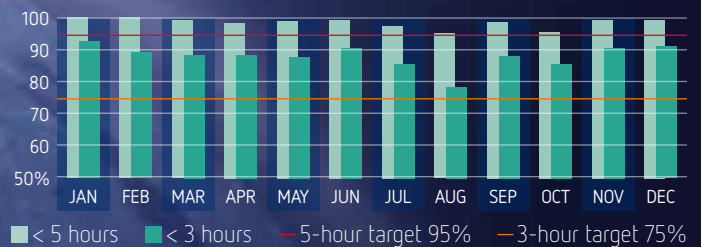
AVAILABILITY OF METOP IASI LEVEL 1C BUFR DATA IN 2011



AVAILABILITY OF METOP GOME-2 LEVEL 1B DATA IN 2011



AVAILABILITY OF JASON-2 OPERATIONAL GEOPHYSICAL DATA RECORDS IN 2011



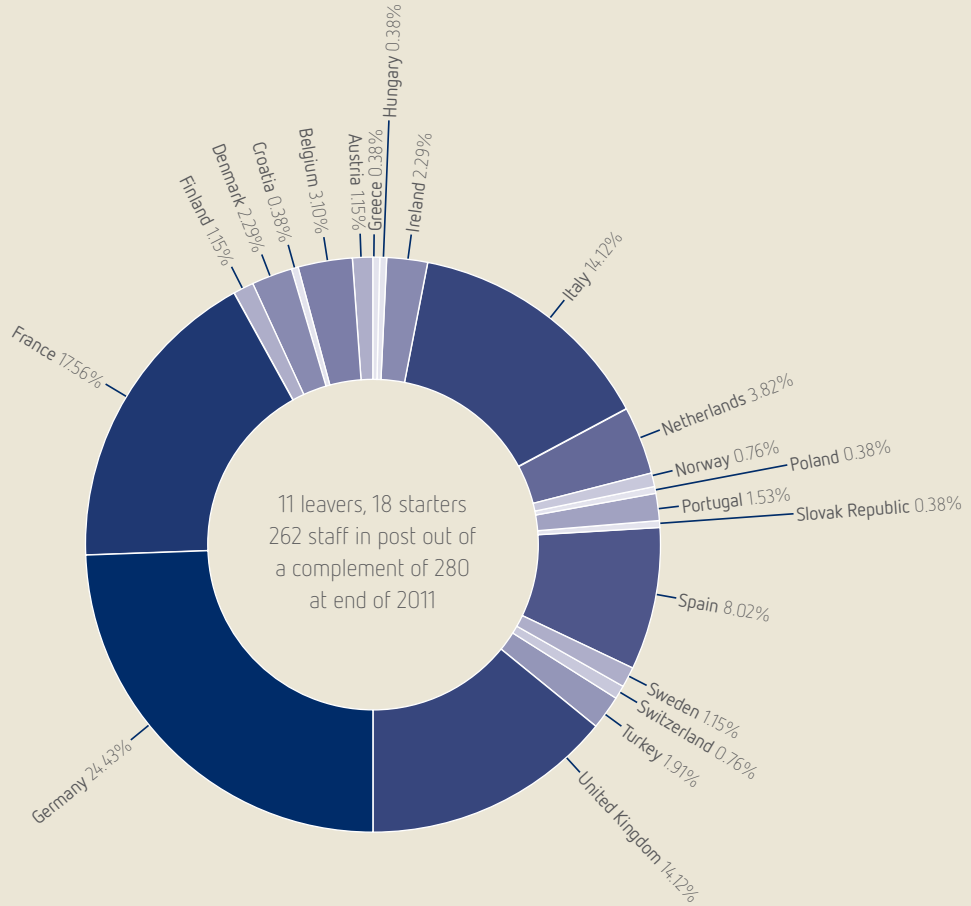
KEY FIGURES

CONTINUED

HUMAN RESOURCES

STAFF IN POST

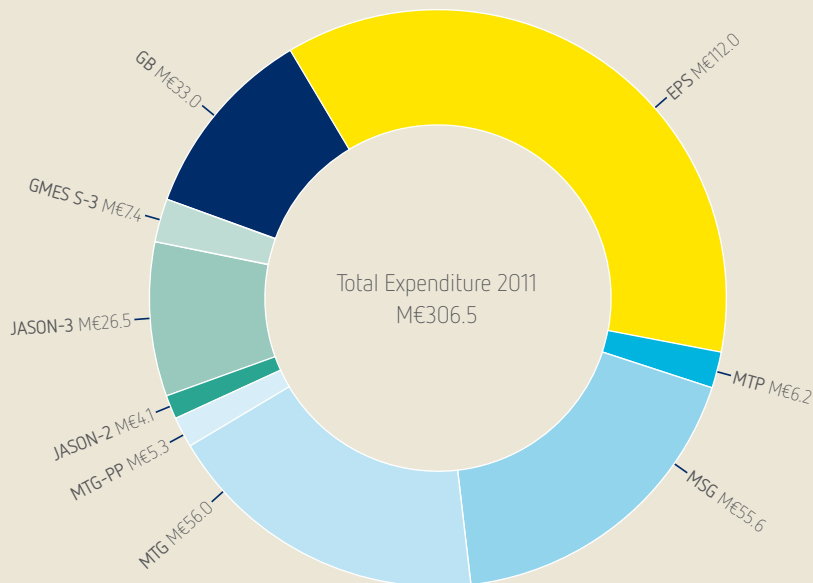
31 DECEMBER 2011



FINANCIAL INFORMATION

EXPENDITURE BUDGETS 2011

(M€ 306.5)



The following tables are a summary of the information included in the 2011 financial statement audited by the French Cour des Comptes.

SUMMARY REVENUE AND EXPENDITURE 2011

	KEUR
REVENUE	
Member and Cooperating State Contributions	255,537
Other Contributions	9,843
Tax on Salary	9,103
Sales Revenue	1,917
Other Revenue	311,670
Use of Provisions	18,059
TOTAL REVENUE	606,129
EXPENDITURE	
Costs for Human Resources	79,449
Other Operating Expenses	8,334
Satellites related costs	23,924
SAF, Prospective Activities, Research Fellows	8,888
Depreciation	215,829
Change of Provisions	4,078
TOTAL EXPENDITURE	340,502
Revenue from Financial Operations	4,857
NET SURPLUS FOR THE PERIOD*	270,484
Surplus to be distributed to Member and Cooperating States	14,351
Result Allocated to Reserves	256,133
SUMMARY BALANCE SHEET 2011	
	KEUR
ASSETS	
Current assets	666,234
Non-Current assets	1,560,532
TOTAL ASSETS	2,226,766
LIABILITIES	
Current Liabilities	426,854
Non-Current Liabilities	89,753
TOTAL LIABILITIES	516,607
TOTAL NET ASSETS/EQUITY	1,710,159
TOTAL LIABILITIES & NET ASSETS/EQUITY	2,226,766

MEMBER AND COOPERATING STATES CONTRIBUTIONS 2011

	KEUR
MEMBER STATE CONTRIBUTIONS	
Austria	4,673
Belgium	6,650
Croatia	636
Czech Republic	1,832
Denmark	4,585
Finland	3,480
France	39,262
Germany	47,833
Greece	4,000
Hungary	1,565
Ireland	2,993
Italy	31,059
Luxembourg	554
Latvia	243
Netherlands	11,291
Norway	5,210
Poland	4,431
Portugal	3,168
Romania	1,461
Slovenia	591
Slovak Republic	727
Spain	19,428
Sweden	6,518
Switzerland	7,108
Turkey	5,839
United Kingdom	39,607
TOTAL MEMBER STATES CONTRIBUTIONS	254,744
COOPERATING STATE CONTRIBUTIONS	
Bulgaria	204
Estonia	130
Iceland	130
Lithuania	178
Serbia	151
TOTAL COOPERATING STATE CONTRIBUTIONS	793
TOTAL MEMBER AND COOPERATING STATES CONTRIBUTIONS	255,537

* The Net Surplus is mainly due to asset revaluation following the introduction of the co-financed assets for the ESA share of Metop-A, internally generated assets and the extension of the life time of satellites/instruments, which are accounted for under Other Revenue.

APPENDIX


ORGANISATION 2011




* From 1 August 2011




EUMETSAT COUNCIL AND DELEGATE BODY CHAIRPERSONS, END OF 2011


EUMETSAT Council
 Prof. P. Taalas (Chairperson)
Finnish Meteorological Institute


 Prof. A. Eliassen (Vice-Chairperson)
Norwegian Meteorological Institute


Policy Advisory Committee (PAC)
 Mr. I. Čačić (Chairperson)
Meteorological and Hydrological Service of Croatia

 Dr. M. Gray (Vice-Chairperson)
Met Office

Scientific and Technical Group (STG)
 Mr. B. Truscott (Chairperson)
Met Office


 Mr. S. Nilsson (Vice-Chairperson)
Swedish Meteorological and Hydrological Institute

Administrative and Finance Group (AFG)
 Mr. M. Palomares (Chairperson)
Agencia Estatal de Meteorología


 Dr. G. Seuffert (Vice-Chairperson)
Bundesministerium für Verkehr-, Bau- und Stadtentwicklung

Data Policy Group (DPG)
 Mag. M. Kober (Chairperson)
Zentralanstalt für Meteorologie und Geodynamik

 Mr. A. Rubli (Vice-Chairperson)
MeteoSwiss

EUMETSAT Advisory Committee of Cooperating States (EACCS)
 Ms. V. Auguliene (Chairperson)
Lithuanian Hydrometeorological Service

 Dr. G. Kortchev (Vice-Chairperson)
Bulgarian National Institute of Meteorology and Hydrology

STG Operations Working Group (STG-OWG)
 Dr. A. Jann (Chairperson)
Zentralanstalt für Meteorologie und Geodynamik

 Mr. P. Labrot (Vice-Chairperson)
Météo-France

STG Science Working Group (STG-SWG)
 Dr. J. Eyre (Chairperson)
Met Office

 Mr. H. Roquet (Vice-Chairperson)
Météo-France

APPENDIX

CONTINUED

EUMETSAT COUNCIL DELEGATES AND ADVISORS, END OF 2011

AUSTRIA

Dr. M. Staudinger *Zentralanstalt für
Meteorologie
und Geodynamik (ZAMG)*
Mr. L.A. Berset *Österreichische
Forschungsförder-
ungsgesellschaft
ZAMG*
Mag. M. Kober

BELGIUM

Dr. D. Gellens *Institut Royal
Météorologique (IRM)*
Dr. S. Dewitte *Belgian Science
Policy Office*
Mr. P. Rottiers *IRM*

CZECH REPUBLIC

Mr. V. Dvorak *Czech Hydrometeoro-
logical Service (CHMI)*
Mr. M. Setvák *CHMI*
Ms. I. Spaltova *Ministry of Environment*

CROATIA

Mr. I. Čačić *Meteorological and
Hydrological Service
(DHMZ)*
Dr. B. Lipovšćak *DHMZ*

DENMARK

Dr. P. Aakjaer *Danish Meteorological
Institute (DMI)*
Dr. L. Prahm *DMI*
Dr. F. Jenle *DMI*
Mr. P. Thorsen *DMI*
Mr. E. Elbroend-Bek *DMI*

FINLAND

Dr. Y. Viisanen *Finnish Meteorological
Institute (FMI)*
Ms. P. Pylkkö *FMI*

FRANCE

Mr. F. Jacq *Météo-France*
Mr. P. Veyre *Météo-France*
Ms. I. Bénézeth *Ministère de l'Ecologie,
du Développement
durable et de l'Energie*
Ms. C. Carretta *Centre National d'Etudes
Spatiales*

GERMANY

Prof. Dr. G. Adrian *Deutscher Wetterdienst*
Mr. J. Saalmüller *Deutscher Wetterdienst*
Mr. J. Asmus *Deutscher Wetterdienst*
Ms. T. Polat-Momen *Bundesministerium für
Verkehr-, Bau- und
Stadtentwicklung (BMVBS)*
Dr. G. Seuffert *BMVBS*
Dr. C. Brüns *Deutsches Zentrum für
Luft- und Raumfahrt*

GREECE

Brig.Gen.N. Chaidaroglou *Hellenic National
Meteorological Service
(HNMS)*
Maj. Gen. L. Asimakis *HNMS*
Mr. A. Fiamegkos *HNMS*

HUNGARY

Dr. Z. Dunkel *Hungarian
Meteorological Service*

IRELAND

Mr. L. Campbell *Met Éireann*

ITALY

Brig. Gen. C. De Simone *Ufficio Generale per la
Meteorologia*
Lt. Col. L. De Leonibus *Ufficio Generale per la
Meteorologia*
Mr. V. De Cosmo *Agenzia Spaziale Italiana*

LATVIA

Mr. A. Leitass *Latvian Environment,
Geology and
Meteorology Agency*

OBSERVERS

EACCS Chairperson (Lithuania)
ECMWF
ESA
EUMETNET
European Commission
NOAA
WMO

LUXEMBOURG

Mr. J. Santurbano *Administration de la navigation aérienne*

NETHERLANDS

Dr. F. Brouwer *Koninklijk Nederlands Meteorologisch Instituut*
Mr. R. Van Oss *Koninklijk Nederlands Meteorologisch Instituut*

NORWAY

Prof. A. Eliassen *Norwegian Meteorological Institute (Met.No)*
Mr. J. Sunde *Met.No*

POLAND

Prof. M. Ostojski *Institute of Meteorology and Water Management*
Mr. L. Legutko *Institute of Meteorology and Water Management*
Ms. E. Wozniak-Dudzinska *Institute of Meteorology and Water Management*

PORTUGAL

Prof. A. Serrão *Instituto de Meteorologia*

ROMANIA

Dr. I. Sandu *National Meteorological Administration*
Dr. G. Stancalie *National Meteorological Administration*
Dr. A. Diamandi *National Meteorological Administration*

SLOVAKIA

Dr. P. Nejedlík *Slovak Hydrometeorological Institute (SHMU)*
Mr. V. Pastircák *SHMU*

SLOVENIA

Dr. K. Bergant *Slovenia Environment Agency*
Mr. J. Roskar *Slovenia Environment Agency*

SPAIN

Dr. R. Garcia Herrera *Agencia Estatal de Meteorología (AEMET)*
Mr. M. Palomares *AEMET*
Mr. E. Vez *Centro para el Desarrollo Tecnológico Industrial*

SWEDEN

Ms. L. Häll Eriksson *Swedish Meteorological and Hydrological Institute (SMHI)*
Mr. T. Kvik *SMHI*
Mr. S. Nilsson *SMHI*

SWITZERLAND

Mr. C. Pluess *MeteoSwiss*
Mr. A. Rubli *MeteoSwiss*
Ms. G. Seiz *MeteoSwiss*

TURKEY

Mr. M. Caglar *Turkish State Meteorological Service*
Mr. E. Erdi *Turkish State Meteorological Service*
Mr. A. Karatas *Turkish State Meteorological Service*

UNITED KINGDOM

Mr. J. Hirst *Met Office*
Mr. B. Truscott *Met Office*
Mr. S. Turner *Met Office*

APPENDIX

CONTINUED

PARTICIPATION IN MAJOR EXTERNAL EVENTS IN 2011

23-27 January	Annual meeting of American Meteorological Society	Seattle, USA
2 February	Sky and Space Intergroup Conference	Brussels, Belgium
16-20 May	XVIth World Meteorological Congress	Geneva, Switzerland
13 June	EU-US dialogue on space cooperation	Brussels, Belgium
15-17 June	GMES and Climate Change Conference	Helsinki, Finland
3-7 October	39 th plenary session of CGMS	St Petersburg, Russia
16-17 October	XIII th European Interparliamentary Space Conference, Plenary session	Berlin, Germany
18-20 October	Meteorological Technology World Expo 2011	Brussels, Belgium
24-26 October	European Commission Space Weather Awareness Dialogue	Brussels, Belgium
24-28 October	World Climate Research Programme (WCRP) Open Science Conference	Denver, USA
7 November	Joint press trip with ESA to Astrium for presentation of the Metop-B satellite	Toulouse, France
8-9 November	4 th Conference on EU Space Policy	Brussels, Belgium
8-10 November	CEOS Plenary	Lucca, Italy
16-17 November	GEO VIII Plenary and Exhibition	Istanbul, Turkey
6 December	8 th European Space Council	Brussels, Belgium
6-9 December	2 nd Asia/Oceania Meteorological Satellite Users' Conference	Tokyo, Japan

SCIENTIFIC AND TECHNICAL PUBLICATIONS IN 2011

Accadia, C., and S. Zechetto, 2011: Scatterometry as a tool to understand the performances of limited area models. *EUMETSAT/ESA Scatterometer Science Conf.*, Darmstadt, Germany.

Ahlers, B., G. Courreges-Lacoste, B. Guldemann, B. Veihermann, H. Stark, and **M. Dobber**, 2011: GMES Sentinel-4/UVN Instrument Concept and Calibration Approach. *CALCON Tech. Conf.*, Logan, United States.

Anderson, C., J. Figa-Saldaña, H. Bonekamp, J. Wilson, C. Duff, and M. Santuari, 2011: ASCAT full resolution backscatter product. *EUMETSAT Meteorol. Satellite Conf.*, Oslo, Norway.

Anderson, C., and **J. Wilson**, 2011: ASCAT radiometric resolution. *EUMETSAT/ESA Scatterometer Science Conf.*, Darmstadt, Germany.

August, T., D. Coppens, T. Hultberg, M. Crapeau, S. Chauhan, D. Klaes, F. Montagner, and R. Munro, 2011: the operational IASI products: progress status. *EUMETSAT Meteorol. Satellite Conf.*, Oslo, Norway.

Battles, D., R. Lambeck, P. Perez Albinana, R. Raja, **H. Bauch**, and **F. Montagner**, 2011: The evolution of the performance of the AVHRR, HIRS and AMSU-A instruments on board MetOp-A after over four years in orbit. *Proc. Conf. Infrared Remote Sensing and Instrumentation XIX*, San Diego, United States, SPIE Int. Soc. for Opt. Eng., **8154**, 81540N.

Bonekamp, H., 2011: ASCAT mission overview. *EUMETSAT/ESA Scatterometer Science Conf.*, Darmstadt, Germany.

Calbet, X., R. Kivi, **S. Tjemkes, F. Montagner, R. Stuhlmann**, 2011: Matching radiative transfer models and radiosonde data from the EPS/Metop Sodankylä campaign to IASI measurements. *Atmos. Meas. Tech.*, **4**, 1177-1189.

Calbet, X., S. Tjemkes, T. August, R. Stuhlmann, 2011: Meteosat Third Generation InfraRed Sounder (MTG-IRS) Level 2 prototype development and application to IASI data. *EUMETSAT Meteorol. Satellite Conf.*, Oslo, Norway.

Chung, E., B. Soden, B. Sohn, and **J. Schmetz**, 2001: Model-simulated humidity bias in the upper troposphere and its relation to the large-scale circulation. *J. Geophys. Res.*, **116**, D10110.

De Coning, E., **M. Koenig**, and J. Olivier, 2011: The combined instability index: a new very-short range convection forecasting technique for southern Africa. *Meteor. Appl.*, **18**, 421-439.

El Amraoui, L., J.-L. Attie, **T. August**, V.-H. Peuch, W. Lahoz, P. Ricaud, A. Piacentini, and S. Massart, 2011: Evaluation of the impact of METOP/IASI CO total column assimilation on the vertical distribution in the troposphere: methodology and validation. *Amer. Geophys. Union Fall Meeting 2011*, San Francisco, United States.

Ferraguto, M., K. Jurva, **M. Smith**, and J. Johansson, 2011: The device simulator: a capable tool for complex systems testing. *Proc. DASIA 2011 Data Systems in Aerospace.*, San Anton, Malta, Eur. Space Agency, **694**.

Figa-Saldaña, J., C. Anderson, H. Bonekamp, J. Wilson, and C. Duff, 2011: ASCAT backscatter, validation and current developments. *EUMETSAT Meteorol. Satellite Conf.*, Oslo, Norway.

Figa Saldena, J., C. Anderson, C. Duff, H. Bonekamp, and J. Wilson, 2011: Overview of the ASCAT backscatter processing. *EUMETSAT/ESA Scatterometer Science Conf.*, Darmstadt, Germany.

Figa Saldena, J., H. Bauch, C. Anderson, and J. Lerch, 2011: Validation and long term monitoring of ASCAT instrument and level 1 products. *EUMETSAT/ESA Scatterometer Science Conf.*, Darmstadt, Germany.

Figa Saldena, J., C. Ponsard, A. Verhoef, S. Hassenauer, and S. Eastwood, 2011: Overview of ASCAT services. *EUMETSAT/ESA Scatterometer Science Conf.*, Darmstadt, Germany.


Garcia Sanchez, P., A. Perez Cambrilles, J. Eufrazio, and **P. Righetti**, 2011: New EUMETSAT polar system attitude monitoring software. *22nd Int. Symp. on Space Flight Dynamics*, San Jose dos Campos, Brazil, INPE Inst. Nacional de Pesquisas Espaciais.

APPENDIX

CONTINUED

SCIENTIFIC AND TECHNICAL PUBLICATIONS IN 2011 (CONTINUED)

- Goldberg, M., G. Ohring, J. Butler, C. Cao, R. Datla, D. Doelling, **V. Gärtner**, **T. Hewison**, B. Iacovazzi, D. Kim, T. Kurino, J. Lafeuille, P. Minnis, D. Renaut, **J. Schmetz**, D. Tobin, L. Wang, F. Weng, X. Wu, F. Yu, P. Zhang, and T. Thut, 2011: The Global Space-based Inter-Calibration System (GSICS). *Bull. Amer. Meteor. Soc.*, **92**, 467-475.
- Grandell, J.**, **M. Dobber**, and **R. Stuhlmann**, 2011: Lightning monitoring from a geostationary orbit: MTG Lightning Imager concept and processing challenges. *EGU General Assembly 2011*, Vienna, Austria, Eur. Geophys. Union.
- Hewison, T.**, 2011: GSICS SEVIRI-IASI inter-calibration uncertainty evaluation. *EUMETSAT Meteorol. Satellite Conf.*, Oslo, Norway.
- Hünerbein, A., R. Preusker, J. Fischer, **P. Phillips**, and **P. Schlüssel**, 2011: Study on a radiometric and spectral requirements of an EPS-SG Visible/Infrared Imager. *EUMETSAT Meteorol. Satellite Conf.*, Oslo, Norway.
- Jeong, M.-J., C. Hsu, **E. Kwiatkowska**, B. Franz, G. Meister, and C. Salustro, 2011: Impacts of Cross-Platform Vicarious Calibration on the Deep Blue Aerosol Retrievals for Moderate Resolution Imaging Spectroradiometer Aboard Terra. *IEEE Trans. Geosci. Remote Sens.*, **49**, 4877 – 4888.
- Kinter, H.**, 2011: Meteosat Third Generation Navigation Approach. *22nd Int. Symp. on Space Flight Dynamics*, San Jose dos Campos, Brazil, INPE Inst. Nacional de Pesquisas Espaciais.
- Lutz, H.-J.**, and **P. Watts**, 2011: Multi-layer cloud detection within the SCE/CLA algorithm. *3rd Cloud Parameter Retrieval Workshop*, Madison, United States.
- Masiello, G., G. Grieco, C. Serio, **X. Calbet**, **R. Stuhlmann**, and **S. Tjemkes**, 2011: MTG-IRS correlation interferometry for the retrieval of CO₂ columnar amount: An error analysis study. *EUMETSAT Meteorol. Satellite Conf.*, Oslo, Norway.
- Mecikalski, J., **P. Watts**, and **M. Koenig**, 2011: Use of Meteosat Second Generation optimal cloud analysis fields for understanding physical attributes of growing cumulus clouds. *Atmos. Res.*, **102**, 175 - 170.
- O'Carroll, A.**, 2011: Interactions of AVHRR brightness temperatures and ASCAT SIGMA-0S. *EUMETSAT/ESA Scatterometer Science Conf.*, Darmstadt, Germany.
- Phillips, P.**, **P. Schlüssel**, **C. Accadia**, **S. Banfi**, and I. Zerfowski, 2011: Observation requirements for the second generation EUMETSAT polar system visible/infrared imager. *Proc. Conf. Sensors, Systems, and Next-Generation Satellites XV*, Prague, Czech Republic, SPIE Int. Soc. for Opt. Eng., **8176**, 817608.
- Phulpin, T., C. Camy-Peret, J. Taylor, C. Clerbaux, P. Coheur, C. Crevoisier, D. Edwards, A. Gambacorta, V. Guidard, F. Hilton, N. Jacquimet, R. Knuteson, L. Lavanant, T. McNally, M. Matricardi, H. Revercomb, C. Serio, L. Strow, **P. Schlüssel**, **D. Klaes**, and C. Larigauderie, 2011: Les resultants exceptionnels de Iasi, sondeur atmosphérique hyperspectral de Metop. *Météorol.*, **8**, 19-30.
- Righetti, P.**, and **H. Kinter**, 2011: Feasibility of Meteosat Third Generation collocation using a single s-band tracking station and large inclination maneuvers. *22nd Int. Symp. on Space Flight Dynamics*, San Jose dos Campos, Brazil, INPE Inst. Nacional de Pesquisas Espaciais.
- Righetti, P.**, **F. Sancho**, **D. Lazaro**, and **A. Damiano**, 2011: Handling of conjunction warnings in EUMETSAT flight dynamics. *22nd Int. Symp. on Space Flight Dynamics*, San Jose dos Campos, Brazil, INPE Inst. Nacional de Pesquisas Espaciais.
- Ryan, B., and **L. Schueller**, 2011: Sustained coordinated processing of environmental satellite data for climate monitoring (SCOPE-CM)—transition of research to operations for climate products. *1st Conf. on Transition of Res. to Operations: Successes, Plans and Challenges*, Seattle, United States.
- Sayer, A., C. Poulsen, C. Arnold, E. Campmany, S. Dean, G. Ewen, R. Graingier, B. Lawrence, R. Siddans, G. Thomas, and **P. Watts**, 2011: Global retrieval of ATSR cloud parameters and evaluation (GRAPE): dataset assessment. *Atmos. Chem. Phys.*, **11**, 3913-3936.
- Schmetz, J.**, **D. Klaes**, **R. Stuhlmann**, **P. Schlüssel**, **L. Sarlo**, **K. Holmlund**, **S. Rota**, and **M. Cohen**, 2011: Update on EUMETSAT Meteorological Satellite Programmes. *7th Ann. Symp. on Future Operational Environmental Satellite Systems*, Seattle, United States.



Steiner, A., D. Hunt, S.-P. Ho, G. Kirchengast, A. Mannucci, B. Scherllin-Pirscher, H. Gleisner, **A. von Engeln**, T. Schmidt, C. Ao, S. Leroy, U. Foelsche, Y. -H. Kuo, E. Kursinski, K. Lauritsen, S. Syndergaard, M. Gorbunov, **C. Marquardt**, C. Rocken, W. Schreiner, S. Sokolovskiy, and J. Wickert, 2011: Towards Earth System Data Records from GPS Radio Occultation: Assessing Structural Uncertainty. *Amer. Geophys. Union Fall Meeting 2011*, San Francisco, United States.

Vogelzang, J., A. Stoffelen, A. Verhoef, and **J. Figa-Saldena**, 2011: On the quality of high-resolution scatterometer winds. *J. Geophys. Res.*, **116**, C10033.

Voges, U., **M. Schick**, and U. Einspanier, 2011: EO PORTAL - WMS services of the EUMETSAT realtime image gallery. *EUMETSAT Meteorol. Satellite Conf.*, Oslo, Norway.

Von Engeln, A., C. Accadia, J. Ackermann, C. Marquardt, Y. Andres, D. Lazaro, and D. Klaes, 2011: Potentials for radio occultation applications during inter-satellite calibration periods. *Adv. Space Res.*, **47**, 1731-1742.

Von Engeln, A., Y. Andres, C. Marquardt, and C. Sancho, 2011: GRAS radio occultation on-board of Metop. *Adv. Space Res.*, **47**, 336-347.

Von Engeln, A., and D. Ector, 2011: Improved exploitation of radio occultation observations. *ECMWF Newsl.*, **128**, 8-9.

Wagner, S., and **Y. Govaerts**, 2011: Joint retrieval of hourly-resolved aerosol optical depths and surface reflectance using MSG/SEVIRI observations. *EGU General Assembly 2011*, Vienna, Austria, Eur. Geophys. Union.

Watts, P., R. Bennartz, and F. Feli, 2011: Retrieval of two-layer cloud properties from multispectral observations using optimal estimation. *J. Geophys. Res.*, **116**, D16203.

Watts, P., and **H.-J. Lutz**, 2011: Progress on optimal estimation cloud property retrieval from SEVIRI observations. *3rd Cloud Parameter Retrieval Workshop*, Madison, United States.

Wilson, J., and **C. Anderson**, 2011: ASCAT radiometric accuracy and stability and overall radiometric performance. *EUMETSAT/ESA Scatterometer Science Conf.*, Darmstadt, Germany.

Wilson, J., C. Anderson, J. Figa Saldena, and H. Bonekamp, 2011: ASCAT calibration status. *Advanced RF Sensors and Remote Sensing Instruments Conf*, Noordwijk, The Netherlands.

Yurganov, L., **T. August**, A. Dzhola, E. Grechko, V. Rakitin, E. Fokeeva, R. Shumsky, L. Strow, and S. Hannon, 2011: CO total columns retrieved from three IR space-based sounders over 2010 Russian wild fires: Comparison with two ground-based spectrometers and surface monitors. *EUMETSAT Meteorol. Satellite Conf.*, Oslo, Norway.

Zhou, D., A. Larar, X. Liu, W. Smith, L. Strow, P. Yang, **P. Schlüssel**, and **X. Calbet**, 2011: Global land surface emissivity retrieved from satellite ultraspectral IR measurements. *IEEE Trans. Geosci. Remote Sens.*, **49**, 1277-1290.

EUMETSAT, 2011: Proceedings of the EUMETSAT 9th User Forum in Africa, Ouagadougou, Burkina Faso, **EUMETSAT, P.58**. [Available online at: http://www.eumetsat.int/Home/Main/AboutEUMETSAT/Publications/ConferenceandWorkshopProceedings/2010/SP_2011032311914467]

EUMETSAT, 2011: Proceedings of the EUMETSAT Meteorological Satellite Conference, Oslo, Norway, **EUMETSAT, P.59**. [Available online at: http://www.eumetsat.int/Home/Main/AboutEUMETSAT/Publications/ConferenceandWorkshopProceedings/2011/SP_2011114105950658]

APPENDIX

CONTINUED

GLOSSARY OF TERMS AND ACRONYMS

ACMAD	African Center of Meteorological Applications for Development	ERS	European Remote Sensing satellite (ESA)
AEMET	Agencia Estatal de Meteorología	ESA	European Space Agency
AGRHYMET	Centre Régional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle	ESOC	European Space Operations Centre (ESA)
AHRPT	Advanced High Resolution Picture Transmission	EU	European Union
AMESD	African Monitoring of the Environment for Sustainable Development	EUMETCast	EUMETSAT's satellite data broadcast system
ASCAT	Advanced Scatterometer (Metop)	FP-7	EC Framework Programme 7
ATOVs	Advanced TIROS Operational Vertical Sounder (Metop)	FY	Fengyun
AVHRR	Advanced Very High Resolution Radiometer (NOAA/Metop)	GCOS	Global Climate Observing System
CCI	Climate Change Initiative (ESA)	GEO	Group on Earth Observations
CCR	Coordinating Committee on Remuneration	GEONETCast	Global network of satellite data broadcast systems
CDOP	Continuous Development and Operations Phase	GFCS	Global Framework for Climate Services (WMO)
CEOS	Committee on Earth Observation Satellites	GMES	Global Monitoring for Environment and Security
CGMS	Coordination Group for Meteorological Satellites	GO	Geometric Optics
CIMSS	Cooperative Institute for Meteorological Satellite Studies	GOME-2	Global Ozone Monitoring Experiment-2 (Metop)
CM SAF	SAF on Climate Monitoring	GSICS	Global Space-based Inter-Calibration System (CGMS/WMO)
CMA	China Meteorological Administration	H SAF	SAF on Support to Operational Hydrology and Water Management
CMACast	CMA's satellite data broadcast system	HPOA	High Precision Ocean Altimetry
CNES	Centre National d'Etudes Spatiales (French space agency)	HRPT	High Resolution Picture Transmission
DAWBEE	Data Access for Western Balkan and Eastern European countries	HRV	High Resolution Visible (MSG)
DCP	Data Collection Platform	IASI	Infrared Atmospheric Sounding Interferometer (Metop)
DLR	Deutsches Zentrum für Luft- und Raumfahrt (German space agency)	IASI-NG	IASI-Next Generation (Metop-SG)
DWD	Deutscher Wetterdienst	IJPS	Initial Joint Polar System
EARS	EUMETSAT Advanced Retransmission Service	IMGW	Institute of Meteorology and Water Management
EC	European Commission	IOC	Intergovernmental Oceanographic Commission
ECMWF	European Centre for Medium-Range Weather Forecasts	IODC	Indian Ocean Data Coverage
EDF	European Development Fund	IODE	International Oceanographic Data Exchange system
EPS	EUMETSAT Polar System	IPSAS	International Accounting Standards for Public Sector
EPS-SG	EPS-Second Generation	IRS	Infrared Sounder (MTG)
ERA-CLIM	European Reanalysis of Global Climate Observations	ISCCP	International Satellite Cloud Climatology Project
		ISRO	Indian Space Research Organisation
		Jason-2/-3	OSTM satellites (NASA/CNES/NOAA/EUMETSAT)

Jason-CS	Jason Continuity of Service	Oceansat	Indian ocean remote sensing satellite (ISRO)
JMA	Japan Meteorological Agency	OSCAT	Ocean Scatterometer (Oceansat)
JPS	Joint Polar System	OSI SAF	SAF on Ocean and Sea Ice
JPOC	Joint Space Operations Center (US Air Force)	OSTM	Ocean Surface Topography Mission
KNMI	Koninklijk Nederlands Meteorologisch Instituut	PLM	Payload Module (Metop)
LATMOS	Laboratoire Atmosphères, Milieux, Observations Spatiales	PUMA	Preparation for the Use of MSG in Africa
LEO	Low Earth Orbit	ROM SAF	SAF on Radio Occultation Meteorology
LEOP	Launch and Early Operations Phase	Roscocosmos	Russian Federal Space Agency
LMD	Laboratoire de Météorologie Dynamique	ROSHYDROMET	Russian Federal Service for Hydrometeorology and Environmental Monitoring
LSA SAF	SAF on Land Surface Analysis	RSHU	Russian State Hydrometeorological University
MESA	Monitoring Environment and Security in Africa	RSS	Rapid Scanning Service
MetImage	Advanced VIS/IR imager (Metop-SG)	SADACA	Satellite Data Access in Central Asia
Meteosat	EUMETSAT geostationary meteorological satellite	SAF	Satellite Application Facility
Metop	Meteorological Operational satellite (EPS)	SALGEE	Satellite Applications in Land Surface Analysis Group for Eastern Europe
Metop-SG	Metop Second Generation satellite	SCOPE-CM	Sustained, Coordinated Processing of Environmental Satellite Data for Climate Monitoring (WMO)
MME	Multi-Mission Elements	Sentinel-3	GMES ocean monitoring satellite
MPEF	Meteorological Products Extraction Facility	SEVIRI	Spinning Enhanced Visible and Infrared Imager (MSG)
MSG	Meteosat Second Generation	SSM/I	Special Sensor Microwave Imager (US)
MTG	Meteosat Third Generation	Suomi NPP	Suomi National Polar-orbiting Partnership (NASA/NOAA)
MTG-I	MTG Imaging satellite	SVM	Service Module (Metop)
MTG-S	MTG Sounding satellite	TIB	Technical Infrastructure Building
MWHS	Microwave Humidity Sounder (Fengyun)	TIROS	Television Infrared Observation Satellite
MWTS	Microwave Temperature Sounder (Fengyun)	ULB	Université Libre de Bruxelles
NASA	National Aeronautics and Space Administration (US)	UTC	Coordinated Universal Time
NDVI	Normalised Difference Vegetation Index	VLab	Virtual Laboratory for Training and Education in Satellite Meteorology (WMO)
NMHS	National Meteorological and Hydrological Service	WIGOS	WMO Integrated Global Observing System
NMS	National Meteorological Service	WMO	World Meteorological Organization
NOAA	National Oceanic and Atmospheric Administration (US)		
NOMEK	Nordic Meteorological Post-graduate Education		
NWC SAF	SAF on Nowcasting and Very Short Range Forecasting		
NWP	Numerical Weather Prediction		
NWP SAF	SAF on Numerical Weather Prediction		
O3M SAF	SAF on Ozone and Atmospheric Chemistry Monitoring		

Published by **EUMETSAT**
Europe's Meteorological Satellite Organisation

For more information about EUMETSAT,
it's programmes and activities, please contact:

User Service

EUMETSAT	Tel	+49 6151 807 3660/3770
Eumetsat-Allee 1	Fax	+49 6151 807 3790
64295 Darmstadt	E-mail	ops@eumetsat.int
Germany	Web	www.eumetsat.int

© EUMETSAT, September 2012
EUM AR.25 ISSN 1013-3410 ISBN 978-92-9110-094-1



Eumetsat-Allee 1
64295 Darmstadt
Germany

Tel: +49 6151 807 3660/3770
Fax: +49 6151 807 3790
E-mail: ops@eumetsat.int
www.eumetsat.int

EUMETSAT also has established cooperation agreements with organisations involved in meteorological satellite activities, including the National Meteorological Services of Canada, China, India, Japan, Korea, Russia and USA.

MEMBER STATES



COOPERATING STATES

