Issue 34 May 2011 EUMETSAT

image

News from Europe's Weather Satellite Organisation
– Expanded anniversary edition –

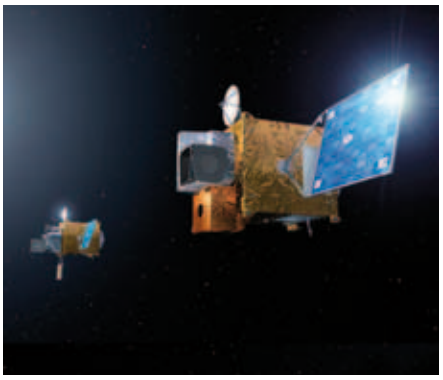
Work proceeds on MTG

The EUMETSAT Council resolution approving the full Meteosat Third Generation (MTG) programme entered into force on 25 February 2011. The consolidation of the full MTG programme as now approved resulted from a long and intensive process through which the initial studies to define user needs for the post-Meteosat Second Generation (MSG) era led to the establishment of end user requirements for the new geostationary programme, followed by the early definition phases of MTG until the end of 2007, when dedicated MTG activities started at EUMETSAT under the framework of the MTG Preparatory Programme.

The full MTG programme, which includes all the major development/procurement activities and the routine operations phase, was planned to start by January 2011 as a result of the approval process initiated by the 70th EUMETSAT Council held in Rome in June 2010. Because the approval process was taking longer than expected, the EUMETSAT Council in December 2010 debated authorising the full start of MTG work as of January 2011 in parallel with the finalisation of voting for those Member States which could not complete it by the Council itself. As a result of very positive developments in December 2010-January 2011, all the necessary steps to authorise the start of MTG activities beyond the Preparatory Programme were successfully accomplished.

"Milestones for MTG are ambitious"

The near/medium term milestones for MTG are ambitious: as part of the European Space Agency programme, the System Requirements Review for the space segment was completed in April 2011, followed by preparation of the Preliminary Design Review for late this year. At EUMETSAT, the Preliminary Design Review of the MTG system will be held by early summer and the Ground Segment Preliminary Design Review is targeted for the end of the year.



Artist's impression of MTG, Source: ESA

Meanwhile, preparations for the major procurements of the MTG ground segment have already started and industry was informed about future opportunities to bid for work on MTG at EUMETSAT during the MTG Industry Briefing Day held at EUMETSAT on 8 December 2010. Some 100 industry representatives were briefed on the current status of and plans for the programme, as well as on the work and studies performed to date and the anticipated timing of the release of invitations.

MTG Phase C/D at EUMETSAT will start in the second half of this year, following the Preliminary Design Review of the overall system. Phase C/D at the space segment level will begin between the end of 2011 and early 2012, lasting until the beginning of 2018, when the first MTG-I satellite will be launched.

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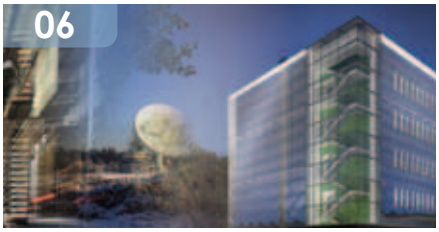


Director-General's Desk

When this issue of IMAGE is published, we will be very close to an important point in EUMETSAT's history, its 25th anniversary on 19 June.

At the same time, we are also close to an important point in my own EUMETSAT history, as my time in office will end in the summer. I am leaving EUMETSAT in an excellent position to continue its mission monitoring weather and climate from space into the future when I pass the baton to Alain Ratier, currently Deputy Director-General of Météo France and previously EUMETSAT's Director of Programme Development and therefore no stranger to the organisation.

History is about looking back and when doing so I can clearly say that the greatest achievement of my period in office was the final approval of the MTG programme in February this year. Other major achievements were the approval of Jason-3 at the beginning of 2010 and generally the recognition of EUMETSAT's role in Global Monitoring for Environment and Security (GMES).

At the same time, history is the foundation for our future. As far as MTG is concerned, we are on track for the launch of the first MTG satellite in the 2018 timeframe. The next major development will be the EUMETSAT Polar System Second Generation (EPS-SG). Furthermore, EUMETSAT is preparing to launch its next two satellites, Metop-B and the third Meteosat Second Generation (MSG-3) in 2012.

EUMETSAT's international cooperation activities are also making progress, with the implementation of expanded data access for our user community, notably with the US National Oceanic and Atmospheric Administration and its future NPP/JPSS-1 satellites, the China Meteorological Administration and its FY-3 satellites, and the Indian Space Research Organisation and its current Oceansat-2 satellite.

I wish Alain all the best as he takes the reins of this organisation, which I very much enjoyed leading for the last seven years and of whose achievements I am very proud.

Dr. Lars Prahm
Director-General of EUMETSAT

Lasting transatlantic relationship

The United States is an important and long-standing partner of EUMETSAT. Even before EUMETSAT was created, a US National Oceanic and Atmospheric Administration (NOAA) Global Observation Environmental Satellite (GOES) took over the data collection function from Meteosat in 1985. The failure of GOES-6 in January 1989 prompted the United States to ask EUMETSAT for help by moving Meteosat-3 to the mid-Atlantic under the Atlantic Data Coverage project. This transatlantic cooperation between EUMETSAT and NOAA developed further with the Extended Atlantic Data Coverage mission in the early 1990s, leading to the back-up agreement under which the two organisations agreed to assist each other in the event of a failure in the other's programmes.

The IJPS signing ceremony in Washington, DC, United States, 19 November 1998

The planning of the EUMETSAT Polar System (EPS) programme drew EUMETSAT and NOAA even closer together as they planned for a joint polar-orbiting system. Under the Initial Joint Polar System (IJPS) and Joint Transition Activities (JTA) agreements, the system shared by EUMETSAT and NOAA currently consists of three polar-orbiting satellites, with NOAA-18 and NOAA-19 covering the afternoon orbit and EUMETSAT's Metop-A covering the mid-morning orbit. They will be joined by Metop-B in 2012, followed by Metop-C in 2016, providing coverage of the polar orbit until at least 2020.

Under the Antarctic Data Acquisition project with the United States, Metop environmental data will be received by US and European weather services twice as fast as they received it previously.

The IJPS includes the exchange of instruments, with NOAA becoming interested in European instruments such as the Infrared Atmospheric Sounding Interferometer (IASI), from which it receives data from EUMETSAT, and the Microwave Humidity Sounder (MHS), which measures atmospheric water vapour and is carried by all four satellites forming the IJPS. Under the IJPS, NOAA-18 operations and mission data processing were supported by the EPS Ground Segment until this support was transferred to NOAA-19.

In June 2010, the Obama administration separated the US civil and military space programmes, which had been combined in 1994, and in a presidential statement, the United States announced its intention not to include a mid-morning orbit in its planned polar-orbiting programme, which entails EUMETSAT responsibility for the mid-morning orbit beyond the lifetime of EPS.

Instrument exchange will continue in future with EPS-SG and the US National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP), Joint Polar Satellite System (JPSS), and Defense Weather Satellite System (DWSS). Meanwhile, the JTA agreement is being updated to include NPP and JPSS.

Another area of transatlantic cooperation is the Ocean Surface Topography Mission Jason-2 ocean altimetry satellite and the Jason-3 follow-on programme. Like for Jason-2, the US contribution to Jason-3 includes the satellite launch, planned for 2013.

EUMETSAT exchanges data with CMA and ISRO

The China Meteorological Administration (CMA) is one of EUMETSAT's most important partners outside Europe. EUMETSAT is also expanding its cooperation with the Indian Space Research Organisation (ISRO).

EUMETSAT and CMA have a cooperation agreement focusing on data dissemination and exchange. As part of its growing cooperation with CMA, EUMETSAT started to receive and disseminate test data in November 2010 from CMA's FY-3A polar-orbiting satellite via EUMETCast, EUMETSAT's broadcast system for environmental data, in response to growing interest from its users in Europe for these data, in particular from the European Centre for Medium-range Weather Forecasts (ECMWF). This exchange of polar-orbiting data complements the exchange of data from geostationary satellites and the cooperation activities that EUMETSAT and CMA have on data dissemination through the coordination of the EUMETCast and CMACast systems.

For its part, CMA makes extensive use of EUMETSAT satellite data, which it currently receives at its EUMETCast station in the Xinjiang Uygur Autonomous Region in north-western China and via its link to the European Meteorological Data Network.

The expanding cooperation between EUMETSAT and ISRO takes advantage of both organisations' important role in Earth observation related to meteorological data. A crucial step in this international cooperation is the exchange of global observation data from ISRO's Oceansat-2 polar-orbiting satellite developed by the two organisations.

Before this data exchange, ISRO's missions were focused on national needs and global observations by Oceansat-2 were not shared in real time with global users. As the only scatterometer data available today are from the Advanced Scatterometer (ASCAT) instrument on board EUMETSAT's Metop polar-orbiting satellite, it became clear to users that Oceansat-2 data were essential to continue the operational delivery of ocean surface wind vectors derived from scatterometers. The data from Oceansat-2 have been specifically requested by EUMETSAT's Ocean and Sea Ice (OSI) Satellite Application Facility (SAF) and Numerical Weather Prediction (NWP) SAF. Interested users include EUMETSAT Member States and the United States, as well as ECMWF. The data exchanged by ISRO and EUMETSAT will also be made available to NOAA in the United States.

In addition to the Oceansat-2 polar-orbiting satellite, EUMETSAT is planning cooperation with ISRO on the exchange of data from the ISRO-Centre National d'Etudes Spatiale (CNES, the French space agency) Satellite with ARgos and ALtimeter in Ka-band (SARAL) and Megha-Tropiques missions. ISRO already has access to data from EUMETSAT satellites through the EUMETCast data dissemination system.

Growing family of nations

When EUMETSAT was formed by 16 nations in 1986, its membership was composed of the western European states which had become a traditional cooperating group in political, economic and scientific matters, including meteorology.

Arising as it did from a European Space Agency (ESA) initiative, it is not surprising that the membership of EUMETSAT was not very different from that of ESA itself. These states corresponded approximately to those of the then European Community, which later became the EU, plus Finland, Norway, Switzerland and Turkey. All of the original members of EUMETSAT were also members of ECMWF, often referred to as the sister organisation of EUMETSAT.

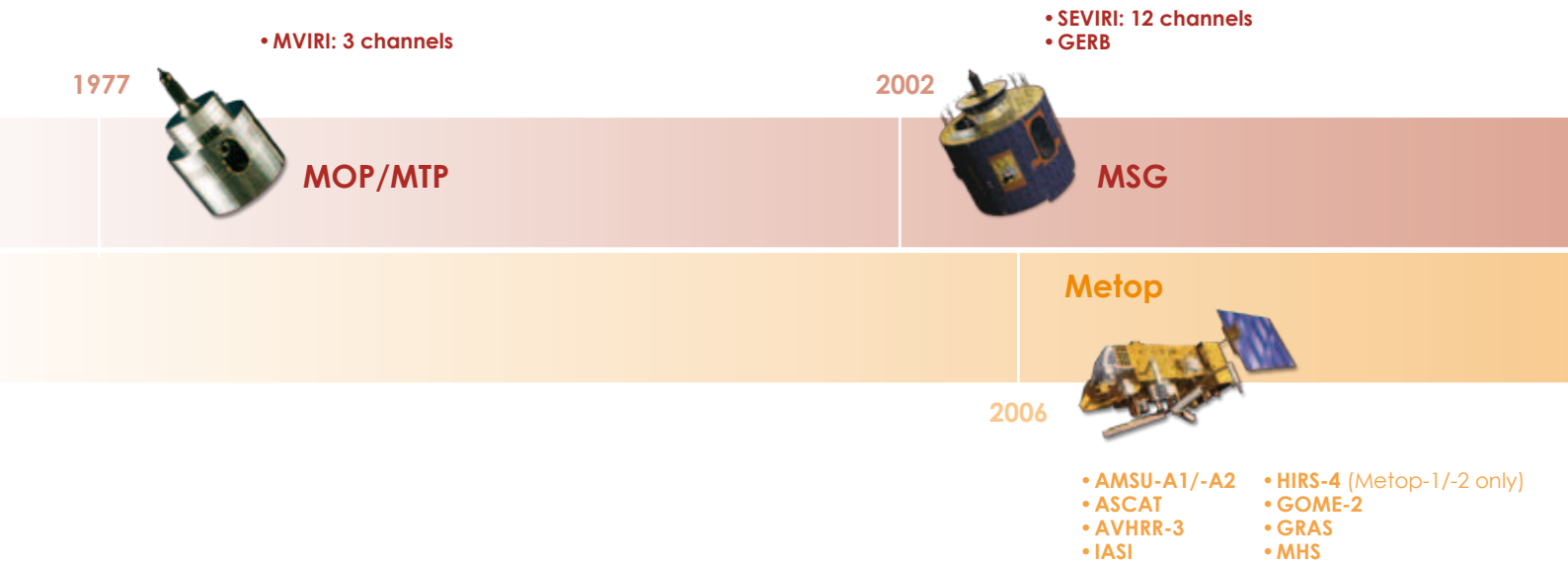
The fall of the Berlin Wall in 1989 opened up the prospect of Central and Eastern European countries joining. The concept of a Cooperating State was approved by

the EUMETSAT Council in June 1995 as an interim step to full membership. Slovakia and Hungary became the first Cooperating States within a day of each other in July 1999 and Slovakia became the first Cooperating State to become a full EUMETSAT Member State in January 2006.

Current EUMETSAT policy towards membership is to mirror the EU, and the last EU Member States which became full EUMETSAT Member States were the Czech Republic and Romania, which completed their ratification processes in 2010.

The aim now is for Bulgaria and Estonia to complete the procedures for their full accession in 2012, Iceland in 2013 and Lithuania and Serbia, the latter of which became the latest Cooperating State in 2009, in 2014.

The EUMETSAT strategy for 2035 foresees EUMETSAT promoting access and use of its data by wider user communities in Member States, Cooperating States and globally. While priority will be given to Member and Cooperating States, EUMETSAT has launched a programme to support Data Access for Western Balkan and Eastern European Countries (DAWBEE) which are neither Member nor Cooperating States. The programme supports the World Meteorological Organization's Regional Association VI (RA-VI) Strategic Plan and involves the installation of a standard EUMETCast (DAWBEE) station in 11 of the National Meteorological Services of RA-VI, as well as providing relevant training, with the support of experts from the region.



Growing applications

EUMETSAT was created in 1986 to operate Meteosat satellites to observe weather from space, but climate monitoring soon became part of the organisation's agenda. The range of satellites EUMETSAT operates has also expanded over the last 25 years, as have their capabilities and therefore applications, to include oceanography and environmental monitoring.

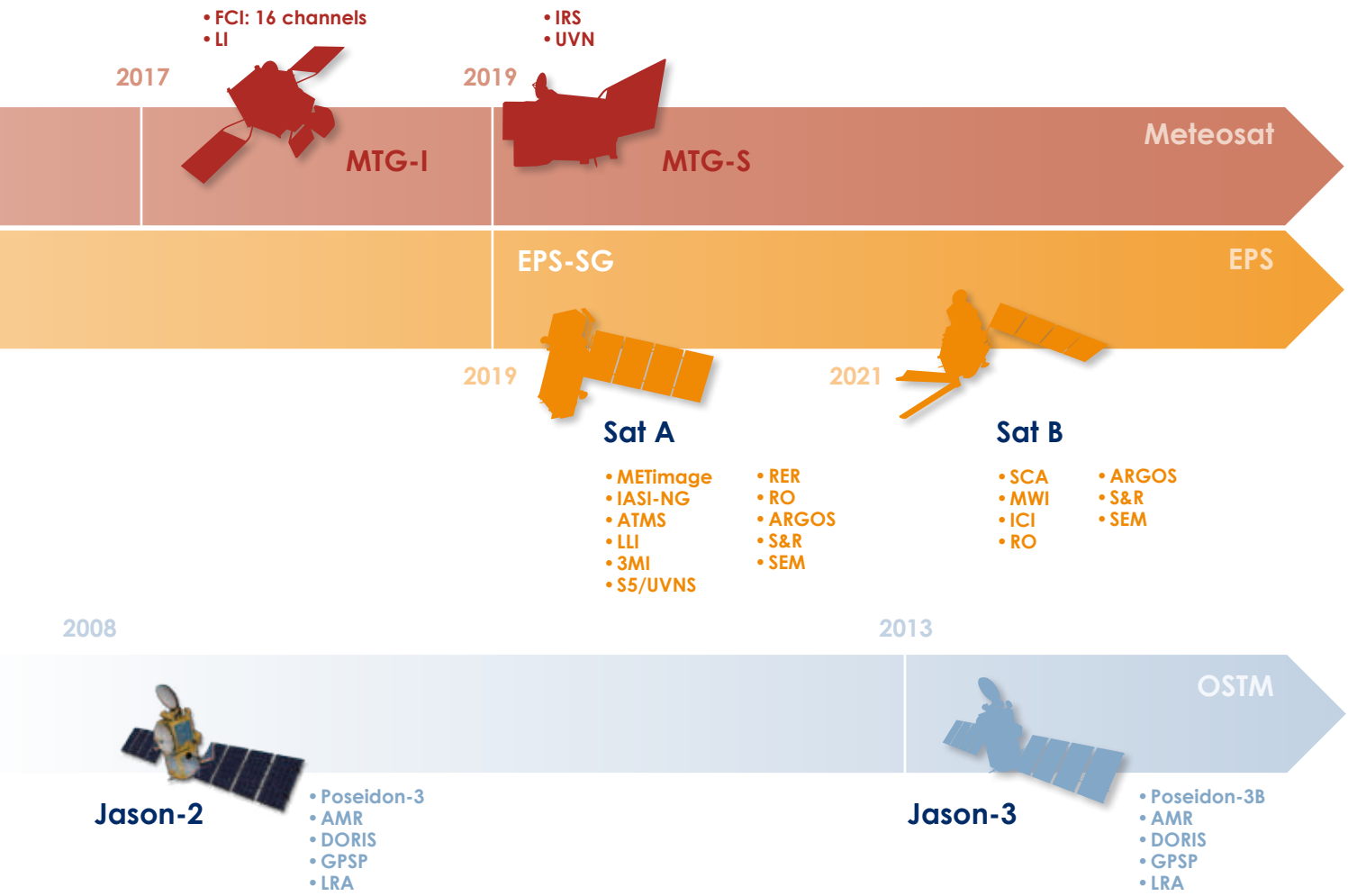
Developed and operated by ESA, the first Meteosat was launched in November 1977, giving Europe the ability to gather weather data over its own territory for the first time with its own satellite. EUMETSAT's initial raison d'être was to support weather prediction with the first generation of Meteosat satellites. The 800-kilogramme first generation Meteosat with its three-channel Meteosat Visible and Infrared Imager and a repeat cycle of 30 minutes brought major improvements, initially with a focus on short-range and severe weather prediction.

Technological advances and increasingly sophisticated weather forecasting requirements created demand for more frequent and more accurate space observations with higher resolution. To meet this demand, EUMETSAT launched the Meteosat Second Generation (MSG) programme, with ESA developing the first satellite and procuring all three recurrent satellites as part of the EUMETSAT MSG programme. The two-ton MSG conducts observation missions with its 12-channel Spinning Enhanced Visible and Infrared Imager (SEVIRI) and covers the full disc of the Earth as seen from geostationary orbit with a repeat cycle of 15 minutes in nominal mode. One third of the full disc, covering Europe and north Africa, is observed with a repeat cycle of five minutes in rapid-scanning mode with the backup satellite.

The MTG programme will bring even greater capabilities to EUMETSAT's geostationary service. The programme will encompass a total of six satellites of the three-ton class - four MTG-I imaging satellites and two MTG-S sounding satellites - providing the imaging service for at least 20 years from 2018 and the sounding service for at least 15 and a half years from 2020. MTG will for the first time add a sounding capability as its satellite bus concept is based on three-axis stabilisation, providing the instruments a permanent view of the Earth and thereby allowing for a sufficiently long observation time.

The MTG-I satellites will carry a Flexible Combined Imager (FCI) capable of providing both full disc imagery with a repeat cycle of 10 minutes and rapid scan imagery over a quarter of the disc with a repeat cycle of two and a half minutes. The FCI has 16 spectral channels, eight covering the solar spectral domain, delivering observations with a one-kilometre spatial resolution, and eight in the thermal spectral domain with a two-kilometre spatial resolution, compared to MSG's three-kilometre resolution. In rapid scan mode, data from four channels - two in the solar spectral domain with a 500-meter spatial resolution and two in the thermal spectral domain with a one-kilometre spatial resolution – will be distributed. For the first time on a Meteosat satellite, MTG-I will carry a Lightning Imager (LI), continuously delivering at very short intervals of about half a minute information on the occurrence and strength of lightning flashes over the full disc.

The MTG-S satellites will add the sounding capability - collecting information on the different layers of the atmosphere - to existing and future imaging missions. As the first sounding mission, MTG-S will carry an Infrared Sounder (IRS), which will deliver four-dimensional (over time and space) high-resolution data on water vapour and temperature structures for Numerical Weather Prediction (NWP) and support of nowcasting activities to monitor instability to provide early warnings of convective



intensities. In addition, the IRS will support air chemistry and air quality monitoring by delivering information on ozone and carbon monoxide. As a second sounding mission, the MTG-S satellites will carry an Ultra Violet Visible and Near-infrared (UVN) sounder provided by ESA under the GMES Sentinel-4 programme. The UVN will deliver information on aerosols and trace gases (formaldehyde, sulphur dioxide, nitrogen dioxide, ozone) for atmospheric chemistry and air quality monitoring applications over a limited area covering wider Europe and parts of the Atlantic.

The October 2006 launch of Metop-A marked the beginning of a new era not only for EUMETSAT but also for operational meteorology and climatology on a global scale. As Europe's first operational meteorological satellite in polar orbit, Metop-A provides a close-in look from low earth orbit and provides global coverage. The instruments on board Metop-A deliver precise information about atmospheric temperature and moisture profiles, ocean surface temperatures, vegetation, ozone levels and wind speeds over the world's oceans. The satellite is thus delivering invaluable input both for NWP models and climate and environmental monitoring.

Metop-A is the first in a series of three satellites making up the EUMETSAT Polar System (EPS) and is expected to be operational until at least 2020. After that, the future EPS Second Generation (EPS-SG) will provide even greater capabilities than EPS. The 70th EUMETSAT Council held in Rome in June 2010 endorsed observation missions for the satellite phase A studies using new and improved instruments. The Infrared Atmospheric Sounding Interferometer (IASI) Next Generation instrument on EPS-SG will have twice the radiometric and twice the spectral resolution of Metop's IASI. EPS-SG's METimage instrument will have more channels than Metop's Advanced Very High Resolution Radiometer (AVHRR), allowing more user applications, and its Advanced Technology Microwave Sounder (ATMS) will provide better temperature and humidity soundings in cloudy situations than the Advanced Microwave Sounding Unit and Microwave Humidity Sounder (AMSU-MHS). EPS-SG's scatterometer will have a spatial resolution of 25 kilometres, compared to 50 kilometres for Metop's Advanced Scatterometer (ASCAT). The radio occultation mission will not only track the Global Positioning System (GPS) but also Galileo satellites. The Global Ozone Monitoring Experiment-2 (GOME-2) will be succeeded by the GMES Sentinel-5 mission, to be embarked on EPS-SG satellites. EPS-SG will also conduct new missions with new instruments: Micro Wave Imaging for Precipitation Ice Cloud Imaging for cloud microphysics measurements; multi-viewing, multi-channel, multi-polarization (3MI) for monitoring aerosols; an Earth Radiation Budget; and a Low Light Imager.

The Jason-2 ocean altimetry satellite, launched on 20 June 2008, added ocean surface topography to EUMETSAT's missions. Jason-2 supplies the much-needed data continuity essential for measuring the sea level trend. Jason-3, to be launched by the end of 2013, will continue this mission, ensuring the measurement of rising sea levels carried out by Jason-2, Jason-1 and TOPEX/Poseidon over the last 18 years. These high-accuracy measurements show a global sea level rise over the last 15 years averaging 3.3 millimetres per year, a key indicator of climate change.

Expanding infrastructure

EUMETSAT has been building and improving its infrastructure since the historic decision by its Council in March 1992 to approve a resolution on long-term management policy to develop its own ground segment and to end its reliance on ESA for these facilities. The result is a reliable and proven ground infrastructure for data and image acquisition, product (re)processing, storage and dissemination, as well as mission and satellite control.

The focus of the infrastructure is to deliver data, images and products to users as rapidly, extensively and reliably as possible. All systems are constantly developed to address future data requirements, and global data exchange is playing an increasingly important role.

All EUMETSAT satellites transmit their data and images to receiving stations on the ground, which together with back-up systems are spread across Europe. Data and images are relayed from these receiving stations to EUMETSAT's Mission Control Centre (MCC) in Darmstadt.

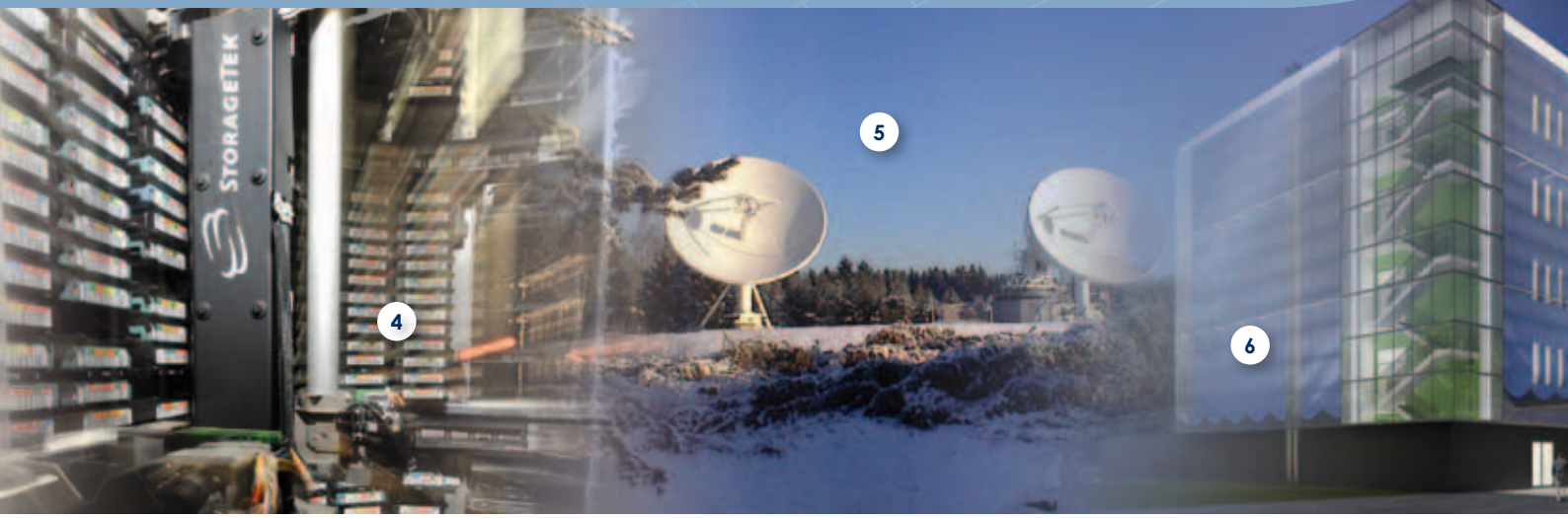
The Primary Ground Station supporting MSG satellites is in Usingen, Germany, around 30 kilometres north of Frankfurt. This ground station is the main channel of communication between the MCC and the MSG satellites. Usingen's three antennas receive MSG data, including raw image data and satellite telemetry, and are also used to transmit telecommands.

The back-up ground station for MSG is located in Maspalomas/Gran Canaria, Spain, and, for the Meteosat Transition Programme first generation satellite, in Cheia, Romania.

Installation of third Meteosat antenna, Usingen, Germany

The Metop polar-orbiting satellite dumps data on Svalbard, Norway, during each of its 14 daily 100-minute orbits. Under the Antarctic Data Acquisition project resulting from EUMETSAT's long-standing cooperation with NOAA, this has been increased to two dumps per orbit, starting with reception of data collected during the first half at McMurdo in Antarctica and its immediate transmission to EUMETSAT headquarters. Some 50 minutes later, data from the entire orbit is dumped over Svalbard. This capability provides Metop environmental data to NOAA and European weather services twice as fast as they received it previously. This has increased the impact of satellite data in global atmospheric models and provides significant benefits to global operational weather forecasting and disaster monitoring.

Satellite data are relayed from receiving stations to the MCC and are processed, archived and then disseminated via EUMETCast, EUMETSAT's own data dissemination system. EUMETCast is also increasingly used to disseminate third-party environmental data from EUMETSAT's Member States and partners.



1 ***EUMETSAT headquarters,*** *Darmstadt, Germany*

2 **Meteosat control room,** *EUMETSAT headquarters, Darmstadt, Germany*

3 ***EPS ground station,*** *Svalbard, Norway*

4 **EUMETSAT Data Centre,** *Darmstadt, Germany*

5 ***Meteosat ground station,*** *Usingen, Germany*

6 ***New infrastructure building,*** *EUMETSAT headquarters, Darmstadt, Germany*

The organisation acts as a service provider providing access to global satellite data from the United States, China, Japan, and India.

The EUMETSAT Advanced Retransmission Service (EARS) provides data received from polar-orbiting satellites through an existing network of High Resolution Picture Transmission (HRPT) stations. Data are processed directly at the stations and disseminated in real time via EUMETCast in support of forecasting and NWP.

EUMETSAT's SAF network is another important element of the EUMETSAT ground system that draws on the expanding range of satellite observations to provide application-specific processed data, software tools and services. These SAFs draw on specialist expertise from EUMETSAT Member State weather services. SAFs specialise in NWP, Support to Nowcasting and Very Short Range Forecasting; Ocean and Sea Ice; Climate Monitoring; Ozone and Atmospheric Chemistry Monitoring; Global Navigation Satellite System (GNSS) Receiver for Atmospheric Sounding Meteorology (GRAS); Land Surface Analysis; and Support to Operational Hydrology and Water Management. EUMETSAT, together with these SAFs and other global partners, is also supporting global climate monitoring through the provision of satellite climate data records.

Ground breaking ceremony for the new infrastructure building, EUMETSAT headquarters, Darmstadt, Germany, 18 October 2010

On-demand data access is possible via EUMETSAT's online Earth Observation (EO) Portal. The EUMETSAT Data Centre archive stores uninterrupted data series since 1981 (see separate article in this issue).

Preparing for the future, EUMETSAT is constructing a new infrastructure building in Darmstadt for completion in March 2012. The primary purpose of the new building is to accommodate the technical-operational installations for controlling and processing the data of EUMETSAT's satellite systems for weather, climate and environment monitoring in the decades to come.

Building a home for EUMETSAT

EUMETSAT's first home Am Elfengrund in Darmstadt-Eberstadt starting in August 1986

Construction of EUMETSAT headquarters building Am Kavalleriesand, Darmstadt, with Phase II (control room facilities) completed in 1994

Phases I and II inaugurated in summer 1995

Phase III (North Wing), completed in 1998

Cornerstone ceremony for new infrastructure building in Darmstadt (for completion in March 2012)

Phase IV (South Wing), completed in 2005

Profile:
Dr. Lars Prahm

Handing over the reins of EUMETSAT

After seven years at the helm of EUMETSAT, Dr. Lars Prahm leaves the organisation with a feeling of accomplishment and the knowledge of having prepared the course of the organisation for the next few decades.

Asked what EUMETSAT's greatest achievement was during his period of service as Director-General, Dr. Prahm immediately replies approval of the MTG programme, which was finalised in February. "The three-billion-euro MTG programme is our largest ever investment in meteorology in Europe," he points out, "and is now moving forward as we have approval of the authorisation to proceed from all Member States, so we can start spending money, recruiting staff and consultants, and paying bills to industry. This is a very big milestone."

Dr. Prahm sees the most challenging part of his job as "getting consensus with our partners, for instance getting ESA, the European Commission and the Member States to agree on our proposals for different programmes. On MTG, it has been particularly challenging to bring the Member States on board, while in relation to GMES we have had to invest a lot of time and effort to persuade the European Commission and ESA of the case for an increased role for EUMETSAT. But the reward is there when we are successful."

In meetings in February with the European Parliament and with Connie Hedegaard, the European Commissioner for Climate Action, Dr. Prahm emphasised "the role that EUMETSAT currently plays in climate monitoring and the bigger role we can play in future. In particular, I explained that if we want to have global continuation of the Kyoto Protocol with CO_2 emission reduction targets, then we need a global uniform way of monitoring CO_2, and this is only possible with satellites. I also explained that we need more satellites with different instruments, otherwise they will not have the necessary monitoring support for their policies."

The next big development as far as Dr. Prahm is concerned is EPS-SG, "where we will have a proposal for Council in Copenhagen this summer, and we hope that we can have the preparatory programme approved and open for participation with a funding level of just below 50 million euros."

In addition to these new programmes, Dr. Prahm points to the growing international cooperation on global data exchange, citing as important developments in 2011 the reception of data from the Chinese FY-3 polar-orbiting satellites and scatterometer data from the Indian Space Research Organisation's Oceansat-2.

> "MTG is our largest ever investment in meteorology in Europe."

Looking ahead, Dr. Prahm said, "We will expand our infrastructure as we build up MTG and EPS-SG and we will get a significant role in GMES, too. We will also try to expand our role on oceans as the oceans and atmosphere are dynamically interlinked and the atmosphere cannot be predicted without having the ocean data. Jason-2 is already delivering ocean data and in future we will get much more from the Sentinel-3 satellite and Jason-3."

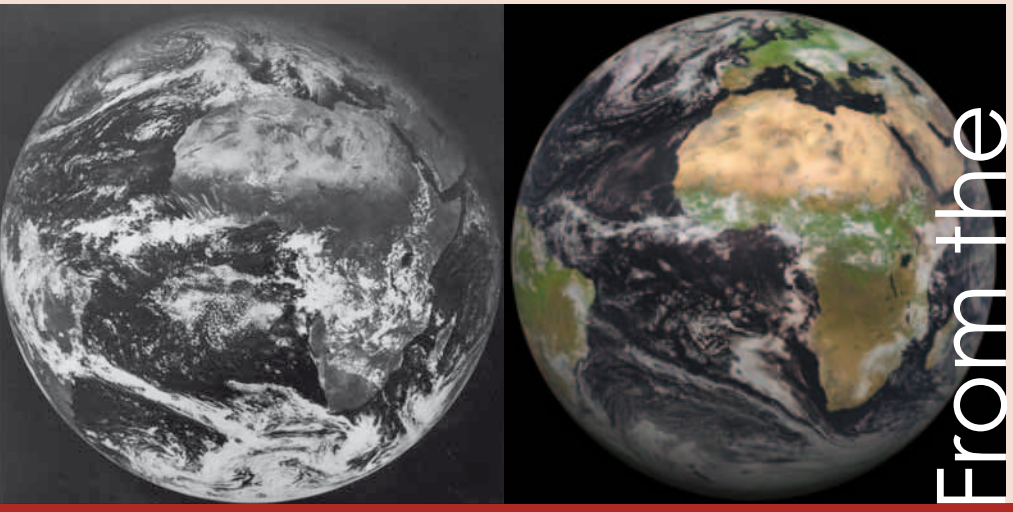
After his seven years at EUMETSAT, Dr. Prahm will go back to the Danish Meteorological Institute (DMI) as Director-General. "It will be very interesting as I will be returning with new ideas and a better understanding of the European and global environment. I will try to push for further improvements in the activities of DMI with, for instance, new climate activities and further improved NWP. I will also continue to have some involvement with EUMETSAT as a Council Delegate but probably not as much as I have today."

Career path

- **2004-2011:** Director-General of EUMETSAT.
- **1999-2003:** Member of the World Meteorological Organization's Executive Council, Vice President and then President of the Council of the ECMWF.
- **1996-2003:** Chairman of the Danish Space Research Advisory Board.
- **1987:** appointed Director (Chief Executive Officer) of Danish Meteorological Institute (DMI).
- **1982:** joined DMI as Head of Computing.
- **1979:** awarded doctorate by University of Copenhagen's Institute of Theoretical Meteorology.
- **1977:** appointed Head of Air Quality Meteorology Section at Danish National Agency for Environmental Protection.
- **1972:** appointed researcher at DMI.
- **1971:** awarded Master of Science degree in Physics from Technical University of Denmark and appointed researcher in plasma physics in the Physics Department of Risø National Laboratory.

Private life

- married with three grown-up children, skiing, hiking, wind surfing and spending time with family and friends.



archive

The first official full-disc image from Meteosat-1 taken on 9 December 1977 (left, copyright: ESA) and a colour full-disc image from the second generation Meteosat-9 19 years later.

User Platform

Expanding services

Very much a user-driven organisation, EUMETSAT provides high-quality and cost-effective services to the EUMETSAT user community, both within the organisation's Member States and within World Meteorological Organization (WMO) Member States. EUMETSAT has constantly been expanding and improving these services as the organisation increases its capabilities and activities to include climate and ocean monitoring, in addition to weather.

Created in the mid-1990s, the EUMETSAT helpdesk responds to user requests by e-mail, phone and fax. The number of user contacts is increasing every year. Over the last decade, the number of enquiries per year has risen from under 2,000 to close to 4,000 today.

The current trend is towards placing more information online, thus providing users with a self-help service. The website supports users in making use of the data, for example with product and format guides, sample imagery, application area case studies and online training material. Additionally, users now have a single entry point for data discovery through the Product Navigator and data access by registering through the Earth Observation (EO) Portal. An average of around 300 users per day use the EO Portal to perform these tasks.

EUMETSAT's training activities are coordinated closely with WMO and are crucial to EUMETSAT's mission of helping its Member and Cooperating States exploit satellite data. Given the increasing demand for training and all users' need for training on Meteosat Second Generation (MSG) satellites, training modules have been developed which cover a wide range of topics and methodologies.

In addition to organising training courses and workshops, much effort has been devoted to distance learning (DL) activities over recent years. These efforts started to pay off with many DL events organised in coordination with EUMeTrain and the WMO Virtual Laboratory for Training and Education in Satellite Meteorology. There is also a clear trend towards more online presentations which can reach the wider user audience. The list of future training events and all current training material are available from the EUMETSAT website.

EUMETSAT training events include "training the trainers" workshops under the Data Access for Western Balkans and Eastern Europe (DAWBEE) project and for EUMETCast Preparation for the Use of MSG in Africa (PUMA) 2010 station upgrades.

IMAGE to go online

The results of the reader survey advertised in the May 2010 issue of IMAGE indicate that readers would be happy to read the newsletter online. IMAGE thanks the 116 readers who responded to the request to participate in the survey, which was sent via the IMAGE e-mail distribution list.

The responses showed that 76 readers already receive IMAGE in the electronic PDF format, while 57 respondents receive the print version. While most respondents (106) were happy with the current format of IMAGE, many (72) would also be happy to read the newsletter online as part of the EUMETSAT website.

IMAGE will therefore go online at a future date. This will have the added benefit that features and articles will appear on a more regular basis and news stories can be updated more frequently, as favoured by many respondents to the survey. In addition, most respondents (80) favoured receiving IMAGE content via e-mail/RSS feed.

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Ever-expanding data access

With the launch of the first Meteosat satellite in 1977, it became clear that an electronic archive was needed to preserve the data collected and make them available to users on a regular basis. These data were initially archived at the European Space Operations Centre (ESOC), but starting in 1995, EUMETSAT began the phased set-up of the Meteorological Archive and Retrieval Facility (MARF) to offer data services for Meteosat first generation satellites. In 2001, the archive was upgraded and became the Unified MARF (U-MARF) to extend data services to include Meteosat Second Generation and two years later the EUMESAT Polar System.

In the early days, delivery was done by post, using primarily tapes as shipped media devices. More recently, online ordering and dissemination by the Internet has been more common.

In 2010, the archive was renamed so it is known externally as the EUMETSAT Data Centre to better reflect the service it provides to the user community. Part of EUMETSAT's Ground Segment, the Data Centre stores all the organisation's satellite data and derived products securely and helps users access the archived data via a central online product catalogue in the EUMETSAT Earth Observation (EO) Portal. This catalogue also includes products generated in the associated Satellite Application Facilities (SAFs). The EUMETSAT Data Centre offers central ordering of all products free of charge, whether hosted in the EUMETSAT or local SAF archives, and the EUMETSAT-SAF Data Centre Network provides a user-transparent order delivery process. The Data Centre contains uninterrupted data records dating back to 1981, the year the second Meteosat satellite was launched.

The EUMETSAT Data Centre forms one cornerstone of EUMETSAT activities in support of climate monitoring. The archived long time series of raw satellite measurements coming from a series of instruments are recalibrated and homogenised over time to establish so called Fundamental Climate Data Records (FCDRs). FCDRs can be used for assimilation in model-based reanalysis and to derive records of geophysical parameters, such as humidity of the upper troposphere, surface albedo or total ozone column using retrieval schemes. The quality of the resulting records is suitable for analysing climate variability on long time-scales up to trends on a decadal scale.

User access to the Data Centre, including orders of EUMETSAT data, is increasing continually. Over 16,000 orders are executed on average on a monthly basis, retrieving and tailoring data and delivering roughly 700,000 products to archive users each month.

Old archive (left) versus new Data Centre

As many researchers are now interested in longer time series for climate-related studies, orders of 1 TeraByte and above are not unusual. The amount of data retrieved from the Data Centre through user ordering is now more than 10 times the amount of all the satellite data and products archived per month. Since 2009, over one Petabyte (10^{15} bytes) of data has been retrieved annually from the Data Centre in response to user ordering.

To cope with the growing access demands from users and new data streams from satellite missions planned in the future, the systems in the Data Centre are continually upgraded.

In addition to system evolutions, Data Centre Search and Ordering has now been integrated into EUMETSAT's EO Portal. This provides users with a single point of access to all EUMETSAT data and dissemination services and also allows users and partner agencies to discover, search, order and subscribe to operational services.

This is done by using internationally recognised standards and complying with the European Union's 2007 INfrastructure for SPatial InfoRmation in the European community (INSPIRE) directive.

The next step is to establish harmonised access to heterogeneous EO data from existing and future missions - including ESA, national, meteorological and Sentinel missions - through the definition and adoption of interoperability standards. A prototype is already being implemented on top of the EO Portal. This is linked to the GMES programme and EUMETSAT's data access/exchange agreement with ESA.

The EUMETSAT Data Centre also hosts and operates the EUMETSAT Global Space-based Inter-Calibration System (GSICS) Collaboration server. GSICS is an international collaborative effort to examine and harmonize data from operational weather satellites to improve climate monitoring and weather forecasting.

Global meteorological satellite update

		Satellite	Launch date	Orbit type	Additional information
Europe	●	**Meteosat-7**	2 Sep 1997	GEO 57.5°E	provides Indian Ocean Data Coverage services
	●	**Meteosat-8**	28 Aug 2002	GEO 9.5°E	provides the Rapid Scanning Service and the backup service for Meteosat-9
	●	**Meteosat-9**	21 Dec 2005	GEO 0°	provides the primary operational service
	○	**MSG-3 and -4**	2012, 2014	GEO	MSG-4 launch date to be revisited following the launch of MSG-3
	○	**MTG-I-1 to -4**	2017 – 2030	GEO	
	○	**MTG-S-1 and -2**	2019 – 2027	GEO	
	●	**Metop-A**	19 Oct 2006	SSO mid-morning	primary satellite of the IJPS
	○	**Metop-B and -C**	2012, 2016	SSO mid-morning	Metop-C launch date to be revisited following the launch of Metop-B
	●	**Jason-2**	30 Jun 2008	LEO 66° inclination	
	○	**Jason-3**	End 2013	LEO 66° inclination	
USA	●	**GOES-11** (West)	3 May 2000	GEO 135°W	
	●	**GOES-12** (S. America)	23 Jul 2001	GEO 60°W	
	●	**GOES-13** (East)	24 May 2006	GEO 75°	
	●	**GOES-14**	27 Jun 2009	GEO 105°	in-orbit spare
	●	**GOES-15**	4 Mar 2010	GEO 90°	standby
	○	**GOES-R**	2015	GEO 135° or 75° W	
	○	**GOES-S**	2017	GEO 135° or 75° W	
	●	**NOAA-15**	13 May 1998	SSO early morning	secondary satellite for Metop-A
	●	**NOAA-16**	21 Sep 2000	SSO afternoon	secondary satellite for NOAA-18
	●	**NOAA-17**	24 Jun 2002	SSO mid-morning	secondary satellite for Metop-A
	●	**NOAA-18**	20 May 2005	SSO afternoon	backup spacecraft for NOAA-19
	●	**NOAA-19**	6 Feb 2009	SSO afternoon	primary spacecraft of IJPS
	●	**NPP**	25 Oct 2011	SSO afternoon	
	○	**JPSS-1 and -2**	2014, 2018	SSO afternoon	result of NPOESS restructuring decision on JPSS-2 not yet made
	○	**DWSS-1 and -2**	2018, 2023	SSO early morning	operated by US Department of Defense
Russia	●	**Meteor-M N1**	17 Sep 2009	SSO morning	
	○	**Meteor-M N2**	2011	SSO morning	
	○	**Meteor-M N3**	2015	SSO morning	
	●	**Electro-L N1**	20 Jan 2011	GEO 76°E	
	○	**Electro-L N2**	2012	GEO 4.5°E	
	○	**Electro-M N1**	2016	GEO 76°E	
China	●	**Fengyun-1D (FY-1D)**	15 May 2002	SSO early morning	primary polar-orbiting satellite
	●	**FY-2C**	19 Oct 2004	GEO 123.5°E	primary geostationary satellite
	●	**FY-2D**	15 Nov 2006	GEO 86.5°E	backup for FY-2C
	●	**FY-2E**	23 Dec 2008	GEO 105°E	
	○	**FY-2F to -2H**	2011-2015	GEO	
	○	**FY-4A to -4C**	2014-2019	GEO	
	○	**FY-4D to -4F**	tbd	GEO	
	●	**FY-3A**	27 May 2008	SSO	first of the second generation of Chinese polar-orbiting meteorological satellites
	●	**FY-3B**	5 Nov 2010	SSO	
	○	**FY-3C** to **-3G**	2013-2021	SSO	planned for biennial launches in the 2013-2021 timeframe
Japan	●	**MTSAT-1R**	26 Feb 2005	GEO 140°E	
	●	**MTSAT-2**	18 Feb 2006	GEO 145°E	backup for MTSAT-1R
	○	**MTSAT follow on**	2014		
	○	**Himawari 8 and 9**	2014/2016	GEO 140°E	
India	●	**KALPANA-1**	12 Sep 2002	GEO 74°E	(formerly METSAT) India's first exclusively meteorological satellite
	●	**INSAT-3A**	10 Apr 2003	GEO 93.5°E	
	○	**INSAT-3D**	2011		planned to have 19-channel sounder
	●	**Oceansat-1**	26 May 1999	LEO	
	●	**Oceansat-2**	23 Sep 2009	LEO	
	○	**SARAL**	Dec 2011	LEO	
	○	**Megha-Tropiques**	2011	LEO 20° inclination	Joint mission with CNES
South Korea	●	**COMS**	26 June 2010	GEO 128.2°E	South Korea's first geostationary meteorological satellite
	○	**COMS follow on**	2017/2018	GEO 116.2° or 128.2°E	

● in service
○ planned

GEO Geostationary satellite
LEO Low-earth orbit
SSO Sun-synchronous orbit

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EUMETSAT-ESA Scatterometer Science Conference

EUMETSAT, together with ESA, organised a science conference on spaceborne scatterometers at the Centralstation in Darmstadt, Germany, on 11-13 April 2011. The conference was a follow on to the October 1998 "Emerging Scatterometer Applications: From Research to Operations Workshop".

Experts attending the Scatterometer Science Conference discussed the needs and requirements of the user community to make better use of scatterometer-derived products, including wind, soil moisture and sea ice, and to shape the next generation of C-band scatterometer missions. With the increasing interest in spaceborne scatterometry around the world, the conference was set in a wider international context, also addressing recent advances in the US, Chinese and Indian scatterometer programmes.

Events Diary

- **2011 EUMETSAT Meteorological Satellite Conference**
  5-9 September 2011,
  Oslo, Norway

- **Coordination Group for Meteorological Satellites**
  3-7 October 2011,
  St. Petersburg, Russia

- **Committee on Earth Observation Satellites Plenary Meeting**
  8-9 November 2011,
  Lucca, Italy

For further information about these events, please visit: *www.eumetsat.int*