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satellite meteorology • european and international news

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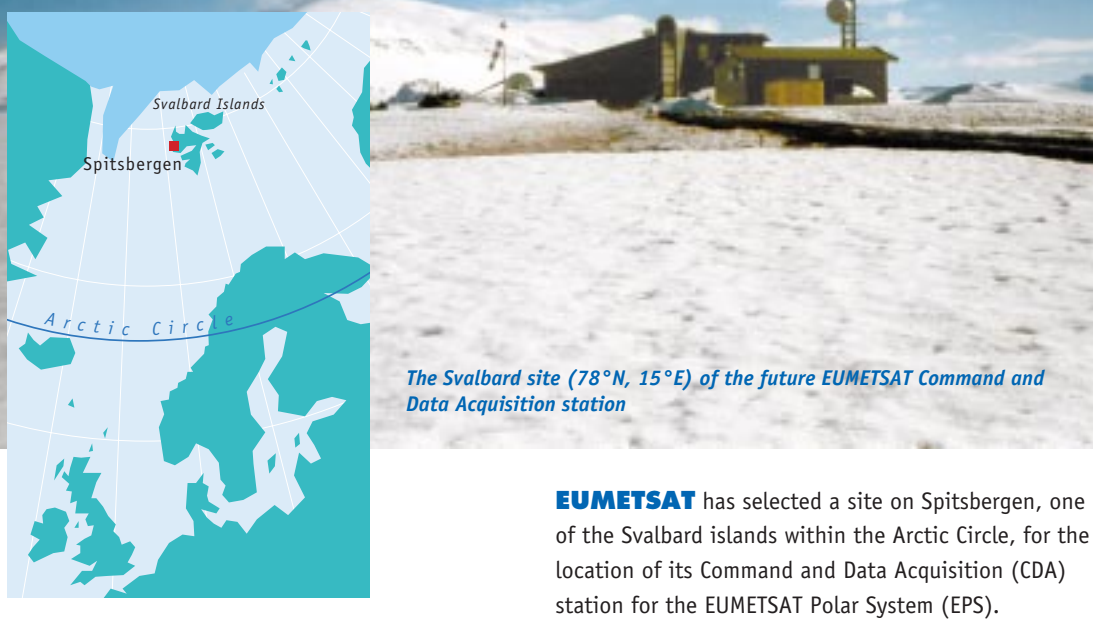
EUMETSAT

Europe's Weather Satellite Organisation

Arctic site for new satellite ground station



The Svalbard site (78°N, 15°E) of the future EUMETSAT Command and Data Acquisition station

EUMETSAT has selected a site on Spitsbergen, one of the Svalbard islands within the Arctic Circle, for the location of its Command and Data Acquisition (CDA) station for the EUMETSAT Polar System (EPS).

Work has already commenced on the CDA station site (78°N, 15°E), near the town of Longyearbyen, which will form an essential part of the EPS Ground Segment infrastructure.

The CDA will act as the up-link station for telecommands to control EUMETSAT's Metop and NOAA's polar orbiting satellites and also as a reception facility for telemetry and global payload data.

The global data, stored on board the Metop satellites, will be received once per orbit by the CDA. From there it will be relayed to EUMETSAT central site facilities in Darmstadt, Germany.

The major advantage of Svalbard comes from its high latitude that eliminates 'blind' orbits (when the satellites are out of range). The duration of the satellite's pass over Svalbard during each orbit is sufficient for the needs of the missions – satellite monitoring and control, and acquisition of the global instrument data.

Completion of the Svalbard CDA site accommodation and station installation is planned for June 2003.

MSG MPEF delivered

The Meteorological Products Extraction Facility (MPEF) in its final configuration has been delivered and provisionally accepted following successful tests in the EUMETSAT HQ by EUMETSAT.

Implemented by Logica through a EUMETSAT contract, the MPEF is one of the first facilities of the Meteosat Second Generation (MSG) ground segment to be accepted.

The new MSG MPEF has 20 times more processing capability than the existing facility, and will be able to produce higher quality products at higher resolution and with more frequent dissemination to the meteorological community.

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PUMA recommendations on the table

Since the last issue of *IMAGE*, the PUMA (**P**reparation for **U**se of **M**SG in **A**frica) Task Team, in cooperation with the Natural Resources Institute (NRI) of the UK and the European Commission (EC), have finalised plans for the replacement of ground reception equipment. These are now in the process of being evaluated by the EC.

It has been decided that the financial proposal will be examined at the time of the European Development Fund Committee meeting on 15 November 2000, so that the latest forecast date for the launch of the first MSG satellite can be taken into account.

The financial proposal currently covers five activities:

- Provision of an HRUS (High Resolution User Station), equipped with basic software packages, allowing data handling at all National Meteorological and Hydrological Services (NMHS) and five regional centres
- Provision of training and station maintenance
- Training for users in the use of data transmitted by MSG
- MSG database activities that will allow the African NMHS to develop new products and services, in partnership with end-users
- Implementation of the project.

The budget is estimated at 11.5 million Euro for the 47 African countries and five regional centres covered by the Lomé Convention.

It is foreseen that a trust fund initiated by the World Meteorological Organization (WMO) will finance the equipment and training for the six countries not covered by these agreements.

The various components of the PUMA project will be discussed at the Fourth EUMETSAT Users' Forum in Africa, in Kampala, Uganda, on 25-29 September 2000 (see page three).

We hope to be in a position to announce the EC's final decision on the project in the Spring 2001 edition of *IMAGE*.

European and African CAL ideas converge

by Henk Verschuur, EUMETSAT Training Officer

Meteosat Second Generation (MSG) will provide a wealth of new data to the user community. The full benefits of this information can only be realised if we are able to prepare technicians and meteorologists for the advent of this new satellite system.

Many courses have already been conducted in Europe and Africa, several of them coordinated with the WMO. However, these cannot cover all the training needs for the new generation of satellites. Modern teaching techniques such as Computer Aided Learning (CAL) – which is widely recognised as a medium for mass training – need to be applied.

The development of CAL modules is expensive and time consuming, therefore careful consideration needs to be given to their design. Consequently, an MSG-CAL Workshop was held at the training school of the Deutscher Wetterdienst (DWD) in Langen, Germany, on 22-24 August 2000. Thirty specialists, coming from as far afield as Helsinki, Edinburgh, Ankara, Nairobi and Niamey, met to discuss the strategy for module development.

The key issues addressed included appropriate applications and the level of technical detail. The report of the workshop will serve as a reference and the recommendations given by the experts will be reflected in the CAL end-products.

The plan is to start the production of the modules this year and to make the first versions available well in advance of the MSG-1 launch. EUMETSAT will install the MSG CAL modules in the public domain of its Web server.

European and African CAL experts discuss future MSG training modules

image

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African forum looks ahead to MSG

Kampala, the capital of Uganda, is the venue for the Fourth EUMETSAT Users' Forum in Africa. Over 130 participants from 50 African countries are attending the Forum in the city's international conference centre from 25 to 29 September.

Tailor-made for the African community, the Forum provides a unique two-way information flow between EUMETSAT and the data users. The opportunity for open debate has led in the past to recommendations enabling EUMETSAT to improve its services to users on the African continent.

In addition to presentations from EUMETSAT on its programmes and services, the Forum agenda includes the use of Meteosat within some of the African countries represented.

Special emphasis is being placed on the transition from the current programme to Meteosat Second Generation and numerous presentations concentrate on potential applications of MSG data in Africa.

For example, the Director General of the African Centre of Meteorological Applications for Development (ACMAD) is presenting on the use of MSG products to improve life in rural areas of Africa.

A further session concentrates on various aspects of training activities, from EUMETSAT policy to the use of new technology in training satellite meteorology within Africa. One specific agenda point eagerly awaited by the participants is the latest news on the PUMA project (see page two for more details).

EUMETSAT will seek feedback from the participants on how PUMA should be implemented.

The event is organised by EUMETSAT in cooperation with the Department of Meteorology of the Ministry of Water, Lands and Environment of Uganda, and supported by the WMO.

EUMETSAT hosts ocean observation conference

A European Global Ocean Observing System (EuroGOOS) Conference on Operational Ocean Observations from Space will be held at the EUMETSAT headquarters in Darmstadt on 5 and 6 October 2000.

Potential users of ocean remote-sensed operational data from around 100 representatives of agencies and industry will meet for two days to receive information about the plans of EuroGOOS, which is the European constituent of the Global Ocean Observing System (GOOS).

The objectives of the conference are to better understand how existing and planned EUMETSAT missions, and new opportunities such as JASON satellite data, can be used by the ocean community.

EUMETSAT aims to gain further information and guidance from the conference for planning a long-term programme of operational ocean observing missions to meet the needs of agencies and industry using ocean remote-sensed operational data.

Director's Desk

We are an operational meteorological satellite organisation and our user communities are of primary importance. With the evolution of remote sensing and processing techniques, other scientific communities use space-based observations from meteorological satellites for applications such as monitoring the global climate, the state of the oceans, the surface of the land and tracking important gases such as ozone.

So, in addition to our all-important routine operational activities and future programme developments, we devote a great deal of attention to discussing issues of common interest with our user communities. This outreach activity has been a prominent feature of our work this year.

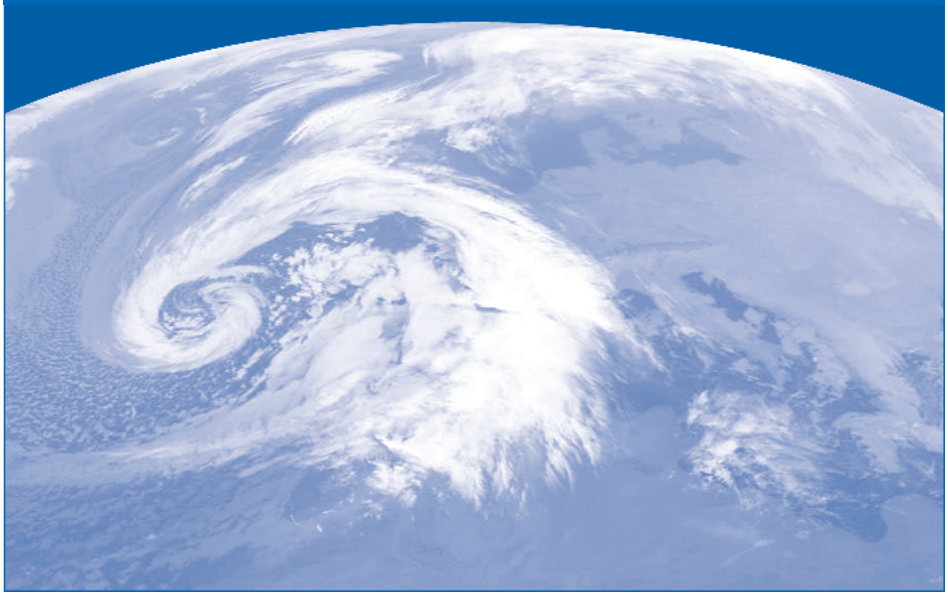
In April we were joined in Budapest by our Central and Eastern European neighbouring states for the third biennial forum and just as *IMAGE* is published we shall be meeting with our African colleagues in the fourth biennial user forum for the continent. An item of major interest to this community is the conversion from the current Meteosat to the Meteosat Second Generation system and the influence of the Preparation for Use of MSG in Africa project.

At the end of May in Bologna we met with over 200 participants at our annual user conference. The vibrant event facilitated the interaction between those working on leading-edge developments and those in operational environments. Just before this conference we met with research organisations to investigate future scientific uses of MSG data.

In October we are hosting a conference on operational ocean observing from space. We hope to gain insights from this event to help plan potential operational missions.

Although such activities do not produce a physical product that can be seen or touched, the results are far-reaching and of vital importance to our existence.

From the archive



Meteosat-2 infrared image: 06.00h UTC, 7 November 1982

This Meteosat infrared image is one of a series depicting interesting meteorological phenomena seen from space. We plan to include one per edition of *IMAGE* by retrieving the files from the EUMETSAT Meteorological Archive.

Mountain ranges have important effects on the airflow across them. One such local effect is the Föhn, or Chinook. It is a strong, gusty, dry and warm wind, which develops on the lee side of a mountain range when stable air is forced to flow over the barrier by the regional pressure gradient.

In November 1982, the Alps were affected by an exceptionally marked Föhn event that resulted in strong winds in Austria, Germany and Switzerland. The observed pressure gradient across the Alps reached a record of 20 hPa causing winds of up to 190 km/h across the Gottard Pass. While Locarno observed an air temperature of +1°C with mixed rain and snow, skies above Zürich were clear with a temperature of 25°C.

The Meteosat-2 infrared satellite image dramatically shows the Föhn situation on the morning of 7 November 1982. There was an anticyclone over the Balkans (1035 hPa) and a deep low over the Atlantic (960 hPa). The resulting southerly wind flow was forced to rise as it met the Alps.

The low cloud on the southern slope of the mountains is not clearly visible in the image because the cloud top temperature is nearly the same as that of the surrounding terrain. However, on the northern slope of the mountains a dark stripe can be clearly seen that represents the terrain heated by the strong, warm Föhn flow.

Volcanic

by Sarah Watkin, The Met. Office, UK

Ash clouds from volcanic eruptions can rise rapidly and are a serious hazard if they reach the cruising altitudes of jet aircraft. They can cause jet engines to fail but cannot be detected beforehand by on-board radar.

The Satellite Meteorology

by Jérôme Lafeuille, Head of CMS

The Satellite Meteorology Centre (CMS) of Météo-France, located since 1963 in Lannion, north-west France, is the national facility for the reception, transmission, processing and relaying of meteorological satellite data. It employs some 80 staff, organised around a management team and six departments.

Main missions

- Operational receiving and processing of meteorological satellite data from geostationary (Meteosat, IODC, GOES-E, GOES-W, GMS) and polar-orbiting (NOAA) satellites.
- Supporting satellite operators such as EUMETSAT and NOAA through relaying satellite data or telemetry between Europe, America and Asia.
- Developing new algorithms and processing software to meet evolving needs, improve data quality, and prepare for future satellites such as EUMETSAT's MSG and Metop.
- Satellite data archiving and retrieval, mainly for the scientific community.

Technical facilities

CMS operations rely on a range of antennas (up to 13 m diameter), receivers, workstation-based processing chains, and a 100 Mbits/s local network with links to Toulouse, Darmstadt and Suitland (USA). Most aerials are designed for L-band (1.7 GHz) reception. Two VHF antennas support NOAA early orbit operations, while a 2.1 GHz antenna relays geostationary data to Meteosat.

Around 25 Gbytes of data per day are acquired for processing. A 3,500 Gbyte file server enables six months of data and products to be available on-line for development or reprocessing. Long-term archiving is also provided on various media.

The whole operation is fully automated, with 24-hour supervision and hot back-up for critical elements.

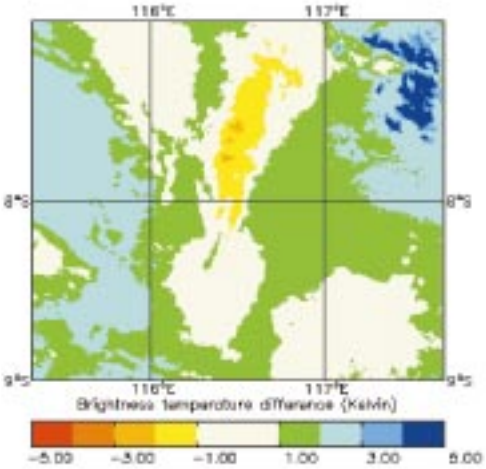
ash cloud detection

Eruptions in remote areas may go unreported for several days, so satellite observations offer the only possibility of providing airlines with timely warnings....

....However, discriminating between volcanic ash clouds and water or ice clouds can be difficult. The differential scattering, absorption and emission properties of water, ice and ash particles at various wavelengths need to be exploited in order to detect ash clouds.

The Spinning Enhanced Visible and Infrared Imager (SEVIRI) on Meteosat Second Generation (MSG) possesses 12 channels, nine in the infrared. It is known that brightness temperature differences between pairs of channels can be used to detect ash clouds.

Studies by the Satellite Imagery Applications Group in the Met. Office, UK on the potential use of multi-channel imagery from the forthcoming MSG, examined the differences $T_{3.7} - T_{10.8}$ and $T_{10.8} - T_{12.0}$ in AVHRR data (T represents the brightness temperature within a particular channel identified by the wavelength, e.g. 3.7 µm).



An AVHRR $T_{10.8} - T_{12.0}$ brightness temperature difference image of an eruption of Rinjani volcano (8.42°S, 116.47°E), Lombok, Indonesia, at 20.18h UTC on 13 June 1994.
The semi-transparent ash cloud has negative brightness temperature difference values.
The AVHRR data were provided by Dr. A.J. Prata, CSIRO Atmospheric Research, Australia.

The split window technique ($T_{10.8} - T_{12.0}$) gives positive values for water and ice cloud and negative values for ash cloud. However, with the basic split window technique there are often situations in which false alarms may occur or ash clouds go undetected.

Combining information from several MSG SEVIRI channels, including the 8.7 µm channel not available on AVHRR, is likely to offer the most effective and reliable detection system, so radiative transfer calculations were performed to investigate the behaviour of ash particles at all the infrared SEVIRI wavelengths.

The results were sufficiently encouraging to justify further development work, with the aim of having a working system in place when MSG data become operationally available in 2002.

Further information may be obtained from Sarah Watkin at **scwatkin@meto.gov.uk**.

Sarah Watkin, as lead author for her co-workers Mark Ringer and Anthony Baron, was presented with the prize for best poster at the recent EUMETSAT Meteorological Satellite Data Users' Conference in Bologna, Italy.

Centre in Lannion, France

Products and applications

Satellite measurements are processed in real-time to derive comprehensive imagery products and quantitative information on cloud cover, radiation fluxes and surface temperatures, and to calculate vertical atmospheric temperature/humidity profiles.

Resulting data support French weather forecasting activities including nowcasting, short-range NWP monitoring and cyclone protection overseas, as well as oceanic surface monitoring.

CMS also produces TV imagery animation sequences, and contributes to volcanic ash cloud hazard detection.

R&D and international cooperation

Most of the scientific development at CMS is focused on the EUMETSAT Satellite Application Facilities (SAF). CMS is responsible for the "Ocean and Sea Ice" SAF, and contributes to the "Nowcasting and Very Short Term Forecasting" and "Numerical Weather Prediction" SAFs. It cooperates with China, Brazil and Hungary on vertical sounding retrieval.

CMS organises training sessions on satellite imagery interpretation and contributes to the training programmes of various institutions in France or abroad. Opportunities are offered to some trainees or visiting scientists to stay at CMS for a few months.

Since 1983, it has been the Satellite Calibration Centre for the WMO-led International Satellite Cloud Climatology Project (ISCCP).

On behalf of EUMETSAT, CMS is preparing to provide the Foreign Satellite Data relay service for MSG, in cooperation with The Met. Office, UK, NOAA/NESDIS and the Australian Bureau of Meteorology.

EUMETSAT meets with its neighbours

Eleven National Hydrometeorological Services participated in the 3rd Central and Eastern European EUMETSAT Forum which took place in Budapest on 5-7 April 2000, hosted by the Hungarian Meteorological Service.

EUMETSAT presented up-to-date information on its programmes and activities. There were also several presentations by the participating States on the use and application of satellite data in their services.

A special focus of the Forum related to the process of becoming a Cooperating State and to the option of full EUMETSAT membership.

The first two Cooperating States, the Slovak Republic and Hungary, which both signed up with EUMETSAT in July 1999, reported on their experiences. Along with Poland, which became a Cooperating State in December 1999, they showed interest in becoming full Member States before the end of their current agreements.

Some Central and Eastern European countries – the Czech Republic, Croatia and Slovenia – expressed interest in joining EUMETSAT directly as Member States.

It was decided at the Forum that EUMETSAT would develop training activities together with the three Cooperating States and Slovenia in the next two years. Training events will be hosted in these countries in 2000 and 2001.

The participants also discussed preparations for purchasing receiving systems for the next generation of satellites (MSG). A special workshop on this is planned to take place in early 2001. The next Central and Eastern European EUMETSAT Forum will be organised in Bratislava, Republic of Slovakia, in 2002.

The participants of the Third Central and Eastern European Forum, Budapest, 5-7 April 2000

MSG news update

A significant delay in the development of the image processing element of the Ground Segment has led to the postponement of the MSG-1 launch from the planned date of July 2001.

Another factor contributing to the postponement of the launch is the uncertainty about the selection and availability of an Ariane launcher as a result of the shock levels imposed on the satellite and its instruments by the Ariane-5 launch vehicle.

The current new planning date for the launch is the end of January 2002, and the launch vehicle for MSG-1 will be an Ariane-4.

With further launcher developments to reduce shock levels, Ariane-5 remains the baseline for the MSG-2 and MSG-3 launches.

To assure continuity of EUMETSAT satellite services from geostationary orbit, parallel operations between the current Meteosat and the MSG system are agreed until at least the end of 2003.

The on-board fuel of Meteosat-7, which currently provides the operational service from 0° Longitude, is sufficient for this period to be extended if necessary. Any changes to this planning will be notified via the EUMETSAT website.

Satellite Application Facilities progress

The crucial mid-term review milestones were reached for the SAFs for Support to Nowcasting & Very Short Range Forecasting and Ocean & Sea Ice.

Emphasis is now moving from scientific development to the engineering processes needed to ensure quality products on an operational basis. These two pilot SAFs are consequently preparing their proposals for the Initial Operations Phase.

Already this year the SAFs successfully performed their "Demonstration Experiments", making prototype products available to users on a regular basis (several per day). These products can be accessed from the following websites:

www.meteorologie.eu.org/safnwc/
www.cnrm.meteo.fr/pi/inter/RDT/index.html
www.inm.es/wwg/index.html
www.smhi.se/saf/
www.zamg.ac.at/SAF/

The SAF on Climate Monitoring (CM) comprises a five-year effort of partner institutes led by the Deutscher Wetterdienst.

The DWD is organising a CM SAF Training Workshop, with EUMETSAT support, to be held on 20-22 November 2000 in Dresden, Germany. Its purpose is to make potential users aware of the CM SAF, its plans and future products, in order to consolidate the definition of user requirements for the forthcoming Operational Phase and to initiate training activities.

For further information, please check the CM SAF webpage **www.dwd.de/research/event.htm** or contact Peer Hechler at **peer.hechler@dwd.de**.

image profile

Georges Bernède

Quality Assurance Division Manager

Georges Bernède

Under the expert guidance of Georges Bernède, EUMETSAT achieved a major milestone in the formal implementation of quality assurance procedures when it was awarded the ISO 9001 certificate in April 2000.

But for Mr. Bernède, who joined EUMETSAT as Manager of the Quality Assurance Division in February 1996, this award was only the first stage in an ongoing mission to enhance performance in every area.

His ambition is to see EUMETSAT positioned alongside the elite companies and organisations of Europe that are considered the very best in terms of providing customer satisfaction at optimal cost.

Georges Bernède has a degree in electronic engineering from the Ecole Supérieure d'Electricité (Supelec) in Paris. He joined French television in 1978, initially exploring new optical recording techniques.

His career then turned towards more operational aspects and he was in charge of defining a new policy for monitoring the transmission and distribution network of French television, and worked on direct broadcast satellite systems.

In 1984 he joined the Centre National d'Etudes Spatiales (CNES) to oversee quality assurance aspects of the Franco-German satellite, TVSAT/TDF-1. Following this he assumed responsibility for monitoring quality issues on all CNES satellites.

Mr. Bernède joined Aérospatiale in 1989 as a quality assurance manager on the Hermès programme, moving two years later to the avionics and systems aeronautic sector.

During this time he implemented a product and performance improvement programme, and participated in the certification of the Airbus A340 and A330. He returned to CNES in 1994 and was put in charge of a management working group overseeing the European Cooperation for Space Standardisation (ECSS).

Georges Bernède has also taught in numerous engineering colleges and has regularly spoken at conferences about the quality and management of projects.

He has a passion for electronics, which takes up a good part of his spare time, and a long-standing interest in motor racing, in which he participated at a modest level during the 1970s.

Workshop on MSG research opportunities

The first workshop of Principal Investigators participating in the MSG Research Announcement of Opportunity (RAO) was held in Bologna on 17-19 May 2000.

This RAO was released worldwide by ESA and EUMETSAT in early 1999 to scientific organisations and institutes, inviting them to submit proposals within three research areas:

- innovative scientific investigations in areas such as hydrology, land surface processes, atmospheric research, oceanography or climate research
- calibration of MSG data and validation of geophysical products
- investigation of new algorithms, including demonstration of new experimental products and their value for research.

The aim was to stimulate interaction between the research and operational meteorological user communities at an early stage of the new MSG satellite programme.

Following the issue of the RAO, 43 projects were selected by peer review.

The variety and innovation of the projects clearly indicates the potential of MSG data to support novel scientific investigations.

The Bologna workshop focused on these projects and on the current MSG status and plans. In addition, ESA presented updated information concerning the ERS and Envisat missions.

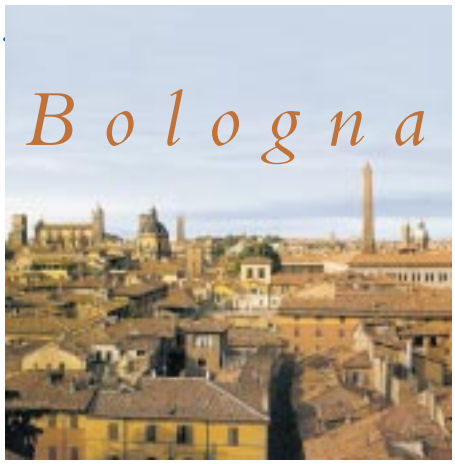
Local organisers Dr. V. Levizzani and Mrs. M.T. Tibaldi ISAO/CNR who made a considerable contribution to the success of the workshop

The RAO provides access to data from these missions and many project proposals made use of the opportunity to investigate these data combined with MSG. The monitoring and cooperation will be performed by Internet-based tools already put in place by ESA.

A second important issue addressed by the workshop was the data delivery mechanism required to serve the needs of the scientific community. It is clear that processing and archiving the large data volume generated by the MSG instruments (such as SEVIRI and GERB) should not be underestimated and will require special arrangements.

The workshop, organised by ESA and EUMETSAT, was hosted by the Institute of Atmospheric and Oceanic Sciences of the National Council of Research in Bologna. Proceedings will be published in due course by ESA. A second MSG RAO workshop is foreseen to take place one year after the launch of MSG-1.

Science and culture in Bologna



The historic Italian city of Bologna was an additional source of inspiration to participants at this year's EUMETSAT Meteorological Satellite Data Users' Conference, which took place between 29 May and 2 June.

Seat of the first recorded university in the world and birthplace or home to so many of the world's learned scholars over the centuries, it was a perfect venue for the 222 participants from 30 different countries.

The majority came from Europe but there were representatives from all major continents. The conference was co-organised by the ISAO-CNR, the Italian Meteorological Service and the Regional Meteorological Service ARPA Emilia-Romagna and took place at the ISAO-CNR centre.

A wide range of topics was addressed in the 79 verbal presentations and over 40 poster displays and software demonstrations.

The programme was organised into six topic sessions: Meteosat Second Generation, Other Satellite Systems, Atmospheric and Oceanic Products and Applications, Land Products and Applications, Earth Radiation Budget and Climate Monitoring, and Operational Systems.

Also included was a special workshop on the use of Meteosat rapid scan data. Participants expressed a definite need for further rapid scanning projects to be carried out with Meteosat as well as rapid scanning sessions to be part of the MSG commissioning phase.

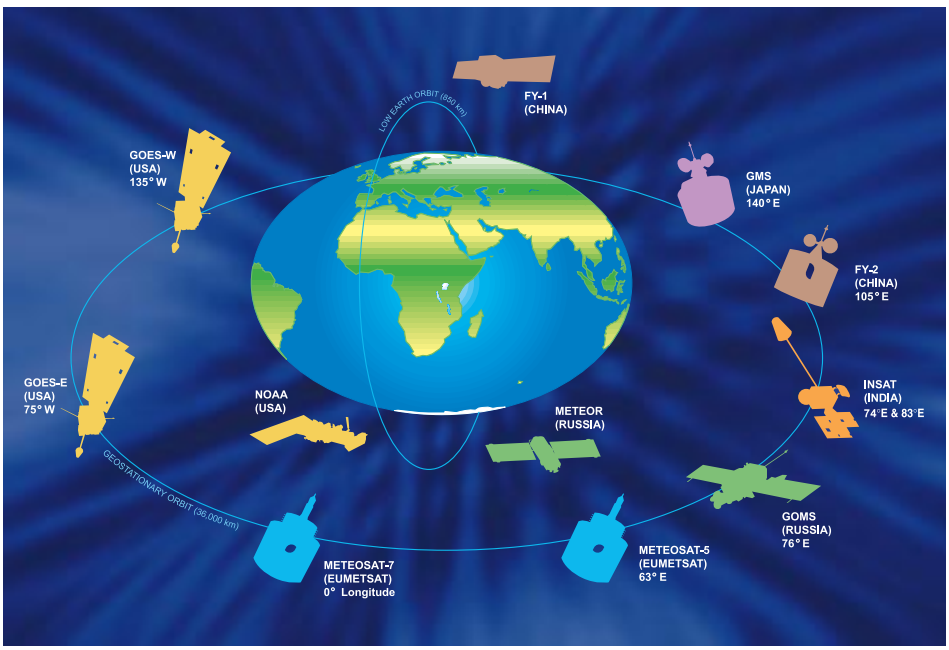
From the comments of participants, it is clear that the Bologna event was highly appreciated. Preparations have already begun on the 2001 conference to be held in Antalya, Turkey, and the organising team will look at ways of making this event as successful as Bologna.

The evaluation forms distributed during each conference are given careful consideration and, where possible, all constructive suggestions are implemented.

Global satellite update

Europe: *The status of the three EUMETSAT satellites remains unchanged. Meteosat-7 supports the primary service at 0° Longitude, with Meteosat-6 as the back-up spacecraft at 9°W. Meteosat-5 continues the Indian Ocean Data Coverage service from 63°E.*

USA: *GOES-10 (West) is the operational satellite at 135°W. GOES-8 (East) continues to function at 75°W with no significant changes. GOES-11 (launched in May 2000 as GOES-L) has completed commissioning and is stationed at 104°W as back-up. NOAA-15 operates in polar orbit with NOAA-12 as back-up. However, the primary imager of NOAA-15 is experiencing problems and evaluation tests are under way. NOAA-14 continues to function well. NOAA-L was scheduled for launch on 21 September 2000 and NOAA-M in mid-2001.*



Russia: *The first of the new Meteor-3M generation of Russian polar orbiting meteorological satellite, Meteor-3M-1, is planned for launch into a morning sun-synchronous orbit by the end of this year. Meteor-3M-2 and the second Russian geostationary satellite, GOMS-2, are scheduled for launch in 2002 and 2003 respectively.*

China: *The FY-2B satellite was successfully launched on 25 June 2000 and has been located at 105°E since 3 July. The first VIS image was received on 6 July and the first IR and WV images on 20 July. The FY-1C polar orbiting meteorological satellite, launched in May 1999, is operating in a morning sun-synchronous orbit. The next in the series, FY-1D, is scheduled for 2001.*

Japan: *GMS-5, the current operational geostationary meteorological satellite, will continue to operate at 140°E until the next generation, MTSAT. MTSAT-1R is planned to be launched in early 2003 and MTSAT-2 in 2004.*

India: *INSAT-1D operates at 74°E and INSAT-2E (launched in April 1999) at 83°E. INSAT-2B and INSAT-2A are the back-up satellites. INSAT-3A is scheduled to be launched by end of 2001 and INSAT-3D in 2003.*