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STATUS OF THE METEOSAT SYSTEM

This document reports on the status of Meteosat satellites and services, including the Indian Ocean Coverage.

CGMS Members are invited to take note.

STATUS OF THE METEOSAT SYSTEM

1 INTRODUCTION

This document provides a summary report on the more recent operations of the Meteosat satellites together with details of EUMETSAT's support to Indian Ocean Coverage. Detailed information about routine satellite operations are not included in this document since they are provided in the EUMETSAT Quarterly Operations Reports, which are regularly distributed to all CGMS Members.

EUMETSAT is currently operating three satellites, Meteosat-5, 6 and 7. At the time of writing, the 0° service is provided by Meteosat-7, with Meteosat-6 as an in-orbit spare at around 9° West. Meteosat-5 is located over the Indian Ocean at 63° East and provides the Indian Ocean Data Coverage (IODC) Service.

Details of Meteosat Operations can be found at the EUMETSAT website: **http://www.eumetsat.de**

2 SYSTEM STATUS

2.1 Meteosat-5

Meteosat-5 has been used in support of the 63° service (now known as the Indian Ocean Data Coverage (IODC)) since the start of EUMETSAT support to the INDOEX experiment on 1 July 1998. No DCP or MDD services are provided via Meteosat-5.

No gain changes were performed during the last quarter. Gain settings remain at: IR1 Gain 5, WV2 Gain 8, VIS1 & 2 Gain 5.

The orbital inclination of the satellite is 3.65° and increasing. The remaining hydrazine fuel on board is estimated to be 5.728 kg, of which a 4 kg reserve will be required to de-orbit the spacecraft at the end of its useful life. This is anticipated to be when the orbital inclination exceeds 5° at the end of the year 2001, or possibly later if it is agreed that the satellite should be used for a longer period.

Orbit			**Attitude**	
Inclination	Longitude	E/W Drift	Right Ascension	Declination
3.654	63.23	0.02	342.66	86.181

Meteosat-5 Orbital Parameters for 14th August 2000

The spacecraft configuration status has remained stable since the failure of Power Amplifier 3 in July 1998.

2.2 Meteosat-6

Meteosat-6 has been used as an in-orbit spare at around 9.5°W, to support trials of rapid scans and to support validation of the re-engineered Meteosat-6 correction system (in addition to, or in place of, routine weekly imaging).

The routine reception of DCP messages was transferred to Meteosat-6 during Meteosat-7 eclipses when the Meteosat-7 Power Amplifier 2 was deconfigured.

Gain settings remain at: IR1 Gain 5, WV2 Gain 8, VIS1 & 2 Gain 5.

The inclination of the satellite is 0.60° and increasing. The remaining hydrazine fuel on board is estimated to be 8.801 kg, of which a 4 kg reserve will be required to de-orbit the spacecraft at the end of its useful life. It is estimated that the fuel available will be sufficient to allow nominal orbit and attitude control until the end of the year 2001.

Orbit			**Attitude**	
Inclination	Longitude	E/W Drift	Right Ascension	Declination
0.61	351.074	0.0047	311.13	89.57

Meteosat-6 Orbital Parameters for 14th August 2000

2.3 Meteosat-7

During the reporting period, Meteosat-7 has been used to provide the nominal 0° operational service.

Black body calibrations have been performed twice per day on slots 24 and 48 (changed to slots 24 and 46 during the eclipse season).

The Meteosat-7 autumn eclipse season ended on 12th March. The spacecraft was deconfigured fully during the deepest portion of the eclipse season, and partially at other times.

The routine reception of DCP messages was transferred to Meteosat-6 during Meteosat-7 eclipses when Power Amplifier 2 was deconfigured due to the depth of the eclipse and the available battery capacity.

The inclination of the satellite is 0.57° and decreasing. The remaining hydrazine fuel on board is estimated to be 26.875 kg, of which a 4 kg reserve will be needed to re-orbit the spacecraft at the end of its useful life. It is estimated that the fuel available is enough to allow nominal orbit and attitude control until the year 2005.

Orbit			**Attitude**	
Inclination	Longitude	E/W Drift	Right Ascension	Declination
0.57	359.36	0.0017	263.59	89.604

Meteosat-7 Orbital Parameters for 14th August 2000

3 SERVICE PERFORMANCE

The following tables show the overall performance of the operational services in the 5 months period up to July 2000. The performance figures for August were not available at the time of writing. All the performance figures are expressed in percentages.

0° Service

	Mar	Apr	May	Jun	Jul
Image Acquisition	99.28	99.15	99.66	99.65	99.40
Dissemination (Wefax+HR)	99.93	99.10	99.83	99.86	99.81
FSDR	100	95.90	97.70	98.80	98.30
DCP	99.42	n.a.	99.10	99.20	98.87
MPEF distribution	98.84	95.26	99.51	99.89	99.96

FSDR – Foreign satellite data relay
MPEF – Meteorological Product Extraction Facility

63° Service

	Mar	Apr	May	Jun	Jul
Image Acquisition	99.35	99.16	99.73	99.65	99.66
Dissemination (HR)	99.93	99.31	99.69	99.88	99.01
MPEF distribution	98.23	95.40	99.34	99.69	99.27

The current level of RF interference observed on the dissemination transponders is very low, with very few High Resolution test format bit errors being reported by the EUMETSAT User Station Display Facility in Darmstadt.

For the DCP channels, interference was observed on regional channels 10, 11, 13, 14, 15, 16, 17 and 18. The DCP performance figures for April are not available because of frequent system reconfigurations during that month. (see CGMSXXVIII WP-07/8 for details of IDCS operations).

The lower than usual performance figures for the MPEF, also in April, were due to a Primary Ground Station network outage. The recovery from this incident had a significant effect upon MPEF operations for both the 0° and the IODC services. Each service was interrupted for 24 hours (not simultaneously) following the outage.

4 ARCHIVE AND RETRIEVAL SERVICE

The routine archiving of both rectified and raw image data has begun. This reduces the retrieval and delivery times for these data to approximately 2 minutes per slot. The systematic rectification and archiving of historic data is planned and is likely to be implemented as part of support to the MPEF reprocessing project. It now looks increasingly unlikely that Meteosat-1 data and the early data from Meteosat-2 will be rectifiable but it is hoped that the entire archive apart from these data will eventually be stored in both forms. In any case this will be a necessary precursor to the migration of image data to the U-MARF.

The "rescue" of image data from the oldest round-reel tapes by a specialised tape treatment process has progressed with a success rate matching our original hopes. Ironically, now that these old files can be successfully read, it has been discovered that there are yet more variations in the archive file format, which cannot yet be handled by the transcription process.

Some reorganisation in the MARF has taken place to reflect the slightly different staffing approach under the new Operations User Service Team contract in which the MARF is more closely integrated into the User Service. This includes a harmonisation of the User Helpdesk function.

4.1 MARF Availability

	Mar	Apr	May	Jun	Jul
Ingestion Availability	100	100	100	100	100
Product Availability	99.73	99.58	99.58	99.88	99.76
Retrieval Availability	99.13	100	98.58	98.26	100

4.2 MARF Transcription Status

These figures are the percentages of images and products that have been transcribed:

	Mar	Apr	May	Jun	Jul
Image files transcribed	65.38	67.30	69.15	70.14	71.91
Product files transcribed	93.86	93.86	93.86	93.86	93.86

4.3 MARF Customer Enquiries

	Mar	Apr	May	Jun	Jul
External Customers	16	6	10	11	12
Internal Customers	17	8	11	15	9
Image Prints	3	25	31	29	6

5 OTHER PROJECTS OF INTEREST

5.1 MPEF Products/Calibration

Validation of the 80 km Clear Sky Radiances Product, distributed routinely since January 1999, continued as a joint activity with ECMWF. Analysis of feedback statistics from ECMWF indicated significant bias variations, causing problems for the variational radiance assimilation. After technical consultations with ECMWF, analysing the problems in detail, it was decided to accelerate the implementation and testing of a revised calibration scheme for Meteosat-7, based on black body calibration. This testing was conducted at the end of 1999, and produced very encouraging results, eliminating the large jumps in bias seen with the pure vicarious calibration. This revised calibration scheme was validated during the spring eclipse season 2000 and was implemented operationally for Meteosat-7 on May 29 2000. The ECMWF radiance feedback information for Meteosat-7 since the migration demonstrates high stability of the radiance bias and shows, that in conjunction with the ECMWF bias correction scheme, the radiances are suitable for direct assimilation.

For Meteosat-5 and –6, which do not have an operational black body mechanism, a cross-calibration scheme is under implementation. The vicarious calibration is still performed for monitoring purposes and remains fully available as a back-up.

On 1 August 2000 a number of changes were made to the MPEF wind products (see Internet pages www.eumetsat.de/en/area3/topic3.html for details), of which the most significant one was the switch to the usage of Euclidean Distance Tracking for the Clear-Sky WV winds product. MSG prototyping has shown, that the use of cross-correlation techniques for tracking of Clear Sky WV structures is inadequate, and that Euclidean Distance Tracking gives better results in these areas. The validation of the new scheme in the MPEF system confirmed this result, and the new scheme was implemented operationally on 1st August.

5.2 MPEF Reprocessing

The reprocessing of Meteosat-5 data from 1996 was completed in August 1999 and the complete set of Meteosat Surface Albedo products was delivered to JRC/ISPRA for initial validation. After completion of this initial validation the product is now being released to a set of beta-testers. Based on the results of the beta-testing, a proposal for a continuation of the albedo reprocessing activity will be presented to EUMETSAT delegate bodies. It is envisaged, that such a continuation of the reprocessing activity will involve an upgraded version of the algorithm, and will also include processing of an albedo product from other time periods and potentially also for the Asian region, based on Meteosat-5 data.

Preparations for the reprocessing of wind products from Meteosat-2 are still ongoing, and it is expected, that the reprocessing can be completed by the middle of 2001. Delays have been caused by more significant work required for the preparation of the processing chains for the historical processing, but the schedule is compatible with the schedule for the ECMWF 40-year reanalysis. The data rescue activity for Meteosat-2 data is proceeding well with a very good recovery rate for the open reel tapes from 1981-83, although some problems resulting from poor data format specification in the historical data have become apparent.

5.3 Meteosat-6 Correction Re-engineering

The Meteosat-6 radiometer anomaly causes the brightness of the IR and WV images from this spacecraft to vary in an unpredictable manner. The Meteosat-6 Anomaly Correction System (M6C) generates corrections for this anomaly. These corrections are derived by a set of 3 algorithms, each of which requires the presence of cloud-free sea regions in the image in order to work. Experience with Meteosat-6 operations at 0 degrees has shown that these algorithms are able to correct for the anomaly with an acceptable level of accuracy. However, the possibility of operating Meteosat-6 at 63°E at a future date has been raised. Since a spacecraft at this location sees very few sea regions in the Northern Hemisphere, and since the sea regions in the Southern Hemisphere are relatively prone to cloud, the performance of the existing algorithms is expected to degrade if used to correct Meteosat-6 images taken from 63°E.

As a result, it has been decided to replace (or supplement) the existing algorithms with a new algorithm based on cross-calibrating Meteosat-6 63°E images with data from the (anomaly-free) Meteosat-7 satellite located at 0 degrees.

The new algorithm will also be used to calibrate Meteosat-5 images taken at 63°E. Experience with Meteosat-5 operations at 63°E has shown that the calibration of the WV images is relatively inaccurate. The new anomaly correction system will therefore be configurable so that the new cross-calibration algorithm can also be used to generate calibration data for Meteosat-5 rather than anomaly corrections for Meteosat-6.

The cross-calibration project began on 31st January 2000. By the end of June all modifications to the M6C and Image Processing System (IPS) had been implemented and tested in the development environment. The results indicate that the new cross-calibration algorithm will provide good quality M6 anomaly corrections and an improved M5 WV calibration. Since the beginning of July, the modified M6C and IPS is being tested and tuned with live data in the validation environment. An extensive operational validation of the new anomaly correction system will start in August. This validation will involve the MPEF so that the quality and quantity of products can be compared with those derived from Meteosat-7.

5.4 Rapid Scan Trials

Following the success of the rapid scan imaging support service provided to the MAP Special Observing Period (SOP) in autumn last year, a further rapid scan imaging trial started at the beginning of August. This trial will last for 4 weeks and will consist of 48 hours of continuous rapid scan imaging starting at 07:00 UT on August 2, 9, 16 and 23, 2000.

This trial will use a modified imaging procedure, in which the stand-by period has been reduced from the 2.5 minutes used for nominal imaging and for the MAP SOP rapid scanning to 30 seconds. The two minute reduction in the stand-by period means that approximately 200 additional image lines can be scanned per rapid scan compared to that achievable with a 2.5 minute stand-by period. For this trial it has been decided to perform 10 minute scanning, which, with the new procedure results in a scan area of 864 lines (which is reduced by about 50 lines after rectification). This selected area covers the northern tropics to southern Denmark.

The rapid scan data is being made available to interested users via a MARF FTP server in a similar manner to that adopted for the MAP SOP. To date, users from the French, German, Dutch, Spanish, Swiss and U.K. Met Services have requested access to the data, as has the U.S. Tropical Prediction Centre.

5.5 New BGS Service

Integration of the new Back-up Ground Station (BGS) service into the MTP ground segment started in July. This service is to be provided by Telespazio using a modified ground station in Cheia, Romania.

So far, the antenna subsystem, RF downlink, baseband modules and communications equipment have been installed and tested. Yet to be installed are the High Power Amplifiers (HPAs), currently awaiting shipment from the USA, and the voice system.

End-to-end testing has taken place of the telemetry streams for all Meteosat spacecraft, and the ranging stream. Processing of the ranging data has not yet been tested, the telecommand stream testing awaits the delivery of the HPAs.

6 CONCLUSION

CGMS is invited to take note of the status of the Meteosat System.