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# REPORT ON MONITORING PROCEDURES FOR PRODUCTS

This paper presents procedures adopted for monitoring EUMETSAT products and addresses the following topics:
- Product Quality Control
- Product Monitoring

and responds to CGMS Action 28.24.

CGMS Members are invited to take note.

# REPORT ON MONITORING PROCEDURES FOR PRODUCTS

## 1 INTRODUCTION

Product quality assessment and monitoring are crucial elements of the process of maintaining and, subsequently, improving the quality of products. For product generation, the goal of product quality assessment is to prevent the dissemination of erroneous observations. However, this type of assessment usually deals with the quality of a single observation. The goal of disseminated product quality monitoring is to observe the quality of products over a longer timescale, typically, more than several months up to several years, in order to observe product quality changes and trends.

EUMETSAT has implemented a procedure to monitor the variability of products over time. The goal of this monitoring procedure is the detection of changes in the products (and hence potentially in the product quality) within a maximum period of one working day. Typically, product information covering the last 30 days is taken into account.

## 2 PRODUCT QUALITY ASSESSMENT

### 2.1 Calibration

The method of deriving calibration coefficients differs for each spacecraft. For Meteosat-7 a black body calibration technique is used, with no internal check on the quality.

For Meteosat-5 a satellite cross-calibration technique is used, using Meteosat-7 as a reference spacecraft. The individual cross-calibration coefficients are not used directly, as they are prone to errors due to possible image anomalies, especially in eclipse periods. The operational calibration of Meteosat-5 is, therefore, performed only twice daily using an average of the latest 24 cross calibration coefficients. Within this averaging procedure a quality check on erroneous values is carried out, which are subsequently flagged as unusable.

### 2.2 Atmospheric Motion Vector (AMV) Products

The AMV products yield estimates for wind speed and direction and are based upon data from various Meteosat channels and at various resolutions. The products are derived from three consecutive images, combining the two vectors from each pair of images into a final vector, which is then disseminated. For all AMV products there are a number of internal quality control steps that result in a quality index for each check. The most prominent checks are the speed, the direction, the spatial and the forecast consistency check.

All quality indices are combined into a single quality index. For all SATOB encoded products only those observations that pass a given quality index are disseminated. For the BUFR encoded

products all observations that pass a given (low) quality index are disseminated with the quality information also included in the coded product. It should be noted that the BUFR template was recently changed to allow a second quality index, which consolidates all previous checks but without a forecast consistency check.

### 2.3 Clear Sky Radiance (CSR) Product

The CSR product describes radiances and brightness temperatures from the Meteosat WV channel for areas free of clouds above 700 hPa. The internal quality assessment determines the standard deviation of the cloud free radiances and the percentage of cloud coverage within the area, and relates a quality index to both checks. The combined quality index is not used for flagging observations, but is disseminated together with the observation.

### 2.4 Upper Tropospheric Humidity (UTH) Product

The UTH product is derived from the Meteosat WV channel and gives the mean relative humidity of a layer between 300 and 600 hPa. It is derived for clear sky areas, and is expressed as a mean relative humidity over water. Consequently UTH observations with relative humidities above 85 % are flagged, as these observations are likely to be cloud contaminated.

### 2.5 Climate Data Set (CDS) Product

The CDS is an archive format for compressed scene analysis results for each spacecraft. There is no internal quality control check on these results.

### 2.6 Cloud Analysis (CLA) Product

The main product quality assessment is limited to observations over the sea, as here the potential for wrong classification is the largest. The scene analysis cannot detect small cloud elements and the detection of low-level clouds over sea is prone to errors when data from the visible channel are unavailable. If no clouds have been detected over the sea, then the AMV algorithm is used to check whether a vector can be determined. If so then the scenes analysis has not detected a cloud, and the CLA observation is flagged.

### 2.7 Sea Surface Temperature (SST) Product

The SST product uses the results of the scenes analysis algorithm to locate clear sky areas. The quality checks within this step are a check that the cloud free area must be larger than a threshold, and that the radiances in the VIS channel (if available) must be lower than a given threshold. Within the second step the warmest 3x3-pixel area is located, and the radiance from this super pixel is then converted into a SST observation.

Before dissemination, the SST observations are flagged if they differ by more than a given threshold from the SST value given by the NCEP model.

# 3 PRODUCT QUALITY MONITORING

## 3.1 Calibration

The variability of the calibration coefficients is monitored by comparing the operational and vicarious calibration coefficients, using NCEP sea surface data or radiosonde observations as a reference. In addition, for Meteosat-5 the operational calibration is compared to the individual satellite cross-calibration coefficients.

Additionally, the operational calibration coefficients are compared with satellite cross- calibration coefficients determined offline using other instruments (e.g. HIRS).

An upgrade of the monitoring system for vicarious calibration is envisaged, by retrieving more information from radiosonde observations over longer time scales.

## 3.2 Atmospheric Motion Vector (AMV) Product

The variability of the AMV products is monitored, by checking the number of derived and subsequently disseminated winds and their averaged quality.

Quality monitoring is performed by monthly comparisons with radiosonde observations. Monitoring is carried out for various products on global, regional and height dependent scales, and for the various channels. These quality statistics are regularly sent to the CGMS Working Group on Winds for further review.

Some deviation between EUMETSAT criteria and CGMS recommendations on data collocation has to be noted. The most noticeable differences are:

(i) a somewhat larger figure for the distance between a radiosonde and an AMV observation,
(ii) the maximum height difference between the radiosonde and AMV observations.

## 3.3 Clear Sky Radiance (CSR) Product

ECMWF monitors the CSR product by passive assimilation in the ECMWF analysis, the results of which are disseminated to EUMETSAT on a daily basis.

### 3.4 Upper Tropospheric Humidity (UTH) Product

The variability of the UTH product is monitored using an averaged UTH (over Meteosat field-of-view) and some other statistical parameters. In addition, collocations of the UTH product with radiosonde observations are generated. As this is closely related to the monitoring of the vicarious calibration of the WV channel these two monitoring procedures will be merged.

### 3.5 Climate Data Set (CDS) Product

The variability of the CDS product is monitored via the relevant statistical parameters (e.g. average, standard deviation) of the individual scene types (e.g. sea surface, land surface, etc.).

There is no quality monitoring of the CDS product against external data.

### 3.6 Cloud Analysis (CLA) Product

The variability of the CLA product is monitored using relevant statistical parameters (e.g. average, standard deviation).

There is no quality monitoring of the CLA product against external data.

### 3.7 Sea Surface Temperature (SST) Product

The variability of the SST product is also monitored using relevant statistical parameters (e.g. average, standard deviation).

Quality control of the SST product is carried out using external sea surface observations (e.g. SHIP).

## 4 CONCLUSION

CGMS Members are invited to take note of EUMETSAT's product quality monitoring procedures.