SATELLITE PRODUCT MONITORING PROCEDURE AND PRACTICE IN MSC

This document reports the procedure and the practice for satellite products monitoring at MSC in response to Action 29.31 in CGMS XXIX.

No action is required on this subject.

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1   INTRODUCTION

Satellite operators are encouraged to report their monitoring procedures and practices for satellite data and products at CGMS XXX (Action 29.31).   This document reports the monitoring procedures for each product of MSC.

2   MONITORING OF SATELLITE PRODUCT IN MSC

MSC has been routinely monitoring the qualities of its satellite products and circulating the monitoring report internally in JMA since early in 1986. The targets of the monitoring are not only products exchanged via GTS such as Atmospheric Motion Vectors but also all those can be checked in one way or another. Various monthly statistics on the products are checked as the monitoring. The monitoring methods for each product have been strictly kept same since MSC started quality monitoring.

The monthly monitoring report has been sent to relevant sections in JMA by e-mail since April 2002 and the latest report and back numbers have been posted on intranet of JMA for internal use.

3   PROCEDURE OF MONITORING FOR EACH PRODUCT

The procedures for each product are described below. The products to be monitored are, high-level cloud motion winds, low-level cloud motion winds, water vapor motion winds, total cloud amount, sea surface temperature, TOVS vertical temperature, TOVS vertical dew point, solar irradiation and TOVS total ozone amount.

High-level Cloud Motion Winds, Low-level Cloud Motion Winds and Water Vapor Motion Winds:

The monitoring procedure is the same as the CGMS intercomaprison of AMV except the cut off distance from the reference rawinsonde station. The cut off distance is set 100km and it is 50km shorter than that of the CGMS intercomparison.

The quality control (QC) scheme comprises two parts i.e. automatic QC and manual QC. In automatic QC, wind vectors extracted from three consecutive imageries are compared with various elements such as the local mean wind vector of the same altitude and different altitude, the NWP forecast wind field and so on, and checked its consistency with respective algorithms. When an inconsistency is found through automatic QC, associated check flag of the vector turns on. After automatic QC, wind vectors are checked by an operator with computer display (manual QC). The operator checks the vectors referring the imageries, NWP forecast fields and the check flags recorded through automatic QC. The operator rejects

inconsistent vectors, reassigns altitudes and sometimes defines new vectors, and completes the final product of wind data.

Total Cloud Amount:

MSC hourly produces total cloud amount in each area of 1 degree by 1 degree for the domain of 80E-160W and 60N-60S from GMS imagery. Monitoring is carried out with comparing the total cloud amount observation at a ground station with the value at the nearest area. QC is not introduced.

Sea Surface Temperature (SST):

SST is derived from GMS and NOAA polar orbital satellites imagery. The product consists of average temperature in each 0.25 by 0.25 latitude longitude area. The products on GMS extracted temperature are generated tree hourly and those on NOAA polar orbital satellites are generated for each path.

In the retrieval procedure, the cloud screening is performed for satellite data at first. It includes three tests: the gross test, the uniformity test and the channel inter-comparison test. Pixel values are compared with thresholds in the gross test. Variations of the values in small arrays (e.g. 2x2 or 3x3 pixels) are compared with thresholds in the uniformity test. The channel inter-comparison tests are performed using combinations of two or three channel data. After the cloud screening process above, SSTs at every pixel under clear-sky condition are retrieved.

As the monitoring, derived SST values are compared with observation data of meteorological ocean buoys. QC is not introduced for NOAA polar orbital satellites product. QC for GMS product is done with following two steps: SSTs are calculated with three algorithms for each area. The area at which differences among the SSTs exceed a threshold is rejected. The SST that passed the first step is compared with SST analysis data (or climatological SST). The SST of which the difference is less than a threshold passes the QC.

TOVS Vertical Temperature, TOVS Vertical Dew Point:

Vertical profile of temperature and humidity are produced for each path of NOAA polar orbital satellites. The profiles are calculated at each 3 degree latitude longitude interval.

The monitoring of comparing a product profile with a rawinsonde observation is conducted. The criterion of the distance to assume each point as identical is 50 km. The aerological observation stations to compare are the stations on island because the products are only for over the ocean; 47678 (Hachijo), 47909 (Naze), 47918 (Ishigaki), 47936 (Naha), 47945 (Minami-daito), 47971 (Chichi-jima), 47991 (Minami-torishima), 91217 (Guam).

The QC for the products is as follows:
The domain of the products is limited to over the ocean. If the cloud amount in a HIRS scope is more than 5 % the pixel is rejected. The cloud amount is based on AVHRR images. Retrieved temperature is compared with NWP data. The temperature of which the difference is less than 4 K passes the QC.

Solar Irradiation:

MSC produces hourly solar irradiation from GMS visible data. The monitoring is conducted by comparing the product with ground observation of one-hour accumulation of solar irradiance measured by pyranometer. The number of referred stations is 67 and all of them are located in Japan. The product is compared with ground observation at the corresponding point and time.

TOVS Total Ozone Amount:

Vertically Total ozone amount is retrieved from NOAA polar orbital satellite data. The product is calculated at each 1 degrees latitude longitude interval.

The monitoring is conducted by comparing the ozone amount with Dobson measurement on direct sun at ground stations. The criterion of the distance to assume each point as identical is 50 km. The ground stations are Sapporo, Tateno, Kagoshima, and Naha. All stations are Japanese domestic ones.

The QC for the products is as follows:
The ozone amount is calculated in a HIRS scope that meets the following criteria. The minimum TBB of AVHRR infrared channel is higher than the atmospheric temperature at a pressure level of 400 hPa. The TBB of channel 8 in HIRS channels should be at least 20 K higher than the TBB of channel 2.