CGMS

CGMS-39, JMA-WP-04
Prepared by JMA
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Discussed in WG II

JMA'S GSICS AND SCOPE-CM ACTIVITIES

In response to CGMS Action 38.20

This document reports on JMA's activities regarding GSICS and SCOPE-CM.

JMA began operation of the MTSAT-1R infrared inter-calibration system on GSICS in 2008, and the system was modified on the occasion of the switchover to MTSAT-2 from MTSAT-1R in July 2010. The MTSAT IR GSICS Correction is now in the Demonstration Phase of the GSICS Procedure for Product Acceptance (GPPA). According to the inter-calibration between MTSAT and LEOs infrared channels, MTSAT-2 infrared brightness temperature data contain biases around midnight during the eclipse seasons.

JMA reprocessed the calibrations of GMS-5 and MTSAT-1R visible images in collaboration with the University of Tokyo and Chiba University. With the switchover to MTSAT-2, the Agency began operational visible vicarious calibration and monitoring of its calibration coefficients.

As a contribution to SCOPE-CM, JMA (re)processed the historical AMV and CSR dataset and made the results available to the re-analysis community. A study carried out using reprocessed GMS AMV data showed a significant positive impact.

Recommendation proposed:

Considering the large contribution to climate monitoring, the producers of AMV and CSR products are encouraged to reprocess the historical dataset of these products and provide to the re-analysis community.

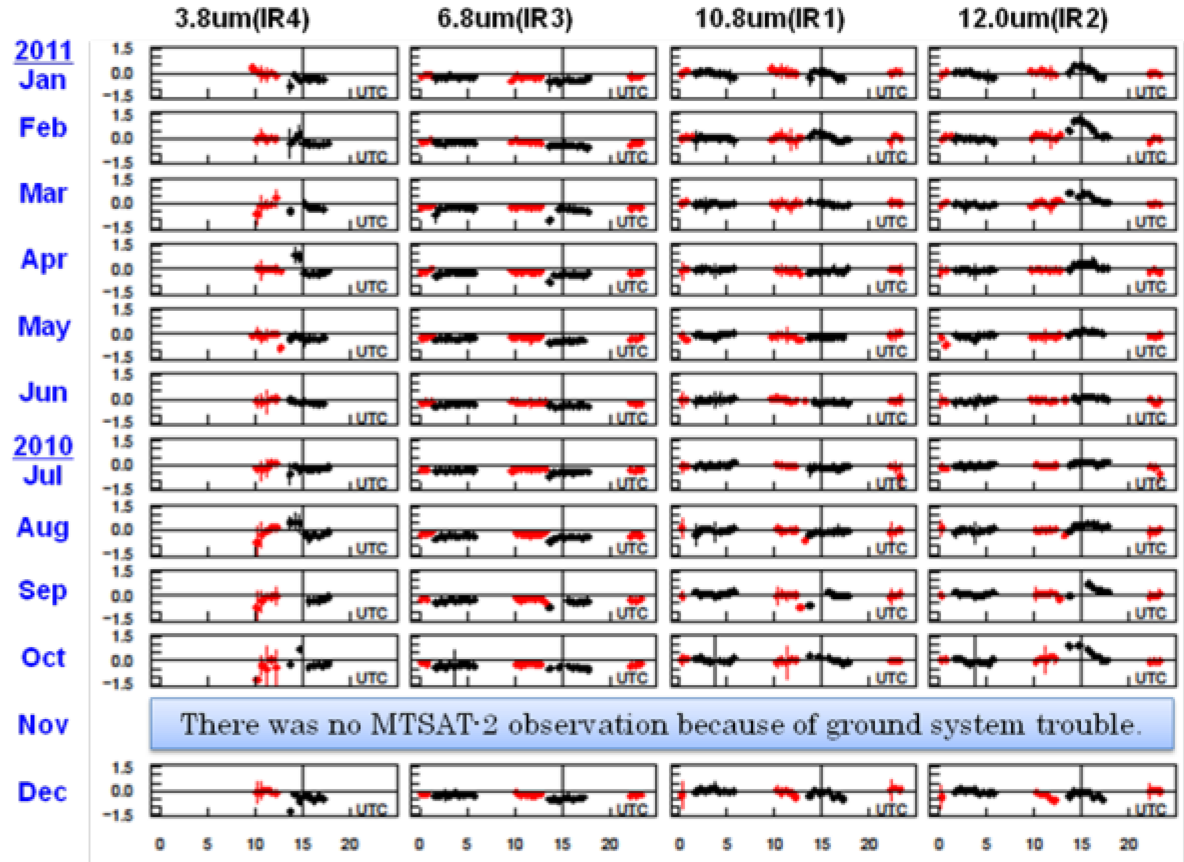

Figure 1 Monthly diurnal variation of brightness temperature differences (dots) between MTSAT-2 and LEOs (AIRS and IASI). The vertical black lines in the charts denote MTSAT-2 local midnight. The red dots indicate the differences from IASI, and the black dots indicate the differences from AIRS. The segments with short vertical lines show the standard error of brightness temperature differences.

JMA'S GSICS AND SCOPE-CM ACTIVITIES

This document reports on the activities of the Japan Meteorological Agency (JMA) regarding the Global Satellite Inter-calibration System (GSICS) and the Sustained Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM).

1 STATUS OF THE MTSAT INFRARED INTERCALIBRATION SYSTEM ON GSICS AND RELATED PLANS (In response to CGMS Action 38.20)

Action 38.20: CGMS agencies to provide reports on satellite calibration anomalies. Deadline: CGMS-39.

JMA began operation of the MTSAT-1R infrared inter-calibration system on GSICS on 2 July, 2008, as reported in CGMS-36 JMA-WP-05. The Agency operationally implements inter-calibration of MTSAT infrared channels through comparison with data from the AIRS high-spectral-resolution sounders on board the AQUA satellite and the IASI installed on the Metop-A satellite. On the occasion of the switchover to MTSAT-2 from MTSAT-1R on 1 July, 2010, JMA implemented the MTSAT-2 inter-calibration system and set up a related monitoring web page.

MTSAT IR's GSICS Correction product, which has been provided to the EUMETSAT GSICS data server in operational usage since September 2010, is now

2 STATUS OF MTSAT VISIBLE VICARIOUS CALIBRATION ON GSICS AND RELATED PLANS

As part of a program of collaborative research with the Atmosphere and Ocean Research Institute at the University of Tokyo (AORI) and the Center for Environmental Remote Sensing at Chiba University (CEReS), JMA reprocessed the calibrations of GMS-5 and MTSAT-1R visible images. Such reprocessing is performed using a vicarious calibration approach that involves comparing visible observations with simulated reflectivity over various homogeneous targets such as ocean areas, bare ground in Australia and liquid cloud top. The surface and atmospheric parameters used in the simulation are independent from those of geostationary satellite observations such as ground-based measurement, Moderate Resolution Imaging Spectroradiometer (MODIS)-retrieved properties and atmospheric fields analyzed under the Japanese 25-year Reanalysis Project (JRA-25). RSTAR (the System for Transfer of Atmospheric Radiation) developed by a group centered on AORI is employed as the radiative transfer model.

With the switchover to MTSAT-2, JMA started operational visible vicarious calibration and related bias monitoring. The algorithm used was based on that of MTSAT-1R. JMA set up a web page at http://mscweb.kishou.go.jp/monitoring/calibration.htm to outline the calibration method and enable monitoring of the results. The monitoring page is updated on a daily basis.

To improve the accuracy of vicarious calibration, homogeneous ice cloud, which is brighter than liquid cloud, was selected and investigated as a new target. The target cloud is generally referred to as deep convective cloud (DCC). Tentative results indicate that DCC provides a potentially effective target, although further investigation is necessary for the parameterization of ice clouds.

Composite visible imagery has also been generated from geostationary satellites as part of related research. An investigation based on comparisons of retrieved upward solar flux on the ground surface from calibrated satellite data with ground observation of flux was reported at the GSICS GRWG meeting in March 2011. Comparison shows good consistency between the retrieved and observed solar fluxes. Further results of these studies will be reported at a future GRWG meeting.

3 CONTRIBUTION TO SCOPE-CM

JMA has participated in SCOPE-CM since its establishment, and carries out initial activities related to Atmospheric Motion Vector (AMV) and Clear Sky Radiance (CSR) products, which are Essential Climate Variable (ECV), as a pilot project.

Over the last year, JMA has completed the reprocessing of historical AMV data using the latest algorithm, which underwent a major update in May 2009, as shown in Table 1. Figure 2 (a) shows temporal comparisons between operational MTSAT AMVs and radiosonde observations. Significant improvement is recognized both in RMSE and in biases. The numbers of AMV data derived have also increased since the update. In addition to the work with AMVs, the generation of historical CSR data from GMS-5 has also been completed. These AMV and CSR data have been made available to the re-analysis community.

Table 1 (Re)processing status of (a) AMV and (b) CSR in JMA

(a)

Satellite images to generate AMV	Template size	Satellite	Year	Achievement rate (%) (SEP04, Apr 2010 --> SEP06, Aug 2011)
Visible images	32 x 32 pixels	GMS-1	1979	100--> 100
		GMS-3	1987– 1989	100--> 100
		GMS-4	1989– 1995	100--> 100
		GMS-5	1995– 2003	100--> 100
		GOES-9	2003– 2005	100--> 100
		MTSAT-1R	2005– 2010	30 --> 100
		MTSAT-2	2010– present	(Operational)
IR, WV images at 30-min intervals	24 x 24 pixels	GMS-1	1979	100--> 100
		GMS-3	1987– 1989	100--> 100
		GMS-4	1989– 1995	100--> 100
		GMS-5	1995– 2003	100--> 100
		GOES-9	2003– 2005	100--> 100
		MTSAT-1R	2005– 2010	73 --> 100
		MTSAT-2	2010– present	(Operational)
IR, WV images at 15-min intervals	16 x 16 pixels	MTSAT-1R	2005– 2010	100--> 100
		MTSAT-2	2010– present	(Operational)

(b)

Satellite	Year	Achievement rate (%) (SEP04, Apr. 2010 --> SEP06, Aug. 2011)
GMS-5	1995 – 2003	100 --> 100
GOES-9 (W. Pacific)	2003 – 2005	80 --> 100
MTSAT-1R	2005 – 2010	100 --> 100
MTSAT-2	2010 – present	(Operational)

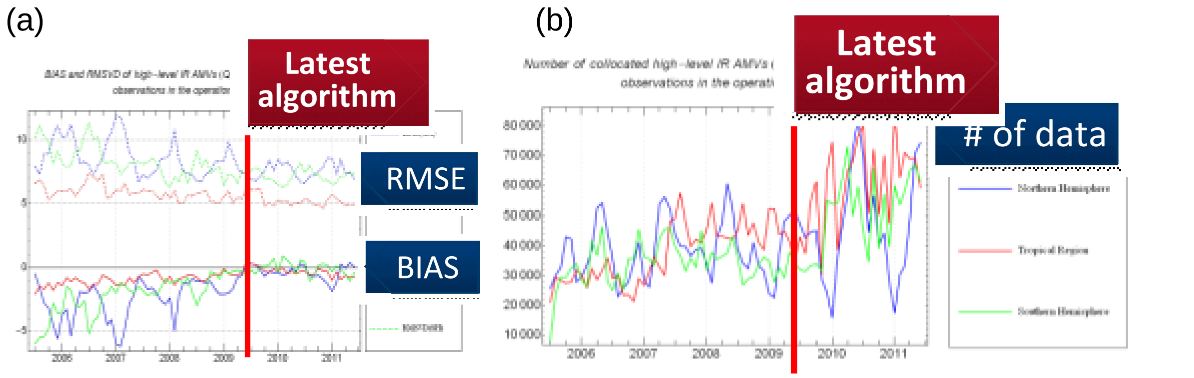

Figure 2 (a) Temporal comparisons between MTSAT AMV and radio sonde observations (b) Time-series representation showing the number of AMV data derived

A study was conducted to determine the impact of the reprocessed GMS AMV on the Japanese 55-year reanalysis project (JRA-55). JRA-55 covers the period from 1958 to 2012. The resolution of the NWP model is 60-km, and the data assimilation techniques of 4D-Var and variational bias correction for radiance observation are used. The results indicate a significant positive impact on forecasts, as shown in Figure 3.

Recommendation proposed:

Considering the large contribution to climate monitoring, the producers of AMV and CSR products are encouraged to reprocess the historical dataset of these products and provide to the re-analysis community.

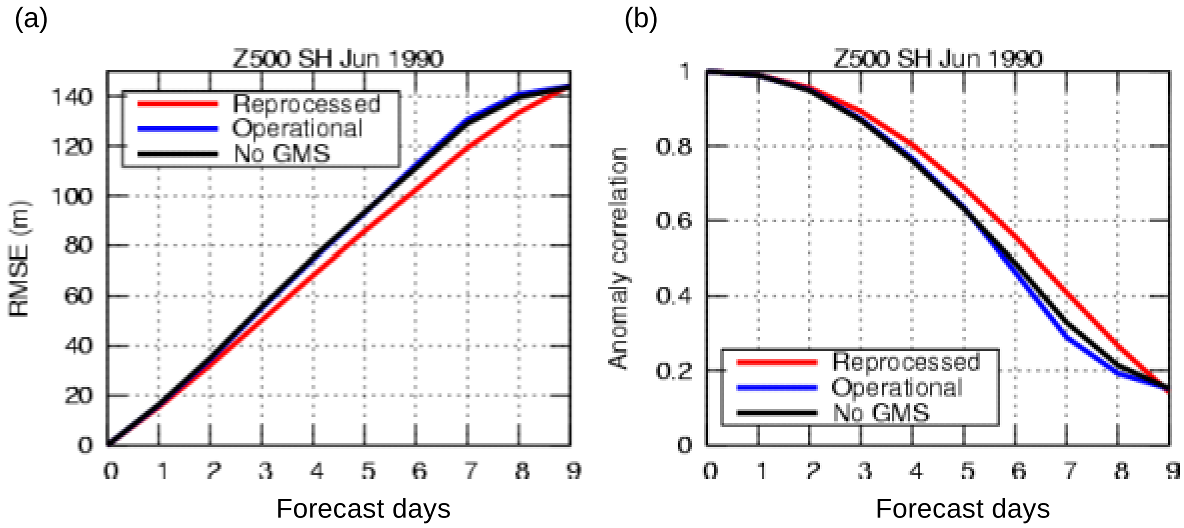

Figure 3 (a) and (b) show RMS forecast errors and anomaly correlations over the Southern Hemisphere with respect to no GMS AMV assimilation (black), assimilation of operationally derived AMVs (blue) and assimilation of re-processed AMVs (red).

In addition to its work in AMV and CSR production, JMA also contributes to the provision of a long-term surface albedo dataset. To provide this dataset for the area over the East Asia and West Pacific regions, the Agency performed recalibration for the GMS-5 visible dataset and generated albedo data using the EUMETSAT algorithm as recommended at CGMS-33 (Recommendation 33.07). JMA has finished computing the GMS-5 albedo dataset covering the period from 2001 onward in which the recalibration by using MODIS is available. The current status of reprocessing is detailed at http://mscweb.kishou.go.jp/product/reprocess/.