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JMA'S GSICS AND SCOPE-CM ACTIVITIES

In response to CGMS Action 37.09

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

JMA began operation of the MTSAT-1R infrared inter-calibration system on GSICS on 2 July, 2008. On the occasion of the switchover to MTSAT-2 from MTSAT-1R on 1 July, 2010, JMA changed the infrared inter-calibration system and modified its monitoring web page as the start of GSICS Correction, which has now entered the Demonstration Phase of the GSICS Procedure for Product Acceptance (GPPA). Trial research on the application of GSICS Correction to re-generate Clear Sky Radiance (CSR) products from MTSAT data was performed.

JMA has reprocessed the calibrations of GMS-5 and MTSAT-1R visible images in cooperation with the University of Tokyo and Chiba University. With the switchover to MTSAT-2, JMA started operational visible vicarious calibration and monitoring of its bias. The investigations for making homogeneous ice cloud as a new target have also been performed.

JMA participated in the establishment of SCOPE-CM, and will proceed with initial activities related to Essential Climate Variable (ECV) satellite products of Atmospheric Motion Vectors (AMVs) and CSR as a pilot project within the framework of SCOPE-CM.

JMA'S GSICS AND SCOPE-CM ACTIVITIES

This paper 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

JMA began operation of the MTSAT-1R infrared inter-calibration system on GSICS on 2 July, 2008, as reported at CGMS-36 JMA-WP-05. The Agency operationally implements inter-calibration of MTSAT's 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 changed the infrared inter-calibration system and modified its monitoring web page as the start of GSICS Correction, which is an initial core product of GSICS. The consensus is that GSICS Correction should be centered on quantifying the inter-satellite bias that depends on the satellite itself as well as on channels, timing and other possible factors, and that it should be well characterized in terms of uncertainty. The guidelines on GSICS Correction were discussed and determined within the GSICS Research Working Group (GRWG) and the Data Working Group (GDWG). JMA has adopted a linear regression equation to produce corrected radiance values from the disseminated digital count as a GSICS Correction formula for MTSAT. MTSAT's GSICS Correction also includes a calibration look-up table to allow direct conversion of the digital count to a corrected brightness temperature based on the results of inter-calibration. MTSAT HRIT users can refer to this table as a simple way of ascertaining the corrected brightness temperature instead of using the linear regression equation. GSICS Correction data have been operationally transferred to the EUMETSAT GSICS data server since September 2010.

JMA submitted a GSICS Product Acceptance Form (GPAF) on the MTSAT's GSICS Correction and an Algorithm Theoretical Basis Document (ATBD) for review to the GSICS Product Acceptance Team (GPAT) via the GSICS Coordination Center (GCC) deputy on 10 May, 2010. The product has now entered the Demonstration Phase of GSICS Procedure for Product Acceptance (GPPA).

As trial research toward the application of GSICS Correction data to the reprocessing of past satellite products, Clear Sky Radiance (CSR) products were derived from MTSAT-2 HRIT data whose bias had been corrected using GSICS Correction. Figure 1 shows the WV channel's brightness temperatures for CSRs before and after correction. It can be seen that the impact is generally small. However, the correction caused the CSR to increase a little in this case. JMA will continue investigation toward applying GSICS Correction to the reprocessing of products. This is expected to represent a significant contribution to the SCOPE-CM pilot project.

JMA has also researched the generation of composite infrared imagery from geostationary satellites related to the climate, weather forecasting and other environmental needs in cooperation with the Center for Environmental Remote Sensing at the Chiba University (CEReS). The achievements of this study will be reported to the GRWG.

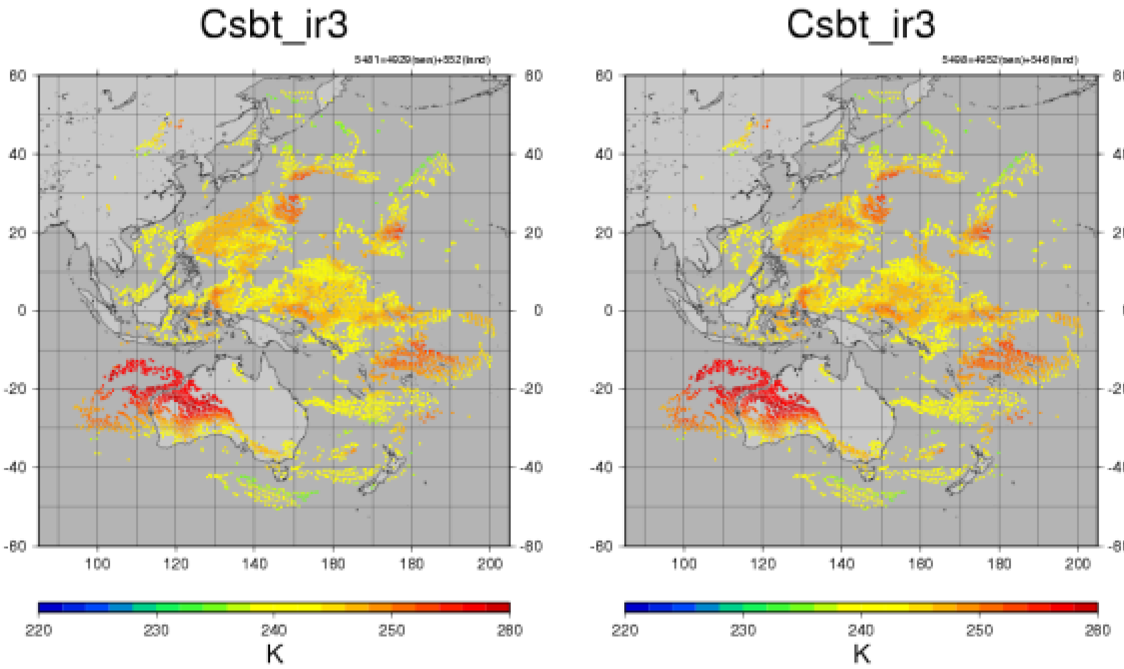

Figure 1: WV channel brightness temperatures of Clear Sky Radiance (CSR) products derived from MTSAT-2 observations at 10:00 UTC on 1 July, 2010. The image on the left shows routine results, while that on the right shows the reprocessed results derived from MTSAT-2 observations corrected using GSICS Correction data.

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 CEReS, JMA has reprocessed the calibrations of GMS-5 and MTSAT-1R visible images. The reprocessing is examined through comparison of visible observations with simulated reflectivity over various homogeneous targets such as ocean areas, bare ground in Australia and liquid cloud. The surface and atmospheric parameters used in the simulation are independent from those of GMS-5 and MTSAT-1R 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 AORI is employed as a radiative transfer model.

With the switchover to MTSAT-2, JMA started operational visible vicarious calibration and related bias monitoring. The algorithm used was developed 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 simulated reflectivity, homogeneous ice cloud (which is brighter than liquid cloud) has been selected and investigated as a new target. The target is generally called Deep Convective Cloud (DCC). JMA has investigated the accuracy of DCC estimated from outputs of Numerical Weather Prediction (NWP) for application to the vicarious calibration algorithm. Current research indicates that DCC is an effective target. However, further investigation will be required to implement it for the algorithm as its accuracy depends on the type of NWP model used and the parameterization of ice clouds. Composite visible imagery has also been generated from geostationary satellites as part of research related to the composite infrared imagery mentioned above. The achievements of these studies will be reported to the GRWG.

3 CONTRIBUTION TO SCOPE-CM

JMA participated in the establishment of SCOPE-CM. Based on the recommendations of the SCOPE-CM planning meeting, the Agency will proceed with initial activities related to Essential Climate Variable (ECV) satellite products of Atmospheric Motion Vectors (AMVs) and CSR as a pilot project within the framework of SCOPE-CM. It has also completed the derivation of a long-term surface albedo dataset from the recalibrated visible dataset of GMS-5 using a EUMETSAT algorithm as recommended at CGMS-33 (Recommendation 33.07). The current status of reprocessing is referred to at http://mscweb.kishou.go.jp/product/reprocess/.

JMA has been conducting the reprocessing of AMV products from images of the GMS series, GOES-9 and MTSAT-1R since the end of 2008, and the reprocessed data may be utilized for the Japanese 55-year Reanalysis Project (JRA-55) scheduled for the period between 2009 and 2012. The ongoing reprocessing (referred to as “the second AMV reprocessing”) is upgraded in terms of the derivation period and algorithm from the first AMV reprocessing conducted for JRA-25. The derivation algorithm is the same as the current operational one. JRA-25 and the Japanese Climate Data Assimilation System (JCDAS, i.e., the successor to JRA-25) analysis fields are used as reference forecast data to derive AMVs. Figures 2 and 3 show the numbers and the wind speed biases (BIASes) of the first and second reprocessed high-level (above 400 hPa) IR AMVs to the JRA-25 analysis fields for January 1996 in the GMS-5 period, respectively. In the statistics, AMVs with Quality Indicator (QI) values above 0.85 are used. The number of AMVs derived is increased in the second reprocessing. This is considered to result from the improvement of the height assignment. Slow BIASes over the middle and high latitudes in the second reprocessing are clearly mitigated compared to those of the first reprocessing.

Numbers for the first reprocessing | Numbers for the second reprocessing

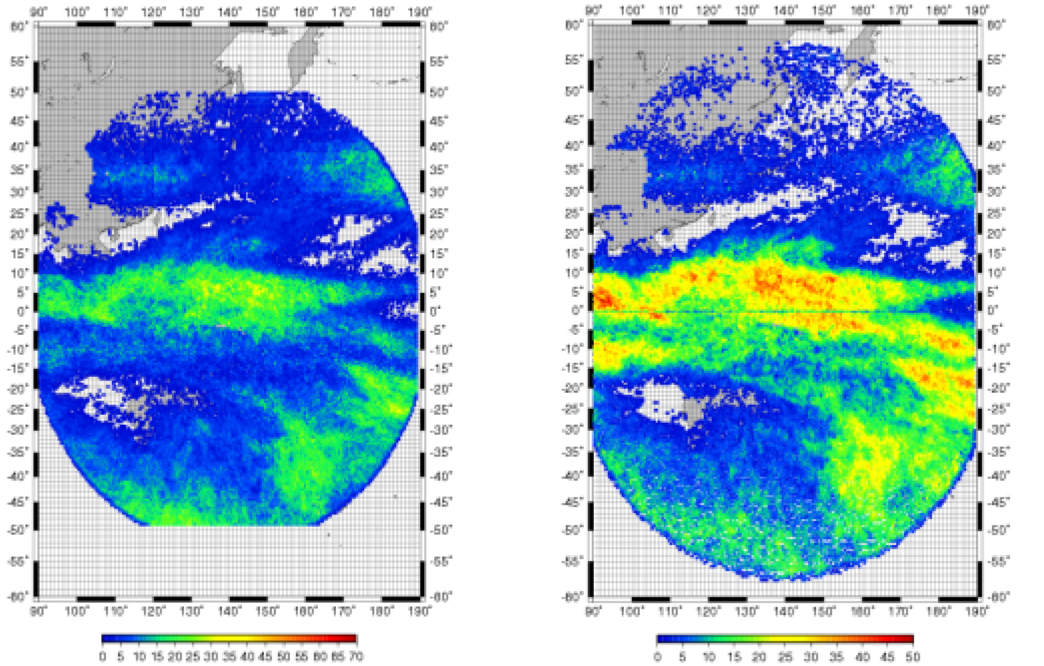

Figure 2: Number of high-level (above 400 hPa) IR AMVs with QI values above 0.85 for January 1996. The images of GMS-5 are used to derive the AMVs. The left and right images show the numbers for the first and second reprocessings, respectively.

BIASes for the first reprocessing | BIASes for the second reprocessing

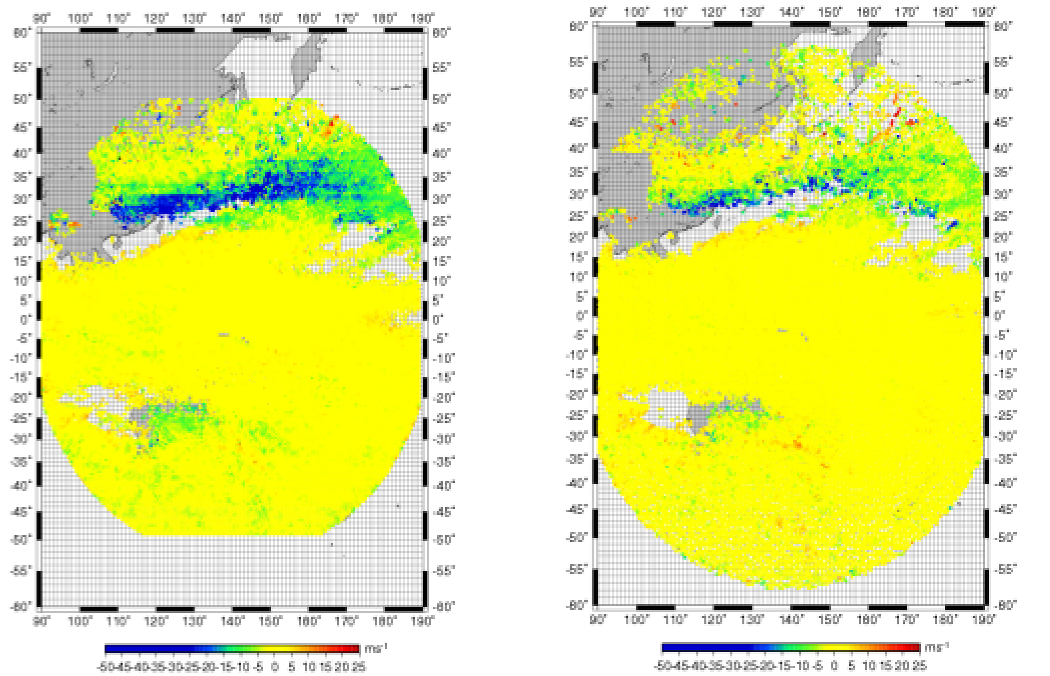

Figure 3: Wind speed bias (BIAS) of high -level (above 400 hPa) IR AMVs with QI values above 0.85 against JRA-25 analysis fields for January 1996. The same images as those shown in Figure 2 are used to derive the AMVs. The left and right images show the BIASes of the first and second reprocessings, respectively.