

**WORLD METEOROLOGICAL ORGANIZATION**

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**GLOBAL SPACE-BASED INTER-CALIBRATION SYSTEM  
EXECUTIVE PANEL**

**FOURTH MEETING**

**GENEVA, SWITZERLAND**

**10 -11 JULY 2008**

**FINAL REPORT**



## 1. INTRODUCTION

Dr. W. Zhang, Director of the Space Programme Office, welcomed the Executive Panel Members and the President of CIMO. Referring to the outcome of the Executive Council regarding the WMO Integrated Observing Systems (WIGOS) he recalled that the WIGOS concept of operations was relying on three levels of integration: instrument standardization, information exchange infrastructure, and product quality assurance. He emphasized the relevance of GSICS in this context.

M. Goldberg, Chairman, underlined the high spirit of collaboration among GSICS members.

## 2. STATUS OF IMPLEMENTATION OF GSICS ACTIVITIES

### a. Overview

The Chair recalled that the main goals for 2008 were:

- To commission the capability to perform routine intercalibration of MTSAT, MSG, GOES and FY2 Infrared Imagers with IASI and AIRS, at JMA, EUMETSAT, NOAA and CMA respectively.
- Generally speaking, to build common capabilities, as a basis for further optimization and scientific and technical improvements.

He concluded that GSICS had already achieved outstanding progress but was still in a building phase. The learning phase had to be pursued since similar capabilities needed to be established at all operational satellite agencies.

GSICS should now be able to demonstrate its utility and be ready to support the R/SSC-CM . GSICS should also strengthen its partnership with the CEOS WG on Calibration/Validation Taking namely into account the Quality Framework for Earth Observation Data being developed by this group.

### b. Report from the GSICS Coordination Centre (GCC)

Following conclusions of the joint GRWG-GDWG meeting in February 2008, a draft roster of potential and current GSICS products and services is under review. This GSICS Products and Services Roster is a list of potential and current GSICS products and services. It is planned to serve as a basis for discussion and decision on precise GSICS deliverables, and as a support to seek input and feedback from users regarding the specification of their needs. The roster will include both a catalogue of what is available and a list of potential additions. Furthermore, a GSICS Procedure for Product Acceptance has been drafted.

The GCC data and information server is being configured. An overhaul is being performed on the GSICS central web site. In agreement with WMO, it is planned to access the website, in future, through the following URL : <http://gsics.wmo.int>, which would point to the central GSICS website hosted by NOAA and to the respective websites of each GPRC.

Outreach activity is pursued through the GSICS Quarterly, a BAMS GSICS article, and presentations at meetings of the scientific community.

### c. Report from EUMETSAT

EUMETSAT recalled the historical roots of GSICS that go back to CGMS 25 in 1997 in St.Petersburg when CGMS members accepted and pursued a first action on a common satellite intercalibration. The presentation then reported on scientific developments that have been

completed on MSG IR intercalibration against IASI and AIRS, as well as MHS for the WV channels.

Preparations were also made for the EUMETSAT GSICS website and the operational GSICS data management.

**d. Report from CMA**

CMA/NSMC submitted a written input confirming its plan to complete FY-2C/2D IR channel intercalibration with IASI and AIRS on a routine basis in 2008 and to make the results available on the CMA GSICS website. Calibration activities are on-going for FY-3A, launched in May 2008 and the results will be shared within the GRWG.

CMA plans to maintain its two Earth-based reference sites for VNIR (on a desert) and TIR (on a lake) respectively with a third one being prepared for MW calibration.

NSMC is considering to provide a back-up system for GSICS data.

**e. Report from JMA**

JMA reported that MTSAT-1R IR intercalibration is routinely performed on an operational basis since July 2. This process includes comparison with AIRS and IASI over a window of 5 days, updated every day. It uses the GRWG agreed collocation algorithm (Ver. 1.2) with scene dependent criteria, including new spectral response compensation method proposed by JMA at the GRWG-III meeting.

Results are available on: <http://mscweb.kishou.go.jp/monitoring/calibration.htm>

The Panel congratulated JMA for this operational implementation and for the completeness of its website that is considered as a useful reference for developing the other GPRC websites.

JMA also mentioned its reprocessing activities in the context of planned that contribution to the RSSC-CM.

**f. Report from CNES**

CNES reported on its experience in Common Nadir Observations (CNO) that extend the SNO concept for LEO/LEO intercomparison with relaxation of the collocation time constraint from 30 sec to 20 min. This allows capturing an average of 6 events per day (20 times more than with strict SNO), and thus applying a more severe constraint on the target spatial uniformity.

CNES prototype software is ready for IASI/AIRS intercomparison including the prediction of SNO/CNO events and extraction of IASI and AIRS measurements.

A method was developed to inter-compare spectra at high spectral resolution (AIRS-like method), and validated against 2000 computed spectra (atmospheric profiles from the TIGR database).

Investigations are on-going towards providing external access to the SADE database.

**g. Report from KMA**

KMA reported on its results of intercomparison of MTSAT with AIRS and IASI, as a preparation for COMS intercalibration and raised the issue of inhomogeneous scenes.

#### **h. Report from NASA**

*NASA was not represented at this meeting.*

#### **i. Report from NIST on pre-launch characterization of instruments**

R: Datla proposed two steps in the approach to pre-launch characterization of instruments, in interaction with NIST/NMI:

- A first step focused on pre-launch activities exclusively, including calibration planning and implementation with feedback on the instruments specifications, subsystem/component characterization, system level calibration and system-in-flight pre-launch validation
- A second step aiming at preparing post-launch sensor performance assessments, including the calibration of the validation sensors and sites, inter-comparison plans in GSICS model with active role of NIST/NMI for SI traceability, plan for component performance reassessments, acquisition of duplicate parts and assemblies like filters, mirror samples, apertures and on-orbit calibration equipment, establishment of Common Reference Values (CRV) and their uncertainty in the time series, algorithms being flexible for recalibration as new data is added in time series.

A National Calibration Center (NCC) is being proposed in the USA, as a virtual organization with core participation from NIST, NOAA and NASA

A report on recommended pre-launch activity will be submitted to CGMS-36 by NOAA. It will include references to GOES-R calibration plans.

### **3. REPORT FROM GRWG AND GDWG**

#### **a. Outcome of GRWG-3 and status of related actions**

Following Executive Panel Guidance, the WGRG strives to:

- Promote the routine generation of collocations at all GPRCs
- Select a protocol of analysis and reporting
- Improve logistics – archive, file and variable name nomenclature, version control, meta data, documentation (with help from GDWG)
- Evaluate IR algorithm accuracy or capability
- Develop a plan for visible channel inter-calibration

The algorithm for GEO-LEO (esp. with AIRS/IASI) was carefully designed (Jan 2007), revised (June 2007), the collocation algorithm was tested with one-day (research mode) and ten-day (operational mode) data, evaluation was completed, the algorithm was then distributed (October 2007) and implemented at some GPRCs. It is supposed to be the baseline algorithm, involving a single pixel, at and off nadir, with no restriction on scene.

- The Panel reaffirmed that it was essential to the GSICS approach to rely on a common baseline algorithm to ensure full intercomparability, and to provide a common benchmark for evaluation of potential improvements.
- The Exec Panel endorsed the hierarchical ATBD structure as presented at EXP-4, with detailed implementation to be finalized by GRWG.

The protocol of analysis and reporting remains a pressing issue. JMA, EUMETSAT, NESDIS are all active in this regard but may need some time for methods to mature and converge. A new proposal is under review.

## b. Outcome of GDWG-2 and status of related actions

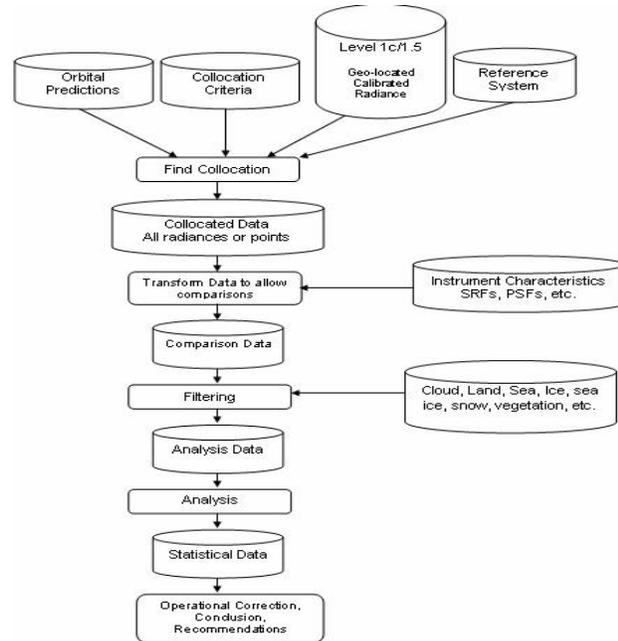
The GDWG agreed a number of recommendations and pursued a number of actions.

In particular it developed a generic data flow diagram as the basis for specifying the breakdown into successive algorithms, the interfaces, and data exchanges. It agreed to use NetCDF4 as a format by default.

The architecture for data processing shall separate the following steps:

- Collocation,
- Transformation (spectral & spatial),
- Filtering,
- Analysis and
- Developing corrections.

All the thresholds and criteria used should be defined at each stage in the baseline, and described in an ATBD.



Further improvements to the processing should be made after comparing results against this baseline in consensus within GSICS.

The GDWG considered the plan for a GSICS data management server that will be implemented by EUMETSAT by December 2008.

A proposal has been circulated for metadata for the EUMETSAT NetCDF data formats to be used on the GSICS data management servers. WMO standards for data formats and naming conventions should be followed. The GSICS Web infrastructure has improved but needs further enhancements.

- GDWG stresses the need to develop an operational schedule of products and to specify the GSICS deliverables in a service specification document.

The GDWG suggested reviewing and possibly updating the Implementation Plan. It proposed convening a User Workshop in 2009.

## 4. STATUS OF DRAFT GSICS SERVICE SPECIFICATION

The GSICS Service Specification will be contained in the GSICS Product and Service Roster described at Item 2.b

It was noted that users to be consulted could include in particular RSSC-CM projects and GCOS (through the GCOS Joint Planning Office).

- The Panel welcomed the draft Roster and agreed to review it in view of adopting a first version at the next meeting.

- It was furthermore agreed to refine the Procedure for Product Acceptance, introducing the concept of product *demonstration status* in advance of product *endorsement* by the Executive Panel. Templates and formats should be defined for product documentation and their archiving. A GSICS Product Oversight Panel could be established.

## 5. RELATIONS WITH OTHER RELEVANT ORGANIZATIONS AND PROJECTS

### a. R/SSC-CM network

The Panel was informed of the outcome of the R/SSC-CM Planning Meeting in April 2008 that had selected 5 topics for initial R/SSC-CM activities:

- AVHRR based data set of cloud and aerosol properties (NOAA , EUMETSAT/CM-SAF)
- SSM/I: total column water vapour, precipitation, liquid water path (EUMETSAT/CM-SAF, NOAA, CMA)
- Surface albedo, clouds and aerosols from geostationary satellites (EUMETSAT, EUMETSAT/CM-SAF, CMA, JMA, NOAA)
- Atmospheric Motion Vectors and Clear Sky Radiance (JMA, CMA, EUMETSAT, NOAA )
- Upper tropospheric humidity (NOAA, CMA, EUMETSAT, EUMETSAT/CM-SAF, JMA)

### b. CEOS WGCV

The Panel was informed of the status of development of a Quality Assurance Framework for Earth Observation data, submitted for peer review.

### c. GRUAN and CIMO

The President of the Commission for Methods of Observation (CIMO), J. Nash, gave a presentation on the status of performances of operational radiosonde measurements. He pointed out that the GCOS Global Reference Upper Air Network (GRUAN) as well as GSICS plans for using in-situ ground-truth measurements from radiosondes would require precise characterization of the performance of radiosondes. The general quality of pressure, temperature and height measurements is currently good; similarly winds are generally of good quality; but relative humidity measurements are still not very accurate, probably hampered by chemical contamination of the Vaisala sensors. The biggest problem is however to ensure adequate network coverage with enough stations operating throughout the year.

It was stressed that the comparison of different upper-air measurements does not only reflect differences in sensor performances but should differentiate various sources of errors including e.g. height assignment and – for passive radiometric sounding – differences in spectroscopy.

He suggested collaboration between GSICS and CIMO experts in that area.

Action was taken to provide comments on the Manual on Operating Practices for GRUAN sites by October 2008 (e.g. recommendation on launch schedules of radiosondes) with the aim to forward consolidated comments to GCOS JPO by end of 2008

## 6. STATUS OF ACTIONS FROM EXP-3

N°	Action	Status
1	NESDIS will inform EUMETSAT of each monthly update of AVHRR solar bands	Done

	coefficients in order to allow EUMETSAT to update the coefficients in its processing at the same time.	
2	The GCC will make software tools available for IASI-AIRS co-location.	Need to put SW tools in repository for GSICS members
3	NOAA (GCC) will support CNES if necessary for AIRS and MODIS data access.	Done
4	CNES will advise GSICS on the instrument to be taken as a reference for Visible channels.	Open (MODIS ? MERIS ? Consider accessibility)
5	GDWG and GRWG will hold short monthly "tag-up" meetings to keep track of the actions and maintain a close coordination among GSICS partners.	Open New Action: V. Gaertner to propose a tool for on-line meetings
6	GCC (F. Weng) will prepare a presentation on absolute calibration for MW channels at GRWG-3.	Open, relevant for GPM, should not consider "absolute" calibration only.
7	M. Goldberg will participate in the GRUAN workshop to be held in Germany on 26-28 February 2008	Completed
8	NOAA to convene GRWG-3 & GDWG-2 in Camp Springs on 19-21/02	Completed

## 7. APPROVAL OF GSICS 2008/2009 OPERATING PLAN

It was agreed to discuss the Operating Plan for 2009 at the next meeting, to be convened during the CGMS-36 time frame in November 2008. However, it was noted that several presentations under item 2 had indicated activities that were proposed or under consideration for 2008/2009. These proposals are summarized in Annex III, and will be an input to the discussion on the Operations Plan.

## 8. SUMMARY OF ACTIONS AND CONCLUSIONS

The following actions were agreed:

N°	Action
	<i>(From the review of Actions from EXP-3):</i> V. Gaertner to propose a tool for on-line meetings
1	R. Datla to circulate to EXP + WG Chairs (via WMO) the draft CEOS WGCV document on data quality assurance
2	J. Lafeuille to include Tim Hewison in GRWG (secondary poc)
3	J. Lafeuille to ask GPRCs to nominate a poc for operational matters
4	WMO (with Ex Panel Chair) to prepare formal report to CGMS on GSICS annual achievements and results
5	M. Goldberg to present at CGMS-36 a WP on CLARREO project
6	J. Lafeuille to report on GSICS at ET-SAT/SUP and : - Seek feedback on GSICS Information, Services & Product Roster - Seek wider participation in GSICS (ISRO, Roshydromet, ESA)

7	All GSICS members invited to review the JMA GSICS website and provide comments to JMA (Yoshihiko Tahara) via Google
8	CNES to further investigate opening SADE access to GSICS partners and feasibility of including additional targets from other regions to support calibration of different GEO satellites
9	R. Datla and WGCV Chair to present at CGMS-36, via NOAA, a Working Paper on pre-launch characterization of sensors
10	GCC to implement operational JMA code for MTSAT-AIRS/IASI, and adapt it to each GEO, in order to serve as GSICS baseline algorithm for comparison/benchmarking purpose
11	All GPRCs to perform operational GEO-LEO intercalibration using possibly an optimized algorithm with respect to the baseline algorithm
12	Executive Panel Members to review the GSICS Implementation Plan and consider the relevance of drafting an update or an additional strategy document (for ExP-5)
13	GDWG and GRWG Chairs to initiate preparation of a GSICS User Workshop in 2009 (e.g. in conjunction with EUM User Conference)
14	GCC to set up bi-monthly teleconference with the GPRCs poc and the 2 WG Chairs (tentatively: 11h00 UTC) no later than Sept.08
15	GSICS Ex Panel Members to provide comments on the Manual on Operating Practices for GRUAN sites by October 2008 (e.g. recommendation on launch schedules of radiosondes) with the aim to forward consolidated comments to GCOS JPO by end of 2008
16	J. Lafeuille to ask GPRCs to nominate poc for product acceptance and inform R. Iacovazzi
17	Detailed implementation of the hierarchical ATBD structure to be finalized by GRWG
18	GCC (R. Iacovazzi) to amend the draft Procedure for Product Acceptance (PPA) introducing the concept of product <i>demonstration status</i> in advance of product <i>endorsement</i> by the Executive Panel.
19	All Executive Panel Members, GRWG and GDWG to review the draft GSICS Information, Services and Product Roster by end of October 08
20	GCC to review the GSICS Product and Services Roster to include: - A priority qualification - Quarterly high-level performance assessment of the GEO-LEO intercalibration (priority) - "Best calibration coefficients"
21	J. Lafeuille to make EXP-4 presentations available on-line at: <a href="http://www.wmo.int/pages/prog/sat/meetings/GSICS-ExecutivePanel-4.html">http://www.wmo.int/pages/prog/sat/meetings/GSICS-ExecutivePanel-4.html</a>
22	Next GSICS Exec. Panel meeting to be held around CGMS-36 in Gran Canaria on 7-8 Nov 2008 . The agenda shall include: - Review of the GSICS Information, Services & Product Roster - Review comments on Manual on Operating Practices for GRUAN - Adoption of 2009 Operating Plan - Review of GSICS Implementation Plan
23	Toshi Kurino will investigate the possibility for JMA to host GRWG4-GDWG3. (Now confirmed: 28-30 January in Tokyo)
24	GRWG4-GDWG3 meeting to be convened (on 28-30 January in Tokyo.)

## Annex I

### PROVISIONAL AGENDA

#### DAY 1

1. Introduction (9h00)
  - Welcome by D/SAT
  - Introduction to the objectives of the meeting
  - Agenda
2. Status of implementation of GSICS activities
  - a. Overview of progress (9h05)
  - b. Report from the GSICS Coordination Centre (GCC) (9h20)
  - c. Report from EUMETSAT (9h40)
  - d. Report from CMA (10h00)
  - e. Report from JMA (10h20)
  - f. Report from CNES (11h00)
  - g. Report from KMA (11h20)
  - h. Report from NASA (11h40)
  - i. Report from NIST on pre-launch characterization of instruments (12h00)
3. Report from GRWG and GDWG
  - a. Outcome of GRWG-3 and status of related actions (14h00)
  - b. Outcome of GDWG-2 and status of related actions (14h30)
  - c. Discussion on the outcome of the WG
4. Status of draft GSICS Service Specification (15h15)
5. Relations with other relevant organizations and projects (16h15)
  - a. R/SSC-CM network
  - b. CEOS WGCV
  - c. GRUAN
  - d. Commission for Instruments and Methods of Observation (CIMO)

#### DAY 2

6. Status of Actions from EXP-3 (9h00)
7. GSICS Operation Plan and Strategy Discussion (9h20- 12:00)
  - a. Status of 2008 activities
  - b. Priorities and expected deliverables for 2008 and 2009
  - c. Planned activities of GCC and all partners
  - d. Discussion on strategic aspects
    - (i) How to ensure homogeneous progress throughout all GSICS components
    - (ii) How to ensure recognition of and support to GSICS
    - (iii) GSICS positioning with respect to GEO and other relevant international initiatives
  - e. Guidance to GRWG and GDWG
8. Approval of GSICS 2008/2009 Operating Plan (13h00- 14h00)
9. Presentation on BAMS Article on GSICS (14h00-14h30)
10. Summary of actions and conclusion (14h30-15h00)

**LIST OF PARTICIPANTS**

Raju Datla (NIST)

Kim Dohyeong (KMA)

Volker Gärtner (EUMETSAT, Chair GDWG)

Mitch Goldberg (NOAA/NESDIS, Chairman)

Robert Iacovazzi (NOAA/NESDIS, GCC)

Toshiyuki Kurino (JMA)

Jerome Lafeuille (WMO, Secretariat)

John Nash (President of CIMO)

Didier Renaut (CNES)

Johannes Schmetz (EUMETSAT)

Xiangqian Wu (NOAA/NESDIS, Chair GRWG)

Wenjian Zhang (WMO)

## ACTIVITIES UNDER CONSIDERATION FOR 2008 / 2009

### CNES:

- Introducing CNES dedicated human and financial support for the continuation of GSICS activities (request made)
- Feasibility study to introduce IASI/AIRS intercomparison activities in the "SADE framework and operational procedures"
- Analysis of IASI/AIRS differences (low spectral resolution "box channel" method) over a few months period
  - o Comparisons with GCC results
  - o Analysis of the impact of scene spatial non-uniformity

### EUMETSAT:

- Establish routine intercomparisons in 2009 using IASI and AIRS as reference (Action all GSICS members)
- Establish a regular monitoring of GSICS work to fulfil operations plan? (led by WMO Space Programme) => Regular reporting of GSICS participants to WMO; twice per year (tbd)? (Action GCC and WMO SP)
- Establish joint research activities for solar calibration (e.g. using deep convective clouds (NASA/Seoul Nat. Univ./KMA/EUMETSAT and others); Action all GSICS members)
- Agree on a general ATBD/processing structure that results in a doable and comparable processing (Action on GRWG)
- Continue to draw on relevant experience from ISCCP and other relevant work (Action on GDWG)
- GCC to issue 'best estimates for instrument calibration' on regular basis (Action on GCC)
- Find 'customers' that produce products from GSICS results => candidates are RSSC-CMs (e.g. Essential Climate Variables, ECVs), ISCCP, CM-SAF ....
- Obvious customer: Our own operational product generation centers (Action: all GSICS members)

### GCC:

- Finalize the Roster and the Procedure for Product Acceptance, and update the documentation on the GSICS central server (GCC) accordingly.
- Improve the presentation of results, with common style/format for graphs and tables from GPRCs.
- Investigate necessary steps to develop the central GSICS web site into a GSICS portal
  
- Implement Procedure for Product Acceptance
  - Create GSCIS Product Oversight Panel
  - Establish GSCIS Product Application Form
  - Establish criteria to be met by GSICS products (data filename formats\*; transfer and storage protocols; quality assurance indicators; etc)

### GDWG:

- An operational schedule of products needs to be developed.
- GSICS deliverables to be outlined in the service specification, under development.
- The GSICS implementation plan defines the roles and activities for the various centres (GCC and GPRCs). It might be useful to crosscheck whether an update is required.
- Participation of more partners in the Data working group would be beneficial.