

PROPOSAL FOR A WORKSHOP ON AN INVENTORY OF THE CALIBRATION OF SATELLITE SENSORS

At CGMS 30 Working Group II on Satellite Products proposed to initiate a workshop wherein an inventory of the calibration of all sensors is established. As the scope of the original proposal appears to be too broad this paper i) proposes to confine the initial work to operational meteorological satellites and ii) outlines a workshop confined in scope.

The paper has been written in response to Action 30.21.

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1 INTRODUCTION

In the discussion of Working Group II on Satellite Products at the 30th meeting of CGMS in Bangalore the rapporteur of the ITWG noted that the TOVS dataset would soon span 25 years and would benefit from a complete audit trail of all TOVS calibration issues and their resolutions. Similar length of data records are obtained for geostationary satellite observations. WG II identified a need to develop an official international mechanism for reporting and acting on past calibration issues. It was felt that currently there is no systematic approach toward this end. Thus WG II recommended the following actions:

ACTION 30.21

CGMS should initiate a workshop wherein an inventory of the calibration of all sensors is established (including sensor performance over time, sensor operation, calibration algorithm adjustment, sensor to sensor intercomparisons, collocated radiosonde observations etc.). Moreover, this workshop should help space agencies to make plans to deploy such methods in current and planned operational systems.

ACTION 30.22

Space agencies are invited to report at the next CGMS on their approaches to produce satellite data for climate purposes.

2 RE-CALIBRATION OF METEOSAT OBSERVATIONS AT EUMETSAT

Meteosat IR (infrared window: 10.5 - 12.5 μm), WV (water vapour: 5.7 –7.3 μm) and VIS (visible: 0.4 – 1 μm) channel observations are being re-calibrated in the context of support to ECMWF's ERA-40 project and a development of a multiyear surface albedo data set, respectively.

2.1 RE-CALIBRATION OF IR AND WV CHANNELS

EUMETSAT supports the ECMWF reanalysis project ERA-40 by re-processing satellite image data from Meteosat-2 and Meteosat-3 using today's algorithms including the advances to the processing that have been made over the years. The initiative is mainly justified through the improved Atmospheric Motion Vector (AMV) fields that can be obtained with the most recent AMV algorithm. Gustafsson et al. (2002) report a vastly increased number of AMVs and a better quality of the reprocessed AMVs resulting in a positive forecast impact in the Northern and, more evidently, in the Southern hemisphere.

It was recognised that the quality and consistency of the IR and WV calibration of earlier Meteosat images had potential for improvement, especially for the WV channel. Consequently both the IR and WV channels are re-calibrated using the vicarious method based on radiative transfer calculations (Schmetz, 1986) and ancillary data. This included all the improvements made to the WV channel calibration as described by van de Berg et al. (1995). Gustafsson et al. (2002) report a more stable IR calibration with differences to the earlier operational calibration of up to 3%. The reprocessed WV calibration shows a much higher variability due to the use of radiosondes in the radiative transfer calculations. The earlier operational calibration was more stable due to a filtering of the calibration that introduced changes only once those exceeded a certain threshold. The apparent (not real) variability suggests that further improvements to the WV calibration are possible.

2.2 RE-CALIBRATION OF VIS CHANNEL

The calibration of the VIS band relies on calculated radiances over bright desert sites whereas clear ocean targets are used for consistency checks. Calibration errors are estimated accounting for the uncertainties of both the sensor spectral response characterisation and targets property description. This algorithm has been used to systematically calibrate Meteosat-5 and -7 observations. Results show that it is possible to calibrate the VIS band with an estimated accuracy of 5% when the sensor response is accurately characterised and to monitor the sensor long-term drift (Govaerts and Clerici, 2003).

2.3 CGMS WORKSHOP ON 'RE-ANALYSIS OF CALIBRATION OF OPERATIONAL METEOROLOGICAL SATELLITES'

Working Group II is invited to consider the following proposal by EUMETSAT:

- a) A workshop should be conducted with the goal to document current and previous operational calibration practices for passive meteorological satellite sensors in the solar, infrared and microwave region
- b) The inventory should include polar and geostationary satellites
- c) The inventory should include all relevant data characterising the instruments (e.g. spectral response functions)
- d) The inventory should draw on existing documentation of the operational calibration and provide a perspective for improvements and re-processing needed to meet climate requirements (if possible).
- e) An attempt should be made to document independent validation work (e.g. calibration campaigns and monitoring of operational calibration)
- f) The workshop should be limited to experts nominated by the satellite operators and a few invited experts (15 – 20 participants)

The realisation of the workshop (when and where) should be discussed during the session of WG II at CGMS 31.

3 CONCLUDING REMARK

WG II is invited to comment on the re-calibration work currently conducted at EUMETSAT in support of:

- i) the ECMWF ERA-40 project
- ii) the development of a multiyear surface albedo data set from Meteosat.

Furthermore WG II is requested to discuss the conduct of a ‘Workshop on an Inventory of the Calibration of Satellite Sensors’ as outlined in section 3.

4 REFERENCES

- Govaerts, Y.M., and Clerici, M. (2003) Evaluation of radiative transfer simulations over bright desert calibration sites, *IEEE Transactions on Geoscience and remote sensing*, in print.
- Gustafsson, J., L. van de Berg, F. Roveda and A. Yildirim, 2002: Reprocessing of atmospheric motion vectors from Meteosat image data. Proceedings of the 6th International Winds Workshop, Madison, WI, 7 – 10 May 2002, p. 53 – 62.
- Schmetz, J., 1986: An atmospheric-correction scheme for operational application to METEOSAT infrared measurements. *European Space Agency Journal*, 10, 145 – 159
- van de Berg, L., J. Schmetz and J. Whitlock, 1995: On the calibration of the Meteosat water vapour channel, *Journal of Geophysical Research*, 100, D10, 21069 - 21076