

2.4 ADVANCED SOUNDERS

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2.4.1 Introduction

This working group focuses on scientific issues affecting the optimal performance of advanced satellite sounder systems. The working group reviews the status of the development of advanced sounder systems and recommends changes pertaining to instrument specification, performance, data processing, and utilisation. For the purpose of this group, “Advanced Sounders” are defined as instruments that present significant new scientific and technological challenges and which require new methods for data processing and utilization. Thus, Advanced Sounders currently include high spectral/spatial resolution infrared and microwave sounders and active sensors.

2.4.2. Geostationary Advanced Infrared Sounders

The group notes the anticipated 2014 launch of GIFTS/STORM and recognises this as an opportunity to gain experience with geostationary hyperspectral infrared products (and in particular vector winds) in advance of the launch of MTG-IRS in 2018.

Recommendation AS-1 for space agencies and NWP centers

To support the use of hyperspectral geostationary imager products, such as GIFTS/STORM data, for research and development of hyperspectral infrared geostationary sounder products in advance of operational instruments (e.g., MTG-IRS).

Action AS-1

For David Crain to publicise information on data availability of the GIFTS/STORM to Advanced Sounder Working group to encourage early use of these radiances.

Research Community Needs

The group noted the work being pursued at the Keck Institute at Caltech/JPL to collate observing requirements from the research community and in particular those interested in investigation of atmospheric processes. Initial indications from this community indicate that they would like improved observation of the boundary layer; diurnal cycle and hydrological cycle with very high spatial resolution and global coverage. In order to communicate these requirements to the instrument community these requirements need to be refined, preferably using the three level EUMETSAT system which defines a “threshold” level (below which the measurement does not add value); “breakthrough” (which will make a significant difference to the desired goal) ; and “goal” (above which all further increases in measurement accuracy add no further value). The World Climate Research Program (WCRP) maintains a database of requirements at WMO related to observations pertinent to the observation of atmospheric processes, and this should be the starting point for further work. It is also recognised that it is not just the instruments themselves but algorithm development that is required to deliver further measurement improvements.

Action AS-2

Brian Kahn, starting from the existing WMO database containing the requirements of the World Climatological Research Program (WCRP), to survey the science community for their observational needs with respect to climate related processes and report back to the group.

Field of View Size

The group has noted that the field-of-view size for the post-EPS IASI has now been fixed at 15km. While recognising that this is a fixed specification for post-EPS, the group considers it worthwhile to continue to review the specification of this type of instrument for the benefit of other space agencies. The group recognises the trade off between field-of-view size, spectral resolution and instrument noise and encourages further investigation bearing in mind continuing scientific and technology advances. In particular, scientific advances include taking into account how clouds will be used in future retrieval and analysis systems and the effect of using noise reduction techniques (e.g., principal component analysis), particularly in the field of trace gas retrieval. Technology advances include large focal plane array technology which enables simultaneous measurements of large spatial domains with high spatial resolution and with enhanced S/N resulting from increased measurement dwell time.

Recommendation AS-2 to the research community

review trade-off studies used to determine spectral, spatial and noise tradeoffs for determining operational advanced infrared sounder specifications with reference to optimal field of view for cloud avoidance and the use of noise reduction processing techniques and/or new detector array technology.

Recommendation AS-3 to the research community

explore the possibility of setting up a community science working group to explore these issues.

Action AS-3

Andrew Collard to initiate discussion on how to proceed with these recommendations.

Recognising the Risk to Conical Scanners

The group recognises the important role of conically scanning sounders for environmental monitoring and NWP and is concerned by the possibility that these instruments will disappear from the Global Observing System, or at least be reduced in number, after the launch of DMSP-20.

Recommendation AS-4 to space agencies

To ensure the continuation of capability for conically scanning instruments in the post DMSP era. All future such instruments should be designed with particular attention to calibration accuracy and stability.

Action AS-4

ITWG Co-Chairs to present the concern of this group to CGMS.

Continued Development of Geostationary Microwave Sounders

The group noted that a microwave sounding from geostationary orbit has potential benefits to environmental monitoring and NWP and encourages the continued development of practical technological approaches for achieving this measurement capability.

Recommendation AS-5

In concert with the continued development of IR geo sounders, we recommend the further advancement of geostationary microwave sounders.

Documentation of Desired Attributes for Infrared and Microwave Sounders

It was noted that it is of benefit to those involved in designing new instruments to be able to consult information on the current suite of satellite instruments including information on the utility of the various spectral regions. A simplified table based on the WMO Global Observing System Dossier is considered to be ideal for this purpose. This document should be reviewed regularly.

Action AS-5

David Crain and Steve English to take the WMO Global Observing System Dossier on current operational systems and produce a simplified table for the Advanced Sounder Working Group report by September 2010.

Action AS-6

Advanced sounder working group to critically review the document produced above.