

# ADVANCED SOUNDERS

Web site: <http://cimss.ssec.wisc.edu/itwg/aswg/>

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The ASWG expressed the following concerns and general recommendations:

- ***Improved Utilization By Forecasting Centers:*** NWP centers should make it a priority to develop the means to assimilate the majority of IR hyperspectral sounding radiance data available in order to obtain further improvements in forecast skill.
- ***Absolute accuracy amongst all detectors within the instrument Field of Regard (FOR):*** Priority should be given to maintain better than 50 mK equivalent brightness temperature calibration match of all sounder FOV radiances over the full brightness temperature measurement range.
- ***Intersatellite Instrument Cross-calibration:*** The evolution of current sounding systems toward climate class measurement uncertainties should be a priority in the development of future hyperspectral IR sounders. This can be achieved with modest incremental cost of existing systems.
- ***Spectral Gaps:*** Augmenting spectral coverage in the gaps between existing bands of future CrIS instruments can be achieved at a very modest cost. This augmentation can be accomplished without detriment to the existing JPSS mission. Consequently, evolving CrIS into a full spectral coverage instrument should be pursued in order to support a worldwide intersatellite calibration capability in the wavenumber range  $650 - 2760 \text{ cm}^{-1}$ . This recommendation should be simultaneously coupled with technology insertion to support SI traceable climate class radiance measurements.

- ***Instrument Horizontal Resolution:*** CrIS currently has high signal to noise ratio margin relative to what is needed for EDR production. Reduction of CrIS FOV size should be pursued on future systems given the current system SNR margin. This will yield significantly more high quality cloud free retrievals. The reduction of FOV size is also expected to improve cloud cleared radiances as a result of increasing the contrast between cloudy and clear FOVs.
- ***Hyperspectral IR Sounding at GEO Orbit:*** The ASWG recommends that a pathfinder hyperspectral IR sounder mission targeting moisture cell tracking and 3D wind vector generation at geo orbit should become an applied research priority and demonstrated on-orbit by 2020.
- ***Complimentarity of GEO and LEO Hyperspectral IR Sounders for 3D Winds:*** Thus, the ASWG recommends that both types of systems should be pursued and developed for improved weather forecasting.
- ***Increasing FOV Number Within Existing IR Sounder FORs:*** Consequently, increasing the CrIS FOV number beyond 6 x 6 should be pursued as a lower priority since the cost penalty also extends to data rate and ground processing resources. In any case, recommendations 1 & 2 in the above listed above must be resolved first before any benefit can be obtained by increasing FOV density further.

## **Recommendation AS-1 to Space Agencies.**

**Consider the following priorities for the development/improvement of the next generation of advanced infrared sounders:**

The prioritized recommendation lists from the highest are

1. High spatial resolution to improve the probability of a uniform scene with the instrument FOV (i.e., all clear or all cloudy)\*.
2. Spectral coverage from shortwave to longwave without gaps – to facilitate improved inter-satellite instrument cross-calibration
3. Adopt/adapt calibration approaches traceable to international standards – to improve absolute radiometric calibration in order to achieve measurements closer to climate quality.

\*Although maintaining FOV contiguity is also desired in order to increase the spatial density of the data and associated probability of obtaining clear FOVs within the instruments Field of Regard (FOR), increasing the spatial resolution alone would provide significant improvements in both radiance data assimilation and sounding retrieval.

## **Action AS-1 to ITWG Co-Chairs:**

**Bring this recommendation to the attention of Space Agencies at CGMS.**

In order to support these recommendations, it is also necessary to coordinate NWP centers to generate high resolution (1-3 km) nature runs to support OSSE to demonstrate the NWP benefits of these measurement improvements. Request satellite agencies to continue to support and accelerate advanced sounder IFOV size OSSE studies

**Recommendation AS-2 to Space Agencies.**

**Coordinate with NWP Centers the generation of high resolution (1-3 km) nature runs.**

**Action AS-2 to ITWG Co-Chairs:**

**Convey this recommendation to Space Agencies.**

## **Recommendation AS-3 to Space Agencies (NOAA):**

**Support further developments towards performing cluster analysis on imager pixels within advanced IR sounder field-of-views and providing statistical information of the collocated imager radiances as part of the sounder radiance observations.**

**(The ASWG recommends that satellite agencies adopt the IASI/AVHRR MAIA approach to co-locate CrIS/VIIRS observations and provide radiance cluster and other analysis information in the CrIS SDR file.)**

## **Action AS-3 to ITWG Co-Chairs:**

**Convey this recommendation to Space Agencies (and NOAA in particular).**

**Recommendation AS-4 to NOAA:**

**Future JPSS instrument enhancements should consider adding 118 GHz O2 band to the baseline design to advance the microwave sounding capability in severe storm conditions.**

**Action AS-4 to Mitch Goldberg:**

**Convey this recommendation to NOAA.**

## **Recommendation AS-5 to Space Agencies and Users:**

**Establish a dialogue between providers and users of microwave soundings on the potential and capabilities of bolometer technology at 90 GHz and beyond.**

### **Action AS-5**

**Steve English to act as the interface and provide related documentation.**



**Recommendation AS-6 to Space Agencies:  
Maintain and evolve the current microwave  
sounding capabilities for future systems.**

**Recommendation AS-7 to Space Agencies:  
Maintain and evolve the capability of microwave  
mesospheric sounding capabilities beyond  
SSMIS.**

**Action AS-6**

**ITWG Co-chairs to relay these recommendations to  
Space Agencies via CGMS.**

**Recommendation AS-8 to Space Agencies:  
Conduct Studies to pursue high temporal  
hyperspectral microwave sounding  
capabilities for future systems.**

**Action AS-7**

**ITWG Co-chairs to relay this recommendation  
to Space Agencies via CGMS.**

**Recommendation AS-9 to NASA:  
To implement the PATH mission.**

**Action AS-8**

**ITWG Co-chairs to bring this recommendation to the attention of  
NASA.**

**Recommendation AS-10 to Space Agencies:**

**To pursue further development and implementation of microwave  
sounding missions in order to achieve global coverage of  
geostationary microwave sounding.**

**Action AS-9**

**ITWG Co-chairs to relay these recommendations to Space Agencies  
via CGMS.**

**Recommendation AS-11 to space agencies**  
**Develop, test, and implement an SI Traceable radiometric standard in space as soon as feasible.**

**Action AS-10**

**ITWG Co-chairs to re-iterate this recommendation to Space Agencies via CGMS.**

## **Recommendation to Space Agencies:**

Re-establish regular dedicated radio-sondes at one of the ARM TWP sites, or at a comparable tropical site (e.g., PMRF).

### **Action AS-11**

**ITWG Co-chairs to relay this recommendation to Space Agencies/Providers.**