**MEMORANDUM FOR:** The Record

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**SUBJECT:** CrIMSS EDR beta status

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The successful launch of the Suomi National Polar-orbiting Partnership (SNPP) Spacecraft on 28 October 2011 with the Cross-Track Infrared Sounder (CrIS) and Advanced Technology Microwave Sounder (ATMS) provides continuity of capabilities for operational environmental remote sounding for weather, climate, and other environmental applications. CrIS succeeds the NASA AIRS and EUMETSAT IASI with 1305 spectral channels covering wavelengths from 4 to 15 m. ATMS succeeds the NOAA AMSU-A and AMSU-B (or MHS) and provides 22 channels covering 20-183 GHz. Together these instruments provide data for the production of the Cross-Track Infrared Microwave Sounding Suite (CrIMSS) EDRs; the Atmospheric Vertical Temperature Profile (AVTP), the Atmospheric Verical Moisture Profile (AVMP) and the Atmospheric Vertical Pressure Profile (AVPP) as well as a number of IPs. The lower troposphere components of AVTP and AVMP are KPPs.

The CrIMSS algorithm utilizes all of the radiances from CrIS and ATMS within a CrIS field-of-regard (FOR) to produce a single sounding of the AVTP, AVMP. The FOR is derived from ~25 ATMS fields-of-view (FOV) that are optimally averaged along with an optimal spatial combination of the 9 CrIS FOVs (called cloud clearing). AVPP is derived from geopotential height computed from AVTP and AVMP. The CrIMSS EDRs are heavily dependent on the upstream SDRs as well as empirically derived bias corrections with respect to the CrIMSS forward model (called the Optimal Spectral Sampling or OSS model). As calibration of the CrIS or ATMS SDRs improves, so does the quality of the CrIMSS EDR. The ATMS and CrIS SDRs achieved beta status in February and April 2012, respectively.

We have evaluated the CrIMSS EDR with 3 focus days: Nov. 11, 2011, Feb. 24-25, 2012, and May 15, 2012 as well as other samples of data in May. The ATMS-only EDR was evaluated using Feb. 24, 2012 focus day using out Off-line version of the CrIMSS EDR (herein “Off-line-EDR”). The Off-line-EDR code allows us to evaluate the functionality of the CrIMSS EDR (it is a copy of the IDPS version that runs on LINUx) and it allows us to process a large volume of data in various configurations; however, it is not guaranteed to be identical to the IDPS CrIMSS products. The majority of the CrIMSS EDR evaluation has been done on ATMS and CrIS products after April 2012. Preliminary results from the Off-line-EDR have been presented at AMS and IGARSS and show that the CrIMSS EDR is functioning very well, if optimization is done. The IDPS-EDR is currently in a sub-optimum and certain optimization changes have been requested for implementation.

Beta quality is defined as:

* Early release product
* Initial calibration applied
* Minimally validated and may still contain significant errors (additional changes are expected)
* Available to allow users to gain familiarity with data formats and parameters
* Product is not appropriate as the basis for quantitative scientific publications, studies and applications

This beta justification is based on the current operational IDPS EDR products that are on the 22 AVMP layers and 42 AVTP layers. Even without optimization we feel that the CrIMSS IDPS-EDR products should be made publically available given that they are reasonably accurate and robust and we feel that it is appropriate for users to gain experience with data formats and parameters.

The Board recommends that users be informed of the following product information and characteristics when evaluating the CrIMSS EDR:

1. The ATMS SDR does not have scan angle dependent (also known as side-lobe) bias corrections. When the ATMS SDR does provide these corrections there will always be a residual bias between observed radiances and those computed from a forward model. In the case of the CrIMSS EDR this forward model is the Optimal Spectral Sampling (OSS). Thus, at this time, there is a scan dependent bias (~ 1K) of the CrIMSS EDR products. This bias is particularly evident in AVTP at ~300 hPa. A code and LUT installation has been requested for Mx6.3 (DR 4325, 474-CCR-12-472).
2. The CrIMSS EDR also requires a bias correction for the CrIS radiances with respect to OSS. This has been implements in the CrIMSS EDR; however, the look-up-table (LUT) was derived from pre-launch proxy data. This contributes to the biases seen in AVTP and AVMP; however, it does not appear to result in regional or scan dependent biases. A new LUT has been created and installation has been requested for Mx6.3 (DR 4334, 474-CCR-12-475).
3. The CrIMSS EDR has a pre-launch emissivity climatology that is sub-optimal. We have seen that this, coupled with the ATMS and CrIS bias correction, leads to a very low yield of accepted cases (most cases are rejected due to high values of chi^2) near coastlines and over land. A new LUT has been created and requested for installation in Mx6.3. (DR 4335, 474-CCR-12-495).
4. The CrIS and ATMS noise estimate files have not been updated from pre-launch values. In addition, the forward model error estimates are also based on pre-launch simulations and proxy data and they need to be updated. These files affect the convergence criteria in cloud clearing, stratification, and the retrieval steps. Optimization of these would increase the yield and improve the performance. This will be addressed in the provisional product.
5. An error was found in the stratification routine for warm ocean. The current test uses the retrieved value of surface temperature and emissivity (in microwave-only stage 1) to select covariance matrices for cold or warm ocean. The logic needs to be changed from (Tskin > threshold .or. emissivity > 0.1) to (Tskin > threshold .and. emissivity > 0.1). Changing this improves retrievals over warm ocean. This will be addressed in the provisional product.
6. Precipitation flag is using an out of date code and AMSU coefficients (DR 4068 and 4079). Preliminary analysis shows this flag is functioning but has a large number of false positives and false negatives. This will be addressed in the provisional product.
7. Daytime yield of the microwave-infrared CRiMSS retrieval has a significantly lower yield. This has been tracked to a software error in the indexing of non-LTE sensitive channels. This will be addressed in the provisional product.

Point of Contact

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