Initial Analysis of CrIMSS Software and Data

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Data Sets Available from Sounder PEATE

- **Only to NPP Science Team members**
- **All CrIMSS related RDR, TDR, SDR, EDR and IP are archived at the Sounder PEATE**
  - 8 minute aggregated xDRs
  - IPs are not aggregated (GRAVITE issue)
- **Various Radiative Transfer Profile version 3 (RTP3) files**
  - SNOs (CrIS-AIRS, CrIS-IASI, AIRS-IASI, ATMS-AMSU) with or without ECMWF analysis, with or without calculated radiances
  - Cal Subset (AIRS, IASI, CrIS) [Aumann]
  - Ra Obs matchup (to be implemented in blue)
  - Reformatted EDRs and IPs (MW only as well as IR+MW)
- **Level 3 files in NetCDF4 format**
  - Temperature and water vapor profiles
  - Skin temperatures, total precipitable water vapor, and total ozone burden
- **Rain rate [Blackwell]**
- **AIRS like retrieval from CrIS and ATMS SDRs[Susskind]**

IDP Software Versions (1)

- **Mx5.0 (I1.05.00) – November 2011**
  - Launch ready version
  - Issue with ATMS sidelobe correction (SDR invalid)
- **Mx5.1 (I1.05.01) – December 9, 2012**
  - Zero sidelobe correction
- **Mx5.2 (I1.05.02) – February 1, 2012**
  - Issue with CrIS geolocation (-9999s) which made Remapped ATMS SDR and hence EDR invalid
- **Mx5.3 (I1.05.02) - April 2, 2012**
  - CrIS geolocation issue fixed
  - CrIS/ATMS SDR declared beta maturity
  - New ATMS OSS table with measured SRF
  - IR tuning
  - New covariance matrix with new MW spectral emissivity
  - Still no MW tuning, rejecting most IR+MW retrievals

IDP Software Versions (2)

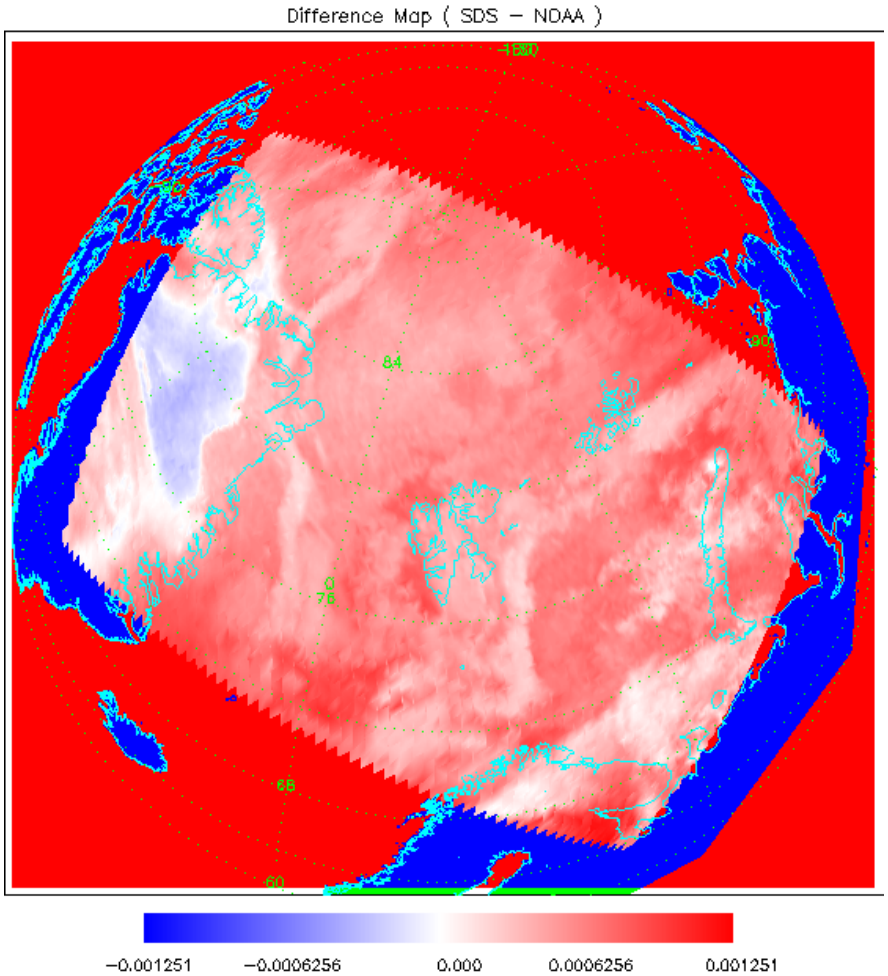
- **Mx6.2 (I1.06.02) – August 9, 2012**
  - Main branch merged with Mx5.3 branch
  - Many CrIS/ATMS quality flag related issues are fixed
  - Not much change in CrIMSS EDR
- **Mx6.3 and Mx6.4 (no difference for CrIMSS) – October 15 2012**
  - CrIS/ATMS SDR to be provisional maturity
  - Initial ATMS bias tuning implementation
  - Known Issues
    - Still issues with not using none-LTE channels during daytime
    - IR Noise Amplification Factor uninitialized
    - Issue with surface pressure, P_{surf} > 1100 mb
      - Indicates issues with surface elevation map
- **CrIMSS Cal/Val team is shooting for making EDR provisional maturity by Mx7.0, due to be released in early 2013**

Issues with Mx6.2 RPM

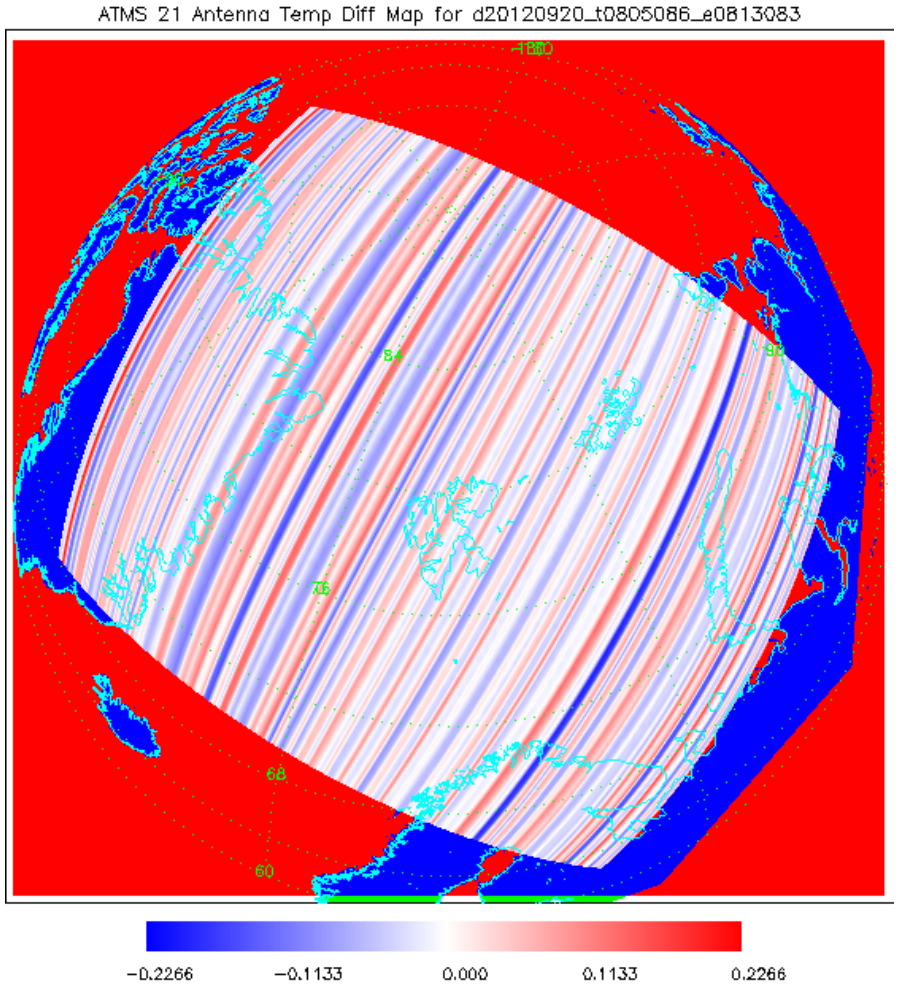
- **The mini-IDPS at SDS is in the process of installing and testing Mx6.2**
- Sounder PEATE volunteered to compare SDS output with operational data products
- CrIS differences are about one mili-Kelvin, possibly due to CMO differences
- ATMS differences are on the order of two tenths of a Kelvin, possibly due differences in ATMS-SDR-AC file
  - The Mx6.2 RPM has copies of old LUTs and AUXs
  - Working with Wael Ibrahim of Raytheon to get a copy of updated files
- EDR products have not been compared

Issues with Mx6.2 RPM (2)

Difference Map



CrIS 1231.25 cm^{-1} Channel



ATMS channel 21

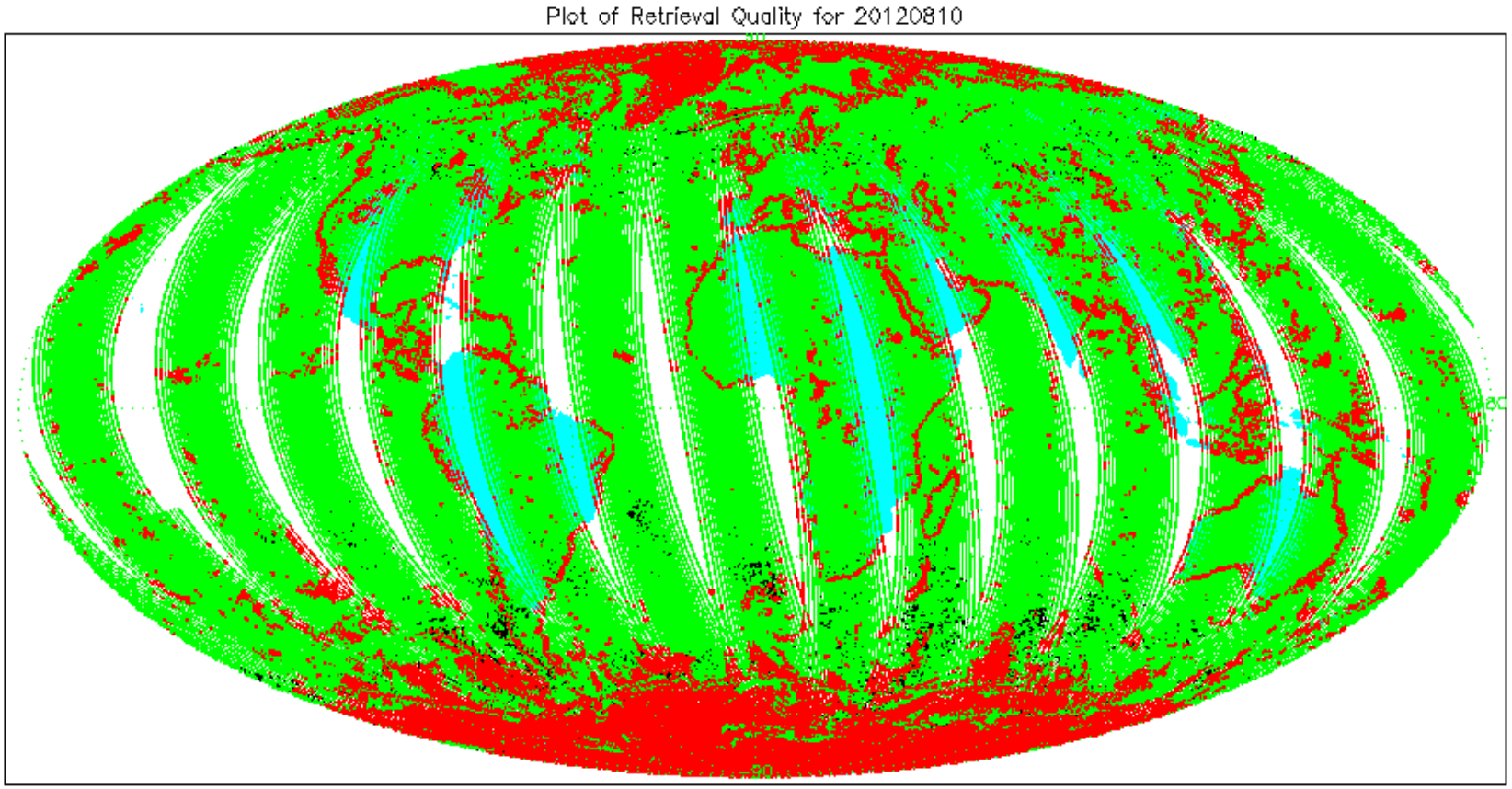
Issues with Aggregated files

- **IDPS processes all the data as soon as practical**
  - Even when all necessary packets are downloaded
  - Missing packets cause much of data anomalies

- **The granules are reprocessed, or repaired, when additional packets become available**
  - Under normal circumstances, his happens mostly in the downlink boundaries, over northern high latitude area
  - But previously downloaded packets in neighboring granules, but in the calibration window, are not used

- **Sounder PEATE currently ignores all unaggregated xDR data products, which are almost all repaired granules.**

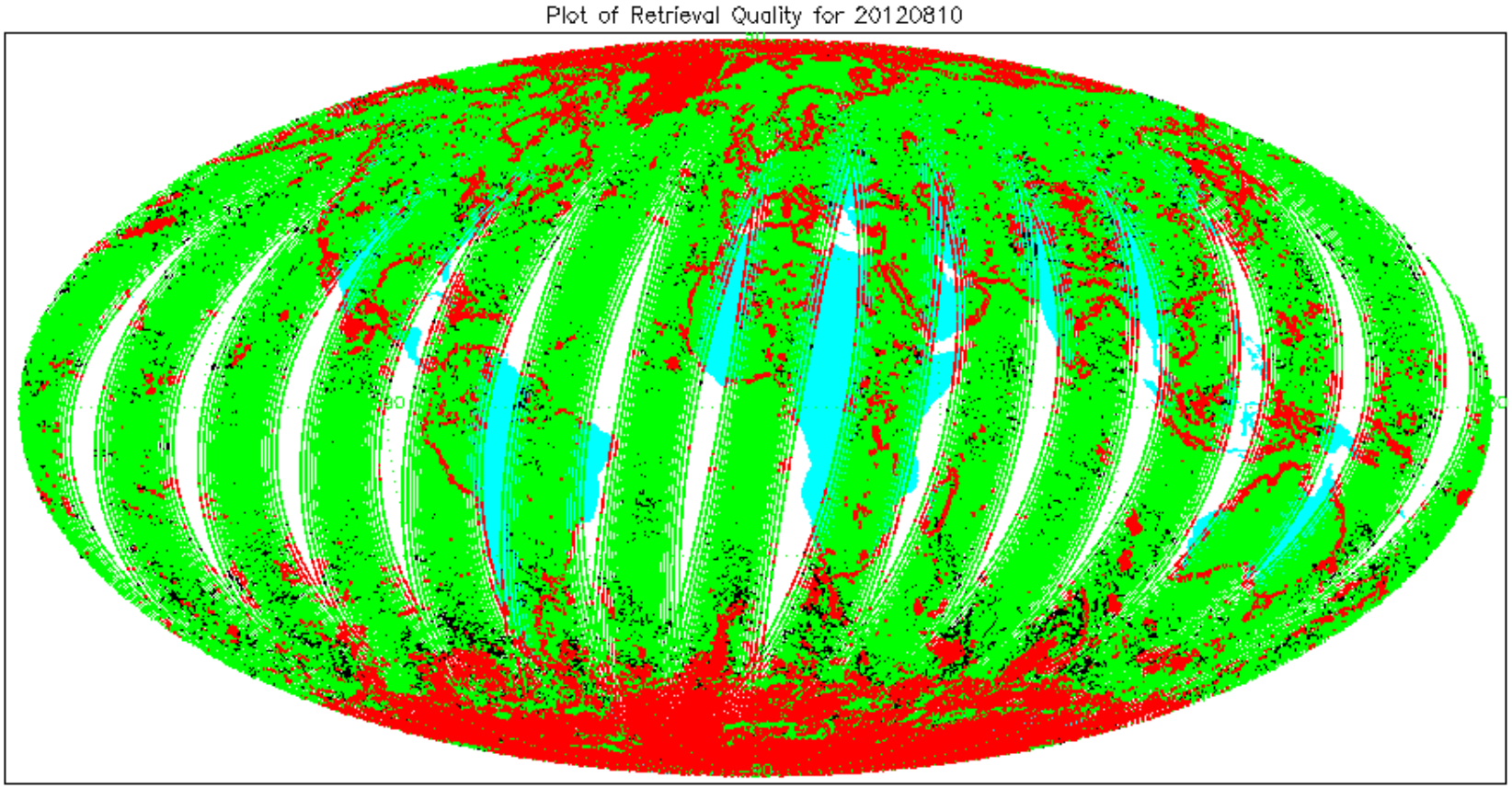
Map of Retrieval Quality for Mx6.2 (Day)



Black(HighQ), Blue(LowIR), Green(LowMW), Red(Poor)

- **Most IR+MW retrievals are rejected due to lack of MW tuning and non-LTE channels**

Map of Retrieval Quality for Mx6.2 (Night)



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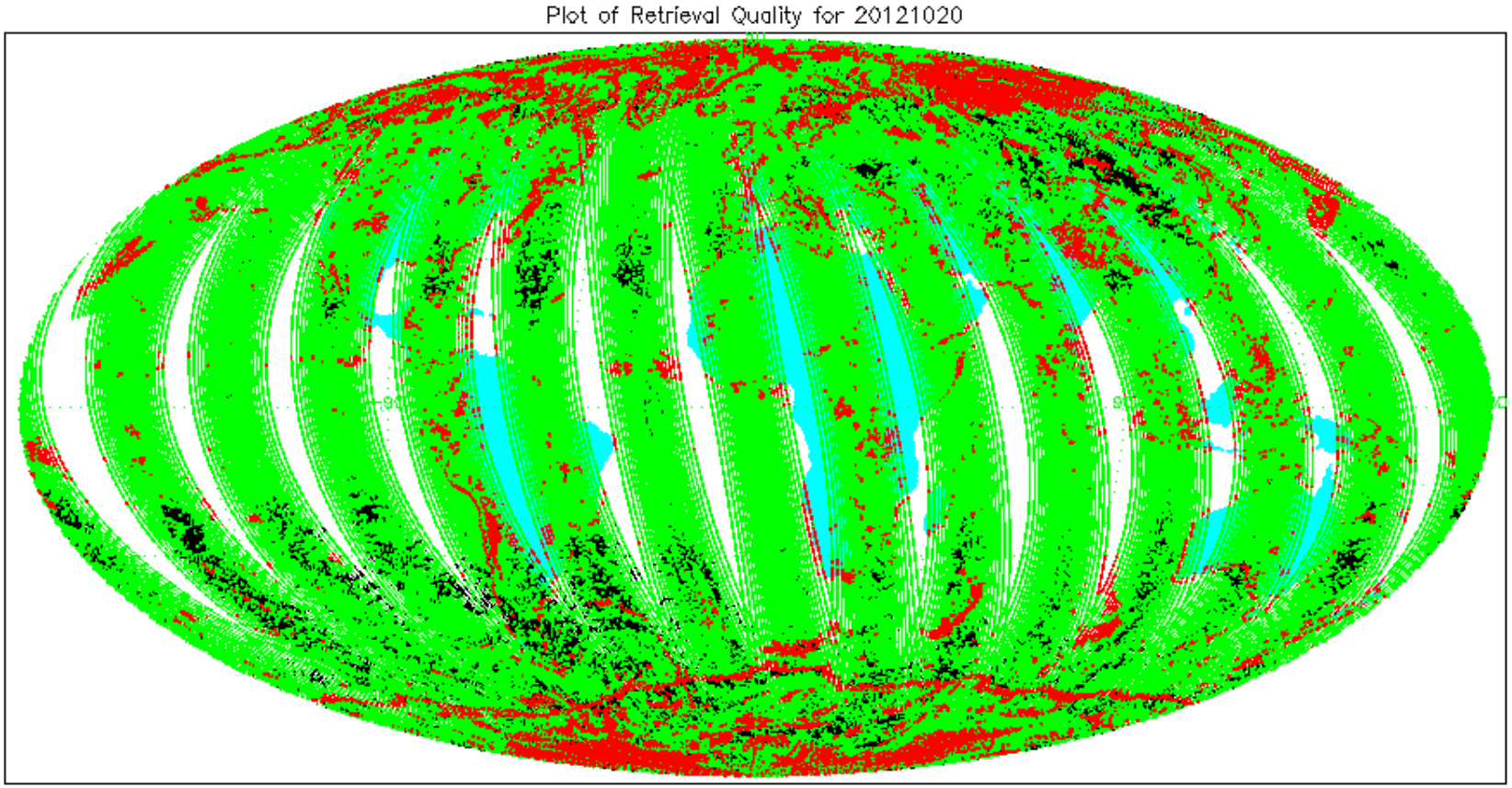
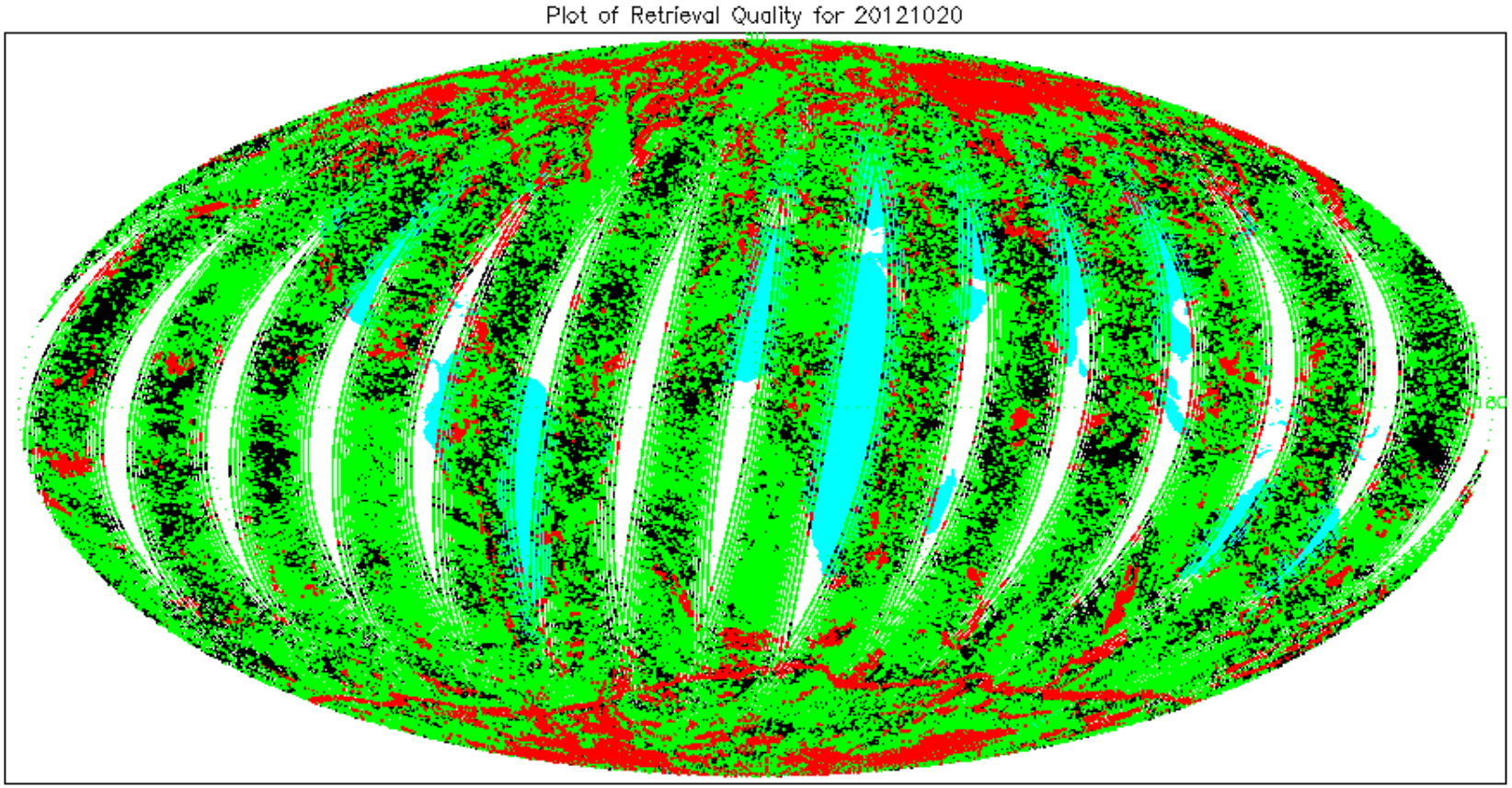
Map of Retrieval Quality for Mx6.3 (Day)



Black(HighQ), Blue(LowIR), Green(LowMW), Red(Poor)

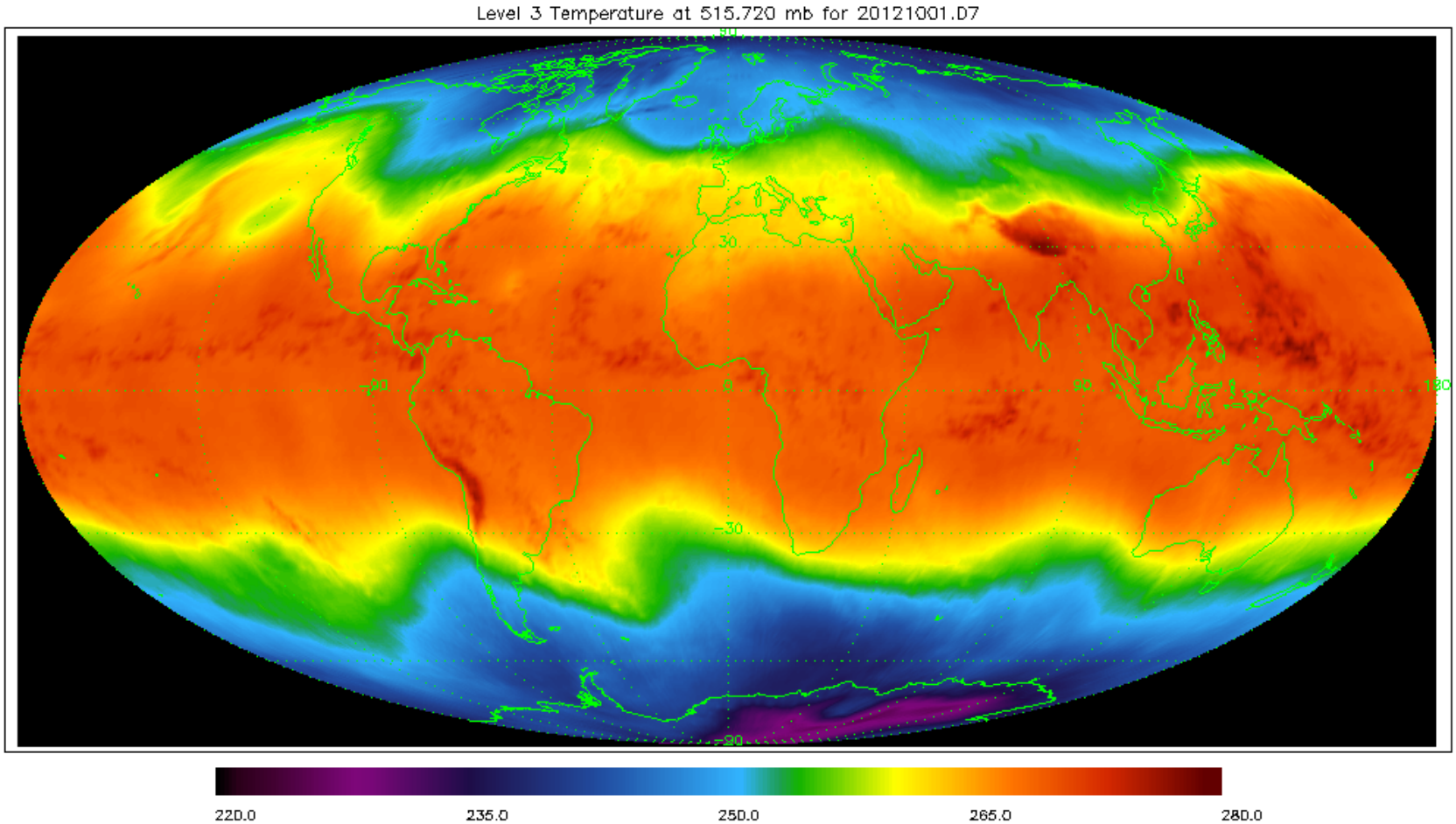
- **Some accepted IR+MW retrievals, but still daytime yield is lower with issues with non-LTE channels**

Map of Retrieval Quality for Mx6.3 (Night)



- **Some accepted IR+MW retrievals, but still daytime yield is lower with issues with non-LTE channels**

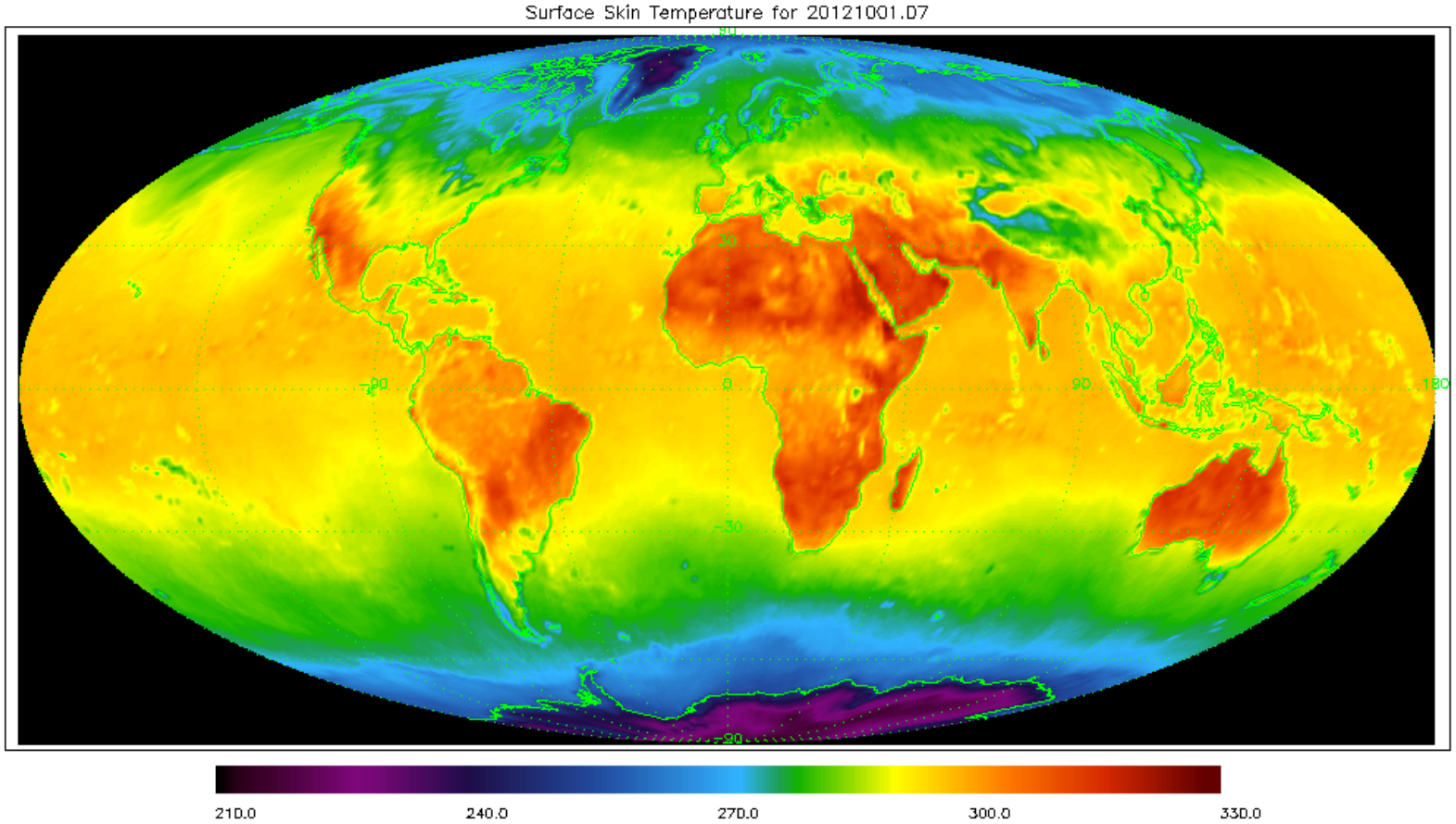
Map of Level 3 Temperature



515 mb temperature (7 day mean)

Map of Level 3 Water Vapor

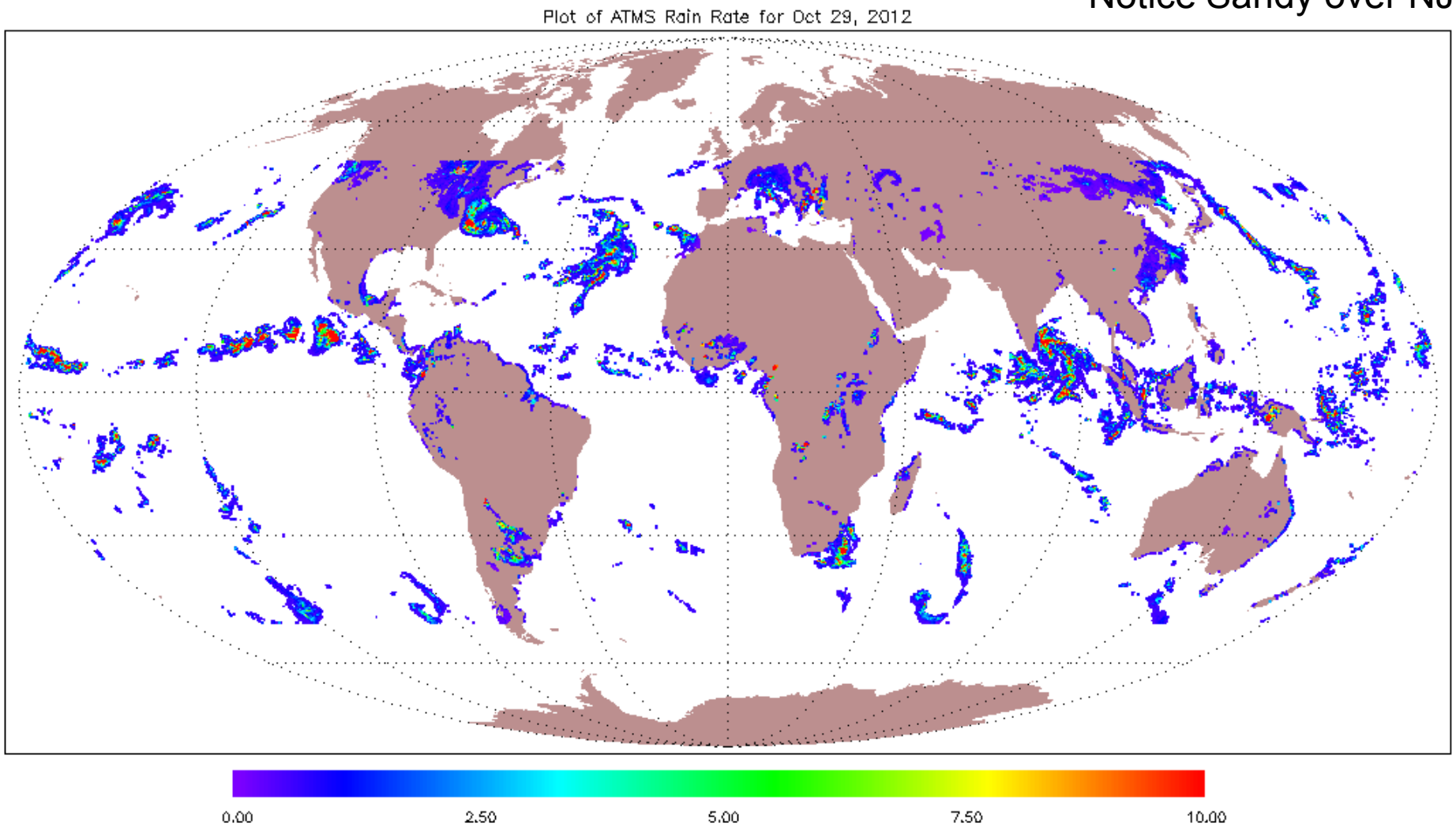
Map of Level 3 Surface Skin Temperature



7 day mean

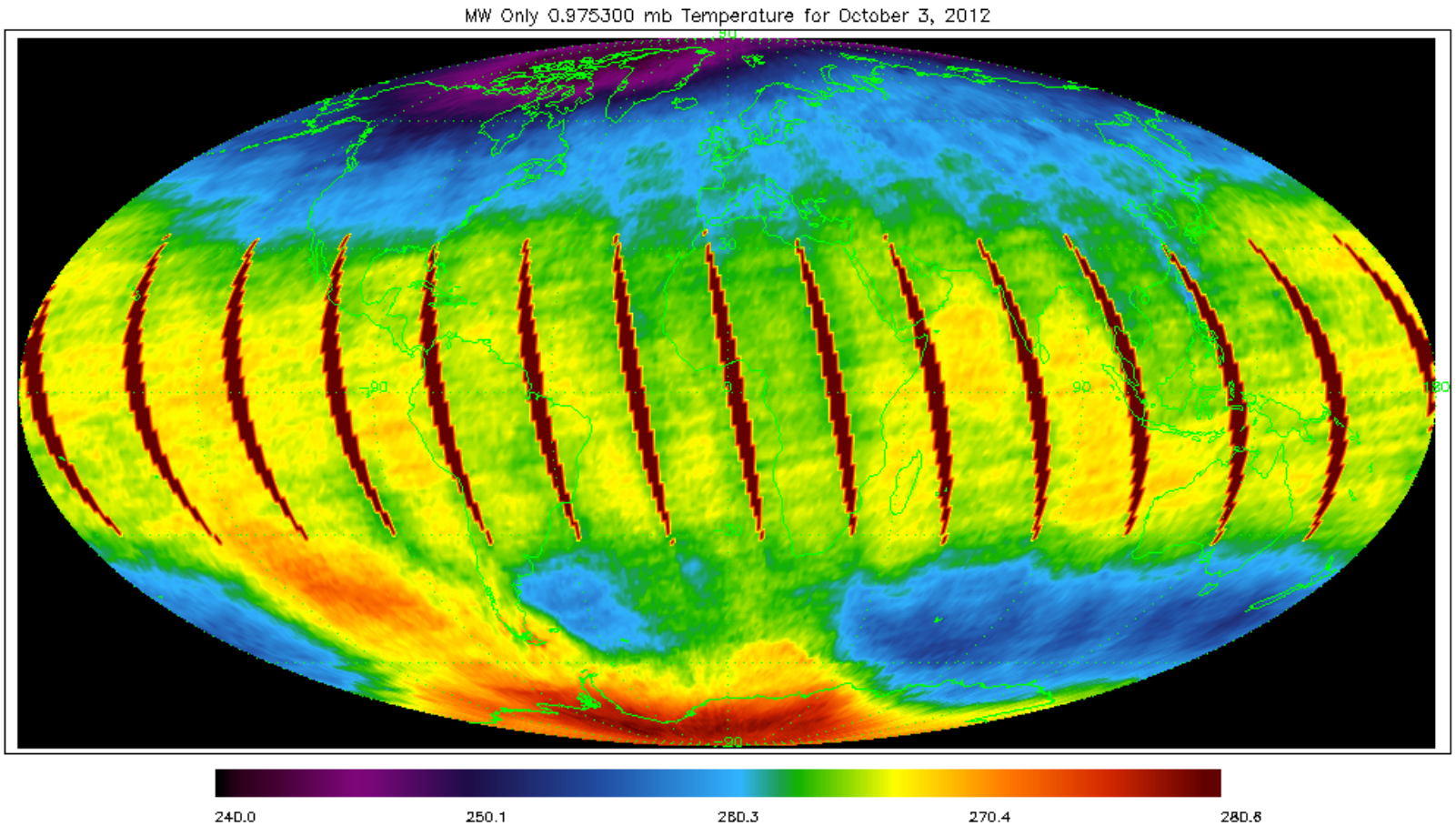
Rain Rate from ATMS (Blackwell of MIT)

Notice Sandy over NJ



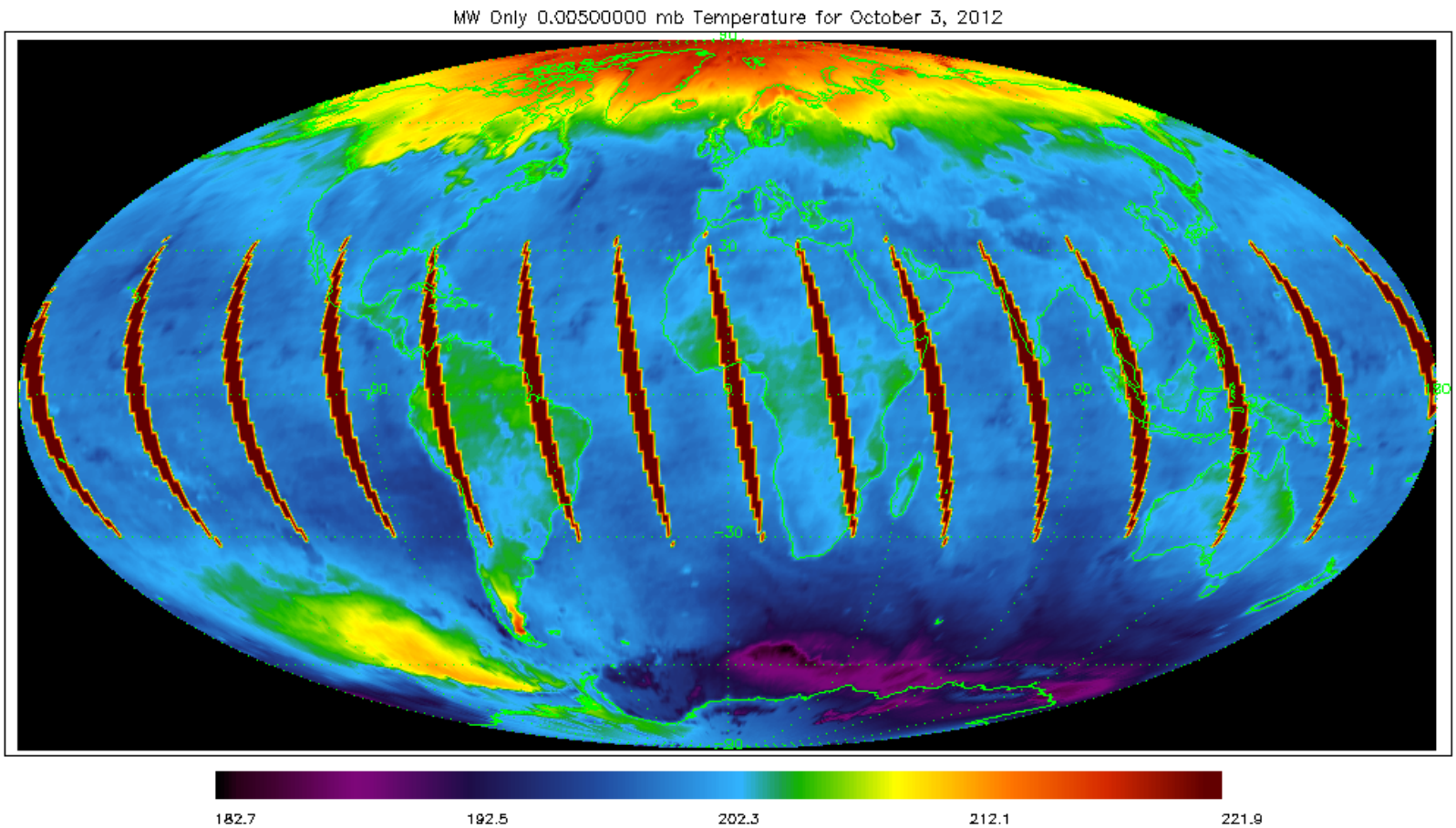
Oct 29, 2012 (Ascending)

MW Only 1mb Temperature



- **ATMS-15 has 1/f noise (low frequency sensitivity fluctuation)**
- **The striping is transferred to EDR temperature**

0.001 mb Temperature

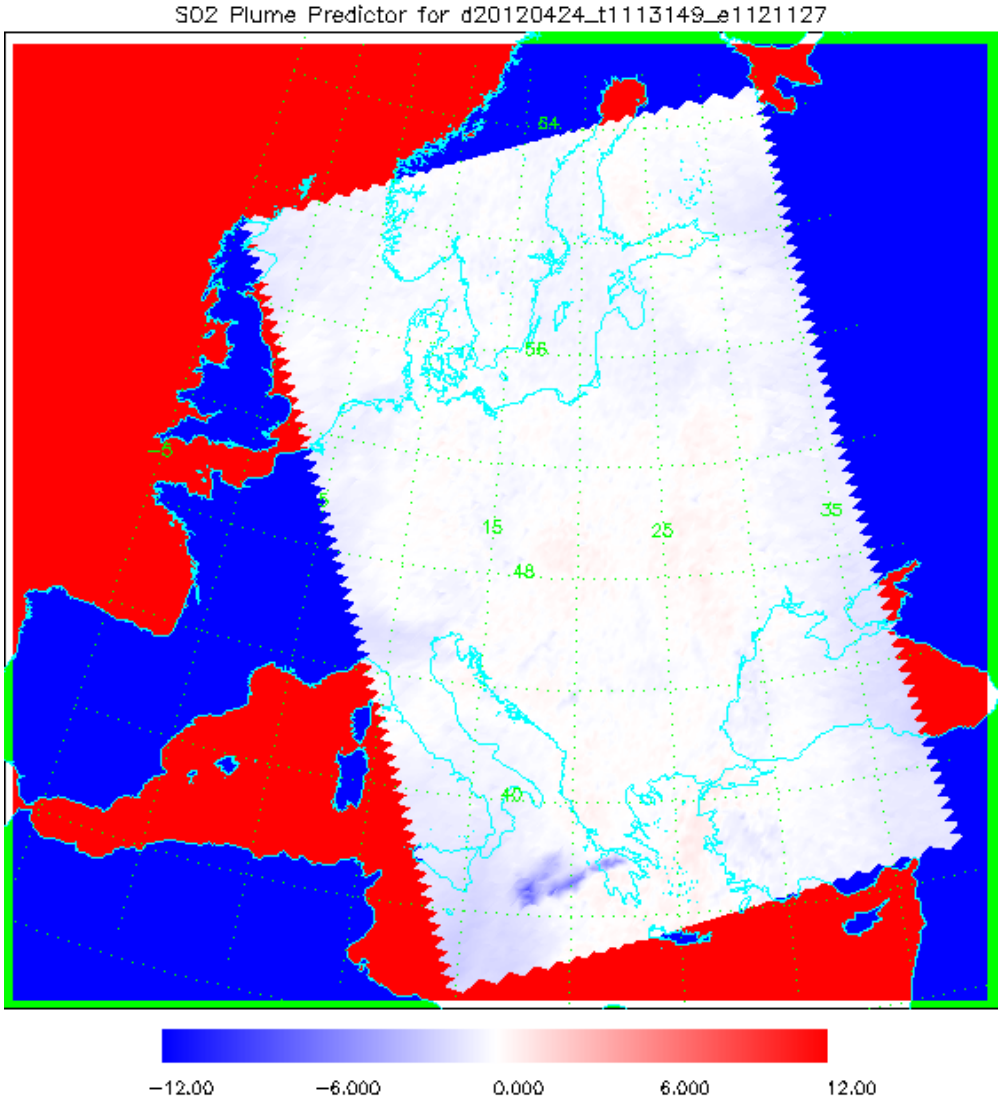


- **ATMS has no sensitivity at 0.001 mb**
- **Some artifacts seen in the map**

MW Brightness Temperature Residual

- Not enough data is written out to correctly calculate the residual
  - MW Spectral Emissivity after MW only step
  - MW skin temperature after MW only step
  - Cloud Liquid water after MW only stepand after IR+MW step
  - Emissivity and skin temp after IR+MW step are available
- Preliminary and INACCURATE calculation shows issues
  - Asymmetry in ATMS channels 18 – 22
    - I believe this indicates a issue with EDR software

Volcanic SO2 Plume Flag



- **SO2 flag developed for AIRS is degrading**
  - Occasional false warning at edge of scan in recent years
- **Developed SO2 flag for CrIS with scan angle bias removal**
  - Only four detections since April
  - Two over Mt Aetna
  - Two over Aleutians
  - One case of possible false warning being investigated

Summary

- **Many data products are available to Science Team members**
  - Some will be released to public through GSFC-ESDIS
- **RTP3 is a powerful tool for Sounder PEATE activity**
  - NetCDF4 format that has excellent metadata capability
  - Tools for HDF5 can be used
- **Level 3 is also useful for finding issues with EDR processing**
- **Supported JPSS Cal/Val activities**
  - CrIS SDR, ATMS SDR, CrIMSS EDR
- **CrIS and ATMS SDR are ready for prime time**
  - Still some minor issues
- **Climate applicability study continues, but EDR is not yet ready for prime time.**