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California Institute of Technology
Pasadena, California

CrIMSS EDR at Sounder PEATE

Sounder Science Team Meeting
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Summary

- **AER delivered Science S/W version 2.1.x (x>3) in Dec 2008**
  - Sounder PEATE acquired version 2.1.3 (Oct 2008?), but with many missing files
- **Mini-IDPS at GSFC implemented Ops S/W version 1.5.0.37 in February 2009**
  - CDFCB compliant SDR/EDR/IP files
- **IDPS CrIMSS EDR S/W Porting activities**
  - U Wisc for IPOPP for DRO community
  - Souder PEATE at JPL
  - LaRC (Xu Liu and Susan Kizer)
- **Status of NGAS test data**
  - Synthetic data is used by the science software
  - Proxy Data used by Ops software is not suitable for science evaluation

CrIMSS EDR Algorithm

- **Roughly parallel to AIRS algorithm**
  - MW only algorithm with global covariance
  - MW only algorithm with “stratified” covariance
  - IR+MW algorithm with cloud clearing
- **AER’s OSS instead of UMBC’s SARTA**
  - No non-LTE correction shortwave channels
  - No separation of thermal and solar reflectance
    - These two make shortwave channels unusable during daytime
  - Variable CO2, HNO3, SO2 in latest science software, not in ops software yet

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IDPS CrIMSS EDR Porting Activity

- **IDPS S/W was developed for a specific H/W for performance**
- **Necessary to port to generic Unix environment**
- **Three groups were porting the IDPS CrIMSS EDR s/w independently**
  - Sounder PEATE
  - U Wisc for IPOPP (Direct ReadOut community)
  - LaRC for IPO
- **Each has a running version, MW only retrievals are close, but IR+MW retrievals are off**
- **Lately we started to work together**
- **Some of the porting difficulties are land fraction, surface elevations that have been performed in AIRS level 1a processing.**

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CrIMSS EDR and IP files

- **Format described in CDFCB volumes 1 – 8**
- **32 second granules (4 scan lines of CrIS) in HDF5**
- **The latest sample files (version 1.5.0.37) are CDFCB compliant, and are being released from mini-IDPS**
- **EDR**
  - Vertical temperature profile
  - Vertical water vapor profile
  - Pressure profile
- **IP (Intermediate Products)**
  - Temperature and water vapor at OSS levels
  - IR and MW spectral emissivity
  - Ozone profiles
  - Cloud Cleared Radiances
- **Cloud liquid water retrieved, but not written**
- **No error estimates or averaging kernels are written**

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Status of IDPS software on Proxy Data

- Main purpose of proxy data is to measure the throughput
- **Cannot judge the quality of EDR algorithm**
- Only 8% of all MW retrievals pass Chi Square Test
- No (or only a few) IR+MW retrieval passes Chi Square Test
- A Few look-up-tables are inconsistent with proxy data
- **Many of lessons learned from AIRS are not passed on**
- Need better and more realistic simulation system
- Many attempts by AIRS science team to remove tuning were unsuccessful
- Use of shortwave window channels helps skin temperature
- Day/Night boundary is not solar zenith angle of 85 degree

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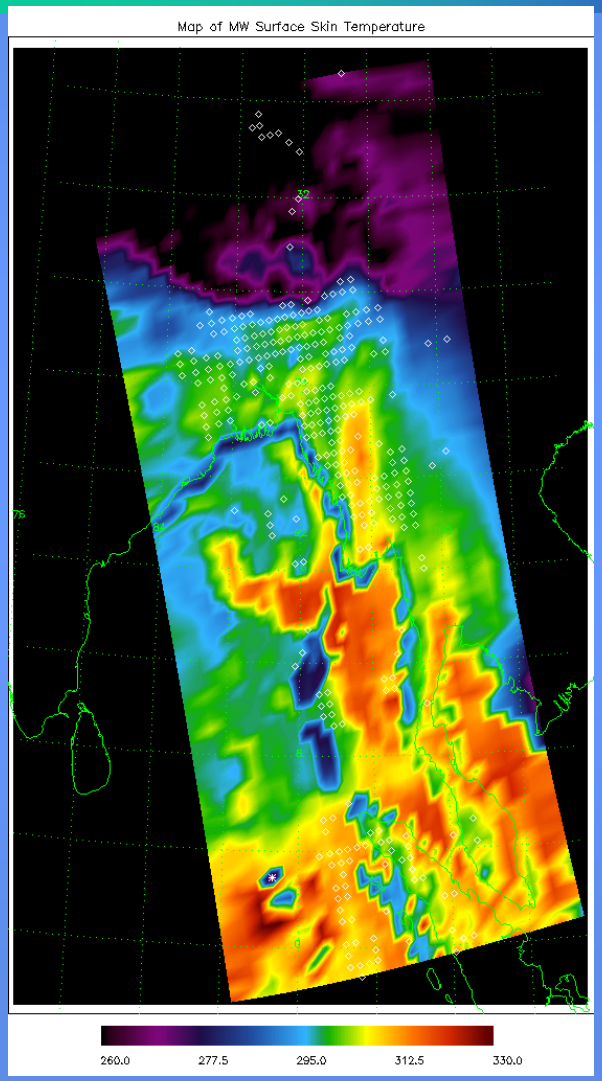
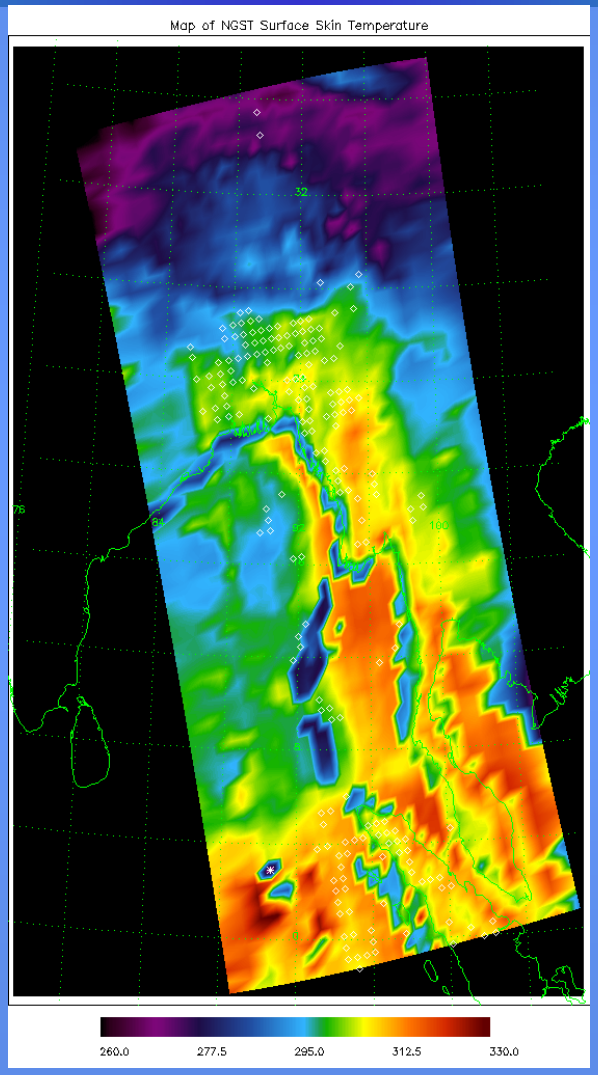
MW Skin Temperature Map





- Ascending granules over southeast Asia
- JPL run (left) vs mini-IDPS sample data (right)
- Pattern match well
- High scan angle FORs are mostly rejected
- Large discontinuity along coastline

Synthetic vs Proxy Data

- **Science S/W is tested on synthetic data**
  - Four days, Oct 1 2000, Jan/April/July 1 2001
  - Sampled at three different angles on either side of nadir
  - No mixed land/water cases
  - Very good retrieval statistics
- **NGAS Proxy data generated from AIRS/AMSU/HSB**
  - Main purpose is to measure the throughput of the S/W
  - Spatial interpolation due to difference in scan pattern
  - OSS was used for AIRS to CrIS and MIT forward algorithm is used for AMSU/HSB to ATMS
  - Rotation of CrIS FOVs is simulated
  - Handling of difference in polarization is unknown
  - Do not use this proxy data outside AIRS swath (two extreme FORs)

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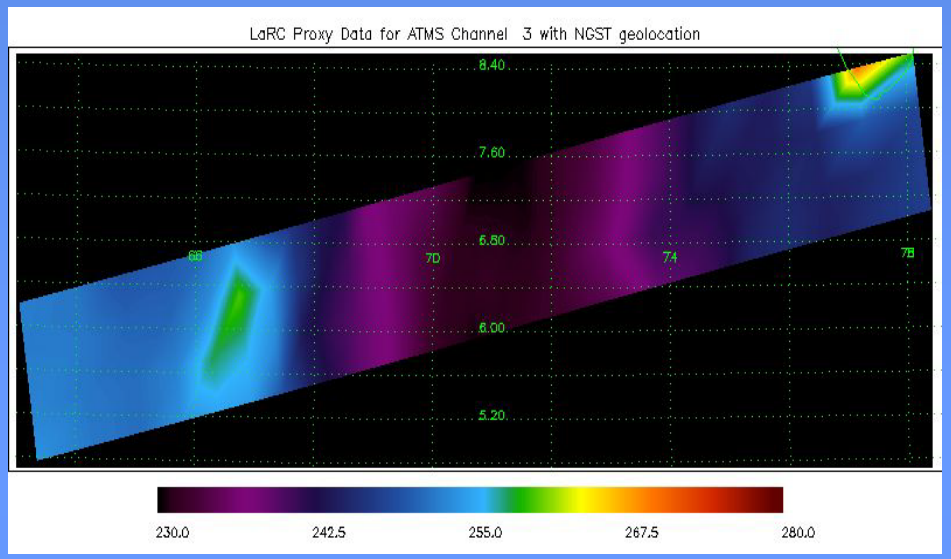
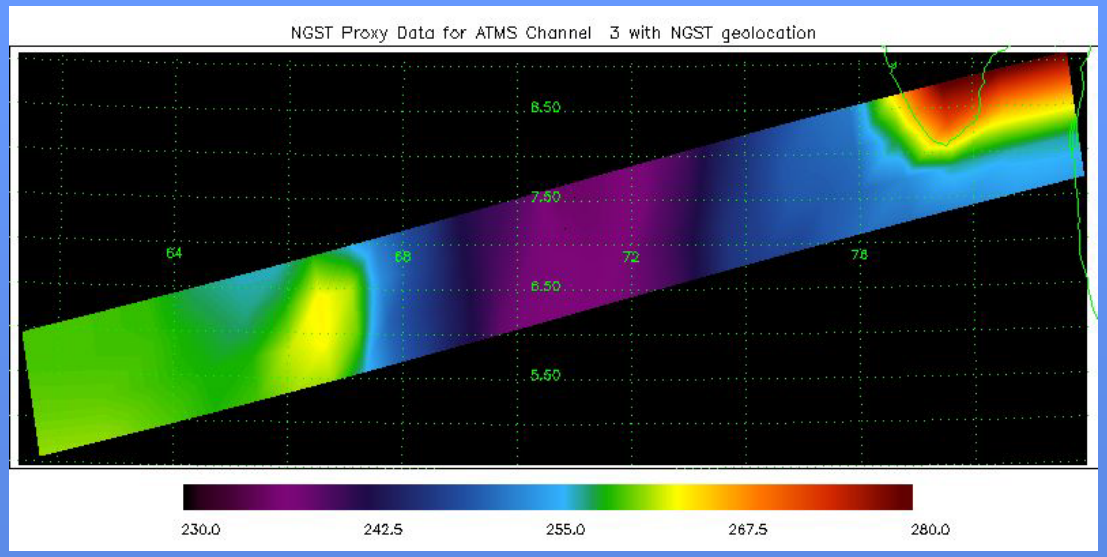
Comparison of Proxy Data





- **ATMS Channel 3**
  - GSFC/LaRC Proxy (top figure)
  - NGAS Proxy (bottom figure)
- **Both generated from Aqua**
- **GSFC/LaRC did not simulate higher orbit of NPP**
- **Couple of NGAS FORs from either end should be ignored**
- **Bias may be coming from different polarization**

Issues

- **Documents**
  - Documents available to me are inadequate
- **Latest Science Software**
  - Version 2.1.3 delivered to us have many missing files.
- **Synthetic Data Need**
  - Unsampled synthetic data
    - Synthetic data for 2000 – 2001 distributed with science software is sampled at 3 different angles on either side of nadir without coastline.
  - NCEP forecasts that go with synthetic data
  - Truth files
- **Proxy Data Need**
  - Consistent synthetic data
  - Enough volume of data to generate tuning coefficients.
    - one or two orbits are available.

Spare Slides

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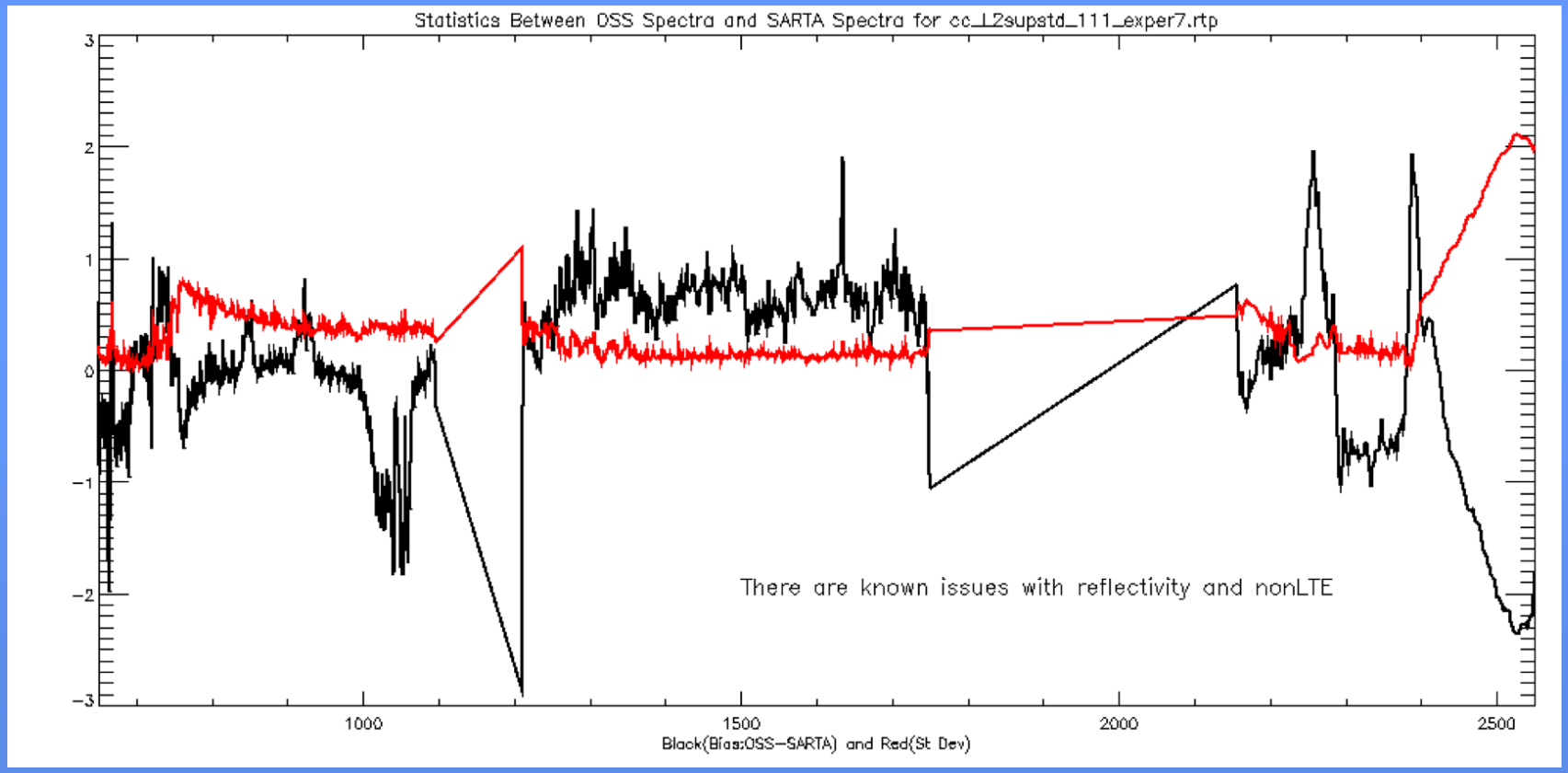
Comparison of CrIS forward algorithms

- AER's OSS vs UMBC SARTA (day time granule, both with Hamming Apod)
- OSS has known issues with reflected solar radiance and nonLTE
- SARTA has issues with end channels of each of the three bands



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Comparison of ATMS forward algorithms

Channel Number	Frequency	Bias	RMS	St Dev
1	23.800	8.12	9.21	4.42
2	31.400	4.47	6.55	4.87
3	50.300	6.20	8.12	5.33
4	51.760	4.69	6.22	4.16
5	52.800	1.19	2.38	2.10
6	53.596	-1.79	1.85	0.49
7	54.400	-2.50	2.50	0.10
8	54.940	-2.21	2.21	0.13
9	55.500	-1.82	1.83	0.21
10	57.290	-0.31	0.36	0.17
11	57.290	0.05	0.08	0.07
12	57.290	0.26	0.28	0.11
13	57.290	0.19	0.23	0.14
14	57.290	-0.31	0.33	0.13
15	57.290	0.10	0.28	0.27
16	88.200	2.19	6.93	6.69
17	165.500	0.31	1.12	1.10
18	183.310	-0.62	0.69	0.29
19	183.310	-0.65	0.69	0.23
20	183.310	-0.84	0.86	0.17
21	183.310	-1.00	1.01	0.16
22	183.310	-1.43	1.44	0.18

- MIT RTA from P. Rosenkranz
- OSS RTA for ATMS (extracted from science software)
- Atmospheric O2 channels match very well
- Small difference in H2O channels
- Surface channels have large differences, even with same emissivities