

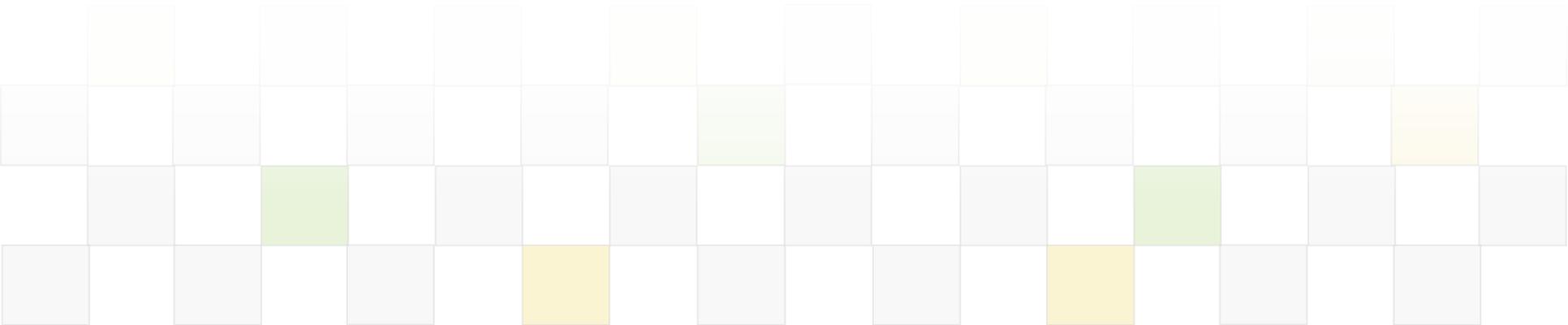


The 1st STAR JPSS Annual Science Team Meeting, May 12-16, 2014, NOAA Center for Weather and Climate Prediction (NCWCP), College Park, Maryland



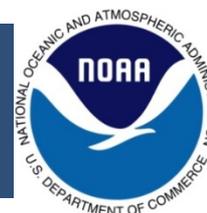
Proxy Dataset for Testing and Evaluating J1 CrIS SDR Products

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Introduction



- **Why we need proxy data**

- Proxy datasets, including simulation, original or modified observation, are critical for evaluating algorithm and testing system robustness

- **What we have**

- **Data**

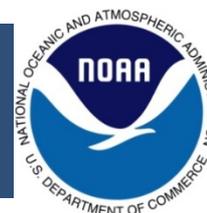
- i. SNPP and J1 CrIS TVAC data
- ii. SNPP CrIS science and telemetry RDR since Day 1 of the mission
- iii. Intact collection of ancillary files such as TLE, PolarWander and CMO.

- **Memo**

- i. Processing log of all SNPP CrIS operational RDR and SDR granules since Day 1 of the mission, including anomaly warning messages down to pixel level: *rcri_s_diary_of_yyyymmdd.txt*, *scris_diary_of_yyyymmdd.txt*
- ii. A diary manually maintained to record any mission-related event/action/anomaly

- **Software**

- I. Matlab scripts to manipulate every bit of the CCSDS binary data.
- II. ICVS: A web-based instrument monitoring and product evaluation system



Readiness of CrIS proxy dataset: Menu

1. Functional

1. Golden day
2. Full resolution

2. Sensitivity test for science

3. Non-linearity correction
4. ILS correction
5. Geolocation calibration
6. Lunar intrusion

3. Instrument anomaly

7. Fringe Count Error
8. Laser wavelength leaps (CMO update)
9. Incorrect time stamp
10. Scene select module (SSM) position counter error
11. ICT temperature anomaly
12. ICT scene impulse
13. Impulse noise mask

4. Engineering

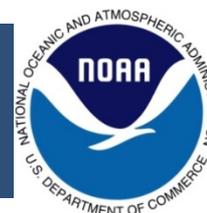
14. Bit trim mask (sun glint)

5. Abnormal inputs

15. (1) Missing scan(s), (2) Missing Earth scene packet(s), (3) Missing deep space packet(s), (4) Missing ICT packet(s), (5) Missing 8-sec telemetry packet(s), (6) Missing engineering packet, (7) Missing spacecraft diary(s)
16. Automatic/Manual re-tasking



Readiness of CrIS proxy dataset: Functional



1. Functional

1. Golden day

1. Our RDR dataset can cover any golden day since Jan 30, 2012, determined by the team decision

2. Full resolution

1. Data for three full-resolution tests are all archived: (Case 1) Feb 22~23, 2012; (Case 2) Mar 12~13, 2013; (Case 3) Aug 27~28, 2013
2. Full resolution RDR will be routinely available after December, 2014

February, 2012

Su	Mo	Tu	We	Th	Fr	Sa
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	1	2	3
4	5	6	7	8	9	10

Case 1:

Intensive cal/val stage
Bit trim mask not optimized
FIR filter not improved

March, 2013

Su	Mo	Tu	We	Th	Fr	Sa
24	25	26	27	28	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	1	2	3	4	5	6

Case 2:

Probationary data stage
Bit trim mask not optimized

August, 2013

Su	Mo	Tu	We	Th	Fr	Sa
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7

Case 3:

Probationary data stage
Bit trim mask optimized
Impulse noise mask not improved
Mid-wave bin size increased from 1039 to 1052



Readiness of CrIS proxy dataset: Sensitivity

2. Sensitivity test for science

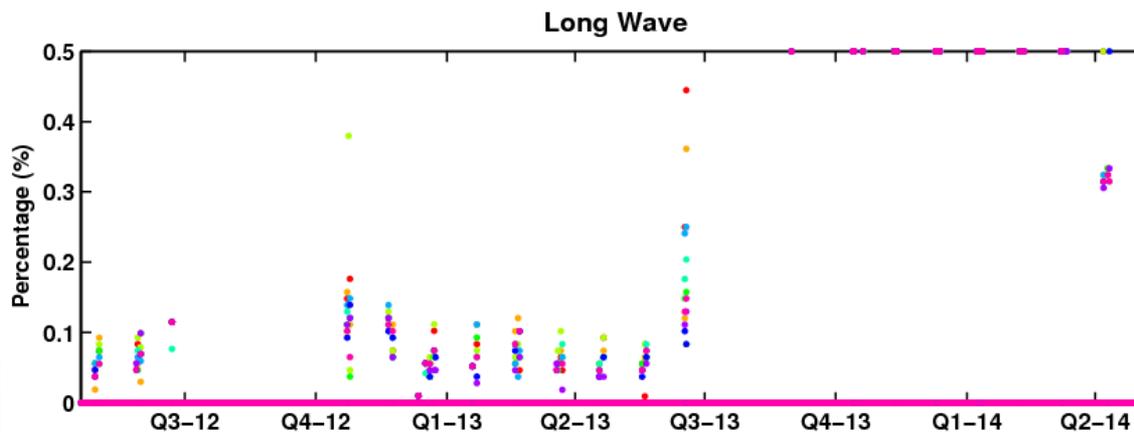
- 3. Non-linearity correction
- 4. ILS correction
- 5. Geolocation calibration
- 6. Lunar intrusion

Dataset + EngPkt tools

- Enough cases are collected for testing

NPP CrIS Lunar Intrusion Occurrence, Both Directions, Daily Average

Created at 05/07/2014 - 14:34:48 UTC



FOV1 FOV2 FOV3 FOV4 FOV5 FOV6 FOV7 FOV8 FOV9

3. Instrument

7. Fringe Count Error

- The real FCE case has never been found since the SNPP mission. Only a false alarm happened on 10:07, Dec 11, 2013. SDL provided several simulated cases:

- LWIR Diagnostic mode

orbit 01303 on Feb 28, 2012

- Mid-latitude scencs

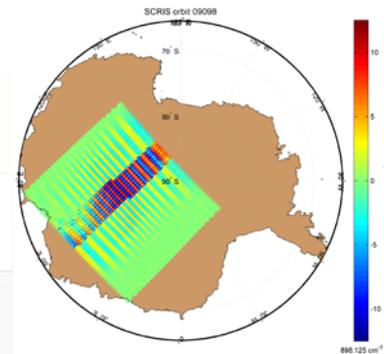
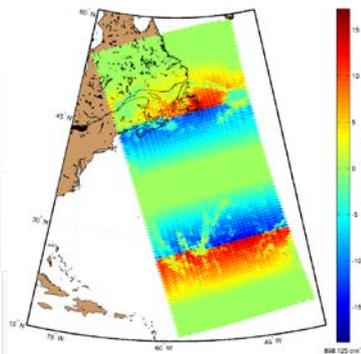
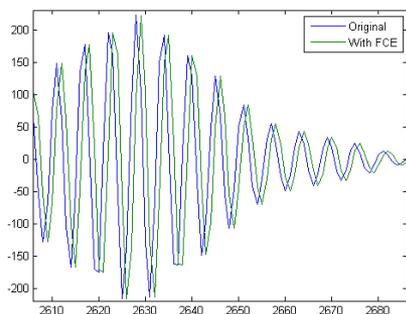
SCRIS_npp_d20130912_t1626499_e1627197_b09723_c20130912224348119785_noaa_ops.h5 to

SCRIS_npp_d20130912_t1638019_e1638317_b09723_c20130912230335907566_noaa_ops.h5

- Very cold Antarctic scene

SCRIS_npp_d20130730_t1616419_e1617117_b09098

SCRIS_npp_d20130730_t1622019_e1622317_b09098



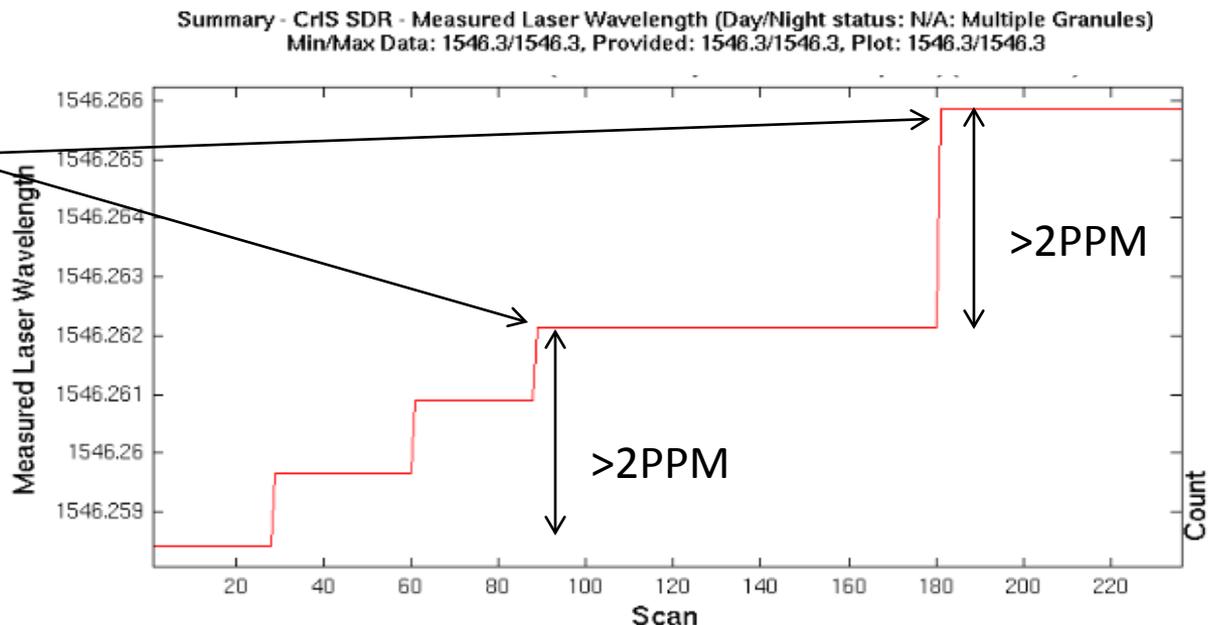
Esplin, SDL

3. Instrument

8. Laser wavelength leaps (CMO update)

- The Sampling laser wavelength of S-NPP CrIS is very stable since the mission. The measurements of laser wavelength in some RDR granules are manually modified to create a dataset to test the functionality of automatic CMO update.

CMO should be updated in both moments





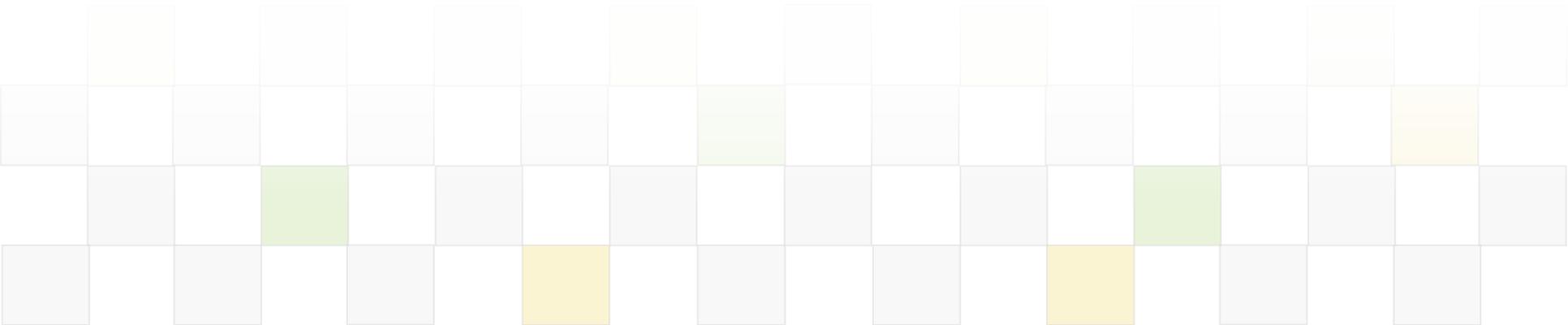
Readiness of CrIS proxy dataset: Instrument

3. Instrument

9. Incorrect time stamp

- The real time stamp error in RDR has not been found yet
- Lihong Wang of NGAS created a case to test the system response to the incorrect time stamp: The number of day since 1598 for all DS LW FOV2 in the following granule is changed from 20381 to 20380 to simulate a RDR time stamp error

RCRIS-RNSCA_npp_d20131020_t0331004_e0331324_b10254_c20131020044721180606_noaa_pop.h5



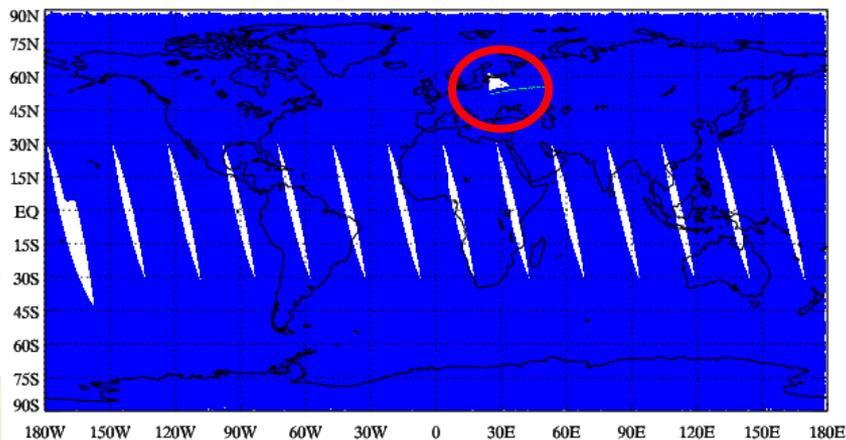
3. Instrument

10. Scene select module (SSM) position counter error

- 5 cases have been recorded:
 - (1) RCRIS-RNSCA_npp_d20120928_t0942093_e0942413
 - (2) RCRIS-RNSCA_npp_d20121212_t1534078_e1534398
RCRIS-RNSCA_npp_d20121212_t1534398_e1535118
 - (3) RCRIS-RNSCA_npp_d20121223_t0104276_e0104596
RCRIS-RNSCA_npp_d20121223_t0104596_e0105316
 - (4) RCRIS-RNSCA_npp_d20130804_t1024338_e1025058
RCRIS-RNSCA_npp_d20130804_t1025058_e1025378
 - (5) RCRIS-RNSCA_npp_d20140213_t2348499_e2349219

NPP CrIS Short Wave SDR Overall Quality Flag, Mapped, Ascending, 08/04/2013

(Blue: Good; Green: Degraded; Red: Invalid)



Currently, when such an anomaly happens, the moving window containing the bad values is skipped without processing

Readiness of CrIS proxy dataset: Instrument

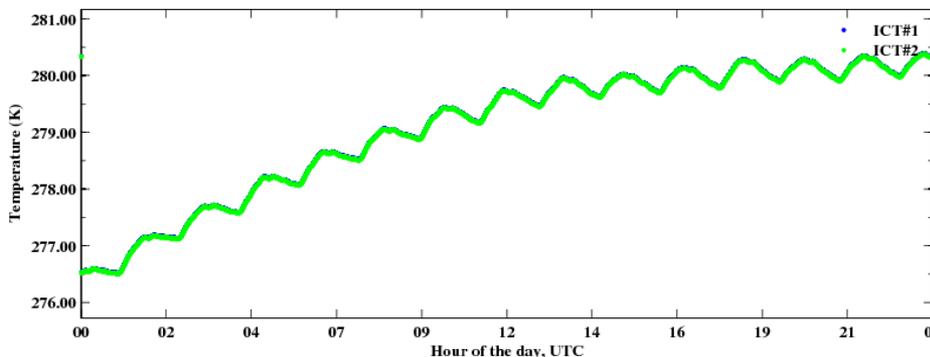
3. Instrument

11. ICT temperature anomaly

- ICT temperature quickly increased more than 4K on Dec 18, 2012 after CrIS was switched to safe mode, and the nominal daily variation is less than 0.8K

NPP CrIS Internal Target Temperature, Date: 2012-12-18

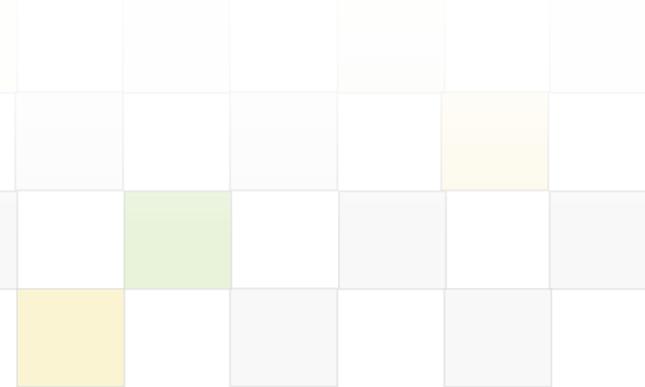
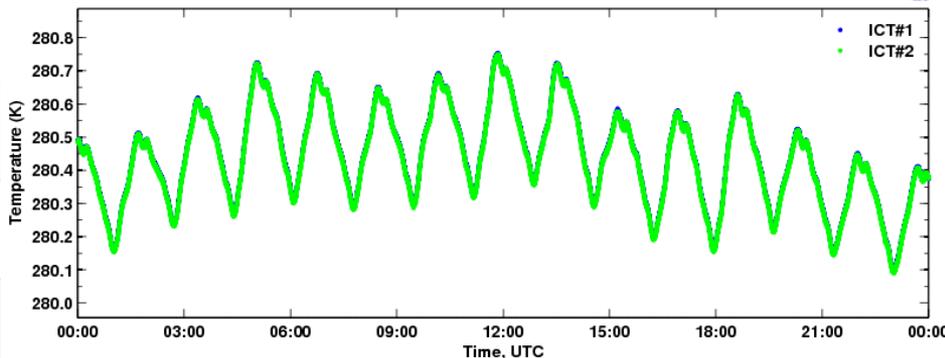
Created at 12/19/2012 - 13:20:05 UTC



This case will be used to test the program response to dramatic ICT drifting. Some quality flags should be triggered.

Suomi NPP CrIS Internal Calibration Target Temperature, 02/13/2014

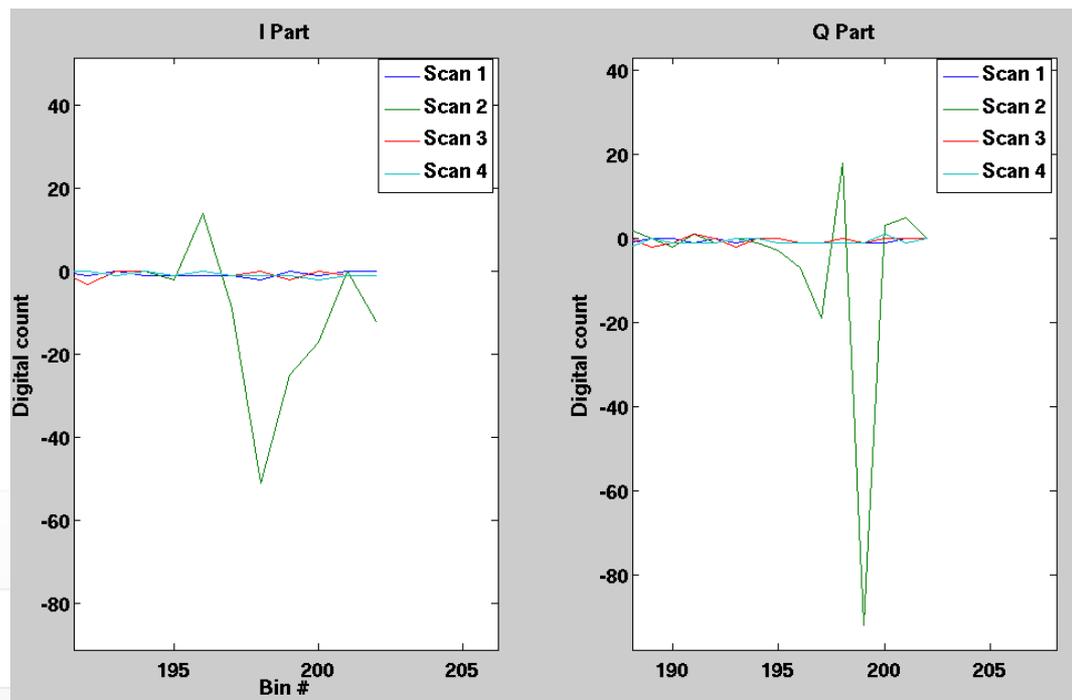
Created at 02/15/2014 - 02:17:06 UTC



3. Instrument

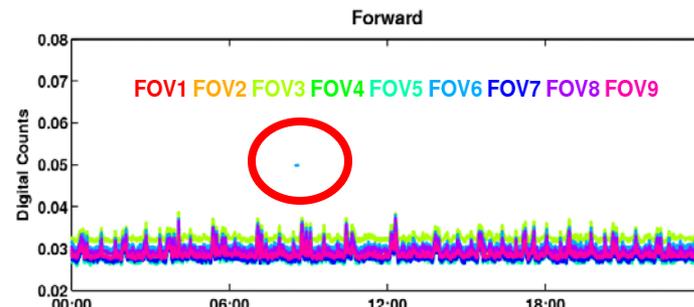
12. ICT scene impulse

- ICT interferogram occasionally gets corrupted by random impulse, resulting in excessive spectral noise. No quality checks for this anomaly in current algorithm. Abundant cases are prepared for testing new algorithms dealing with this issue.



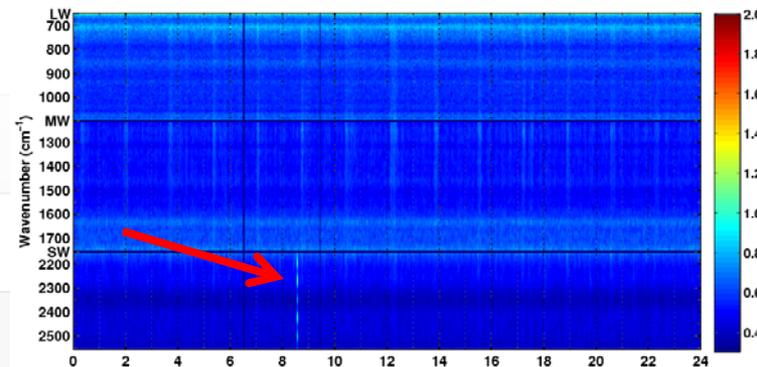
Internal Target Spectral Stability, Short Wave: 01/09/2014

Created at 01/11/2014 - 04:06:26 UTC



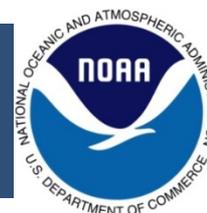
NPP CrIS NEDN, Relative to Specification at 287K, FOV6: 2014/01/09

Forward (Upper) & Reverse (Low)





Readiness of CrIS proxy dataset: Engineering



3. Instrument

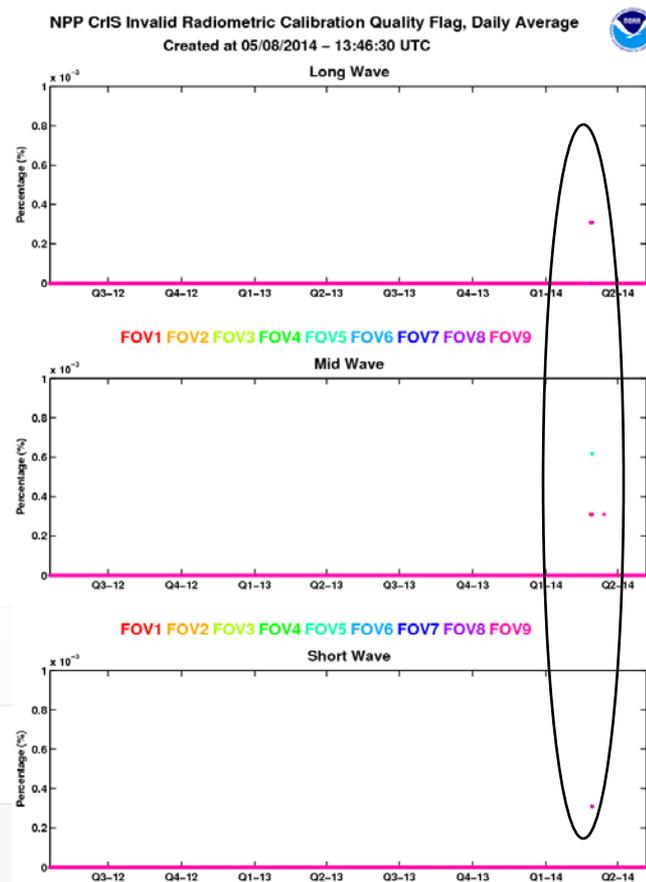
13. Impulse noise

- Too many impulse noise counts could corrupt an interferogram. Although SNPP CrIS is well sheltered, some cases are still found. The following cases are found to be the reason of the false alarm of 'Invalid Radiometric Calibration' in IDPS operational SDR products:

SCRIS_npp_d20140226_t1429539_e1430237_b12091

SCRIS_npp_d20140228_t0459299_e0459597_b12113

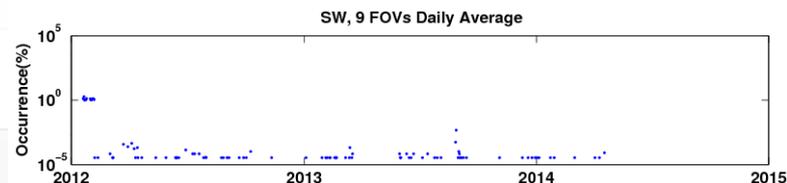
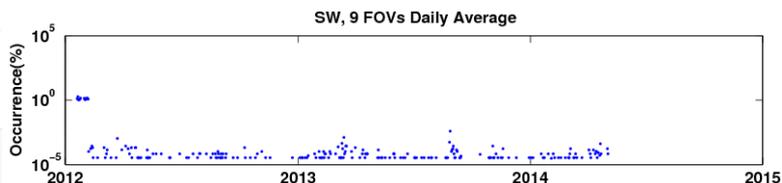
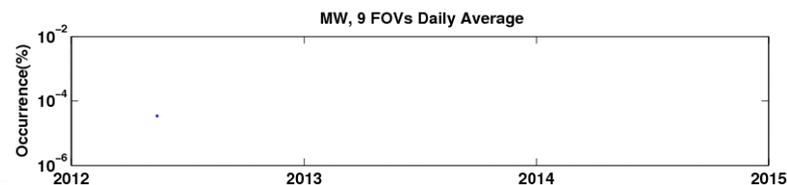
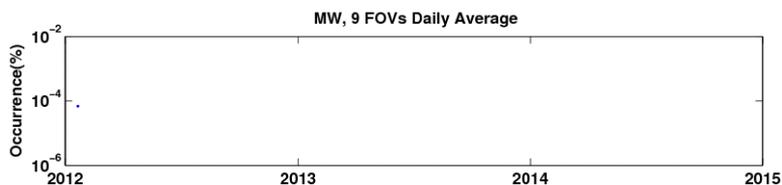
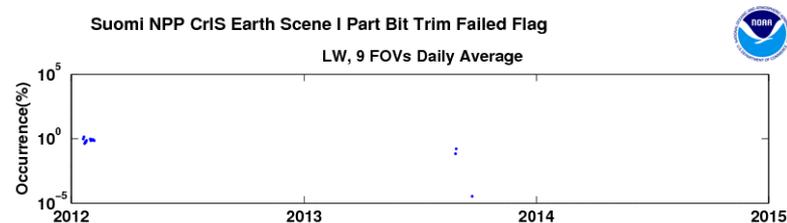
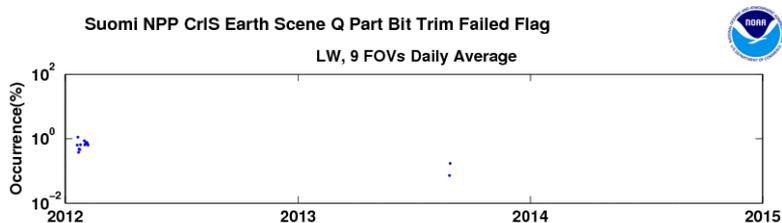
SCRIS_npp_d20140315_t1821379_e1822077_b12334



4. Engineering

14. Bit trim mask saturation

- Abundant BTM cases are available. Most of them are over ocean due to SW sun glint. A few of them are over hot desert or high altitudes with strong surface reflectivity.





Readiness of CrIS proxy dataset: Abnormal inputs



5. Abnormal inputs

15. Abundant cases are ready for the tests of the following anomalies and/or their combinations:

- (1) Missing one or more scan(s)
- (2) Missing Earth scene packet(s)
- (3) Missing deep space packet(s)
- (4) Missing ICT packet(s)
- (5) Missing 8-sec telemetry packet(s)
- (6) Missing engineering packet
- (7) Missing spacecraft diary(s)

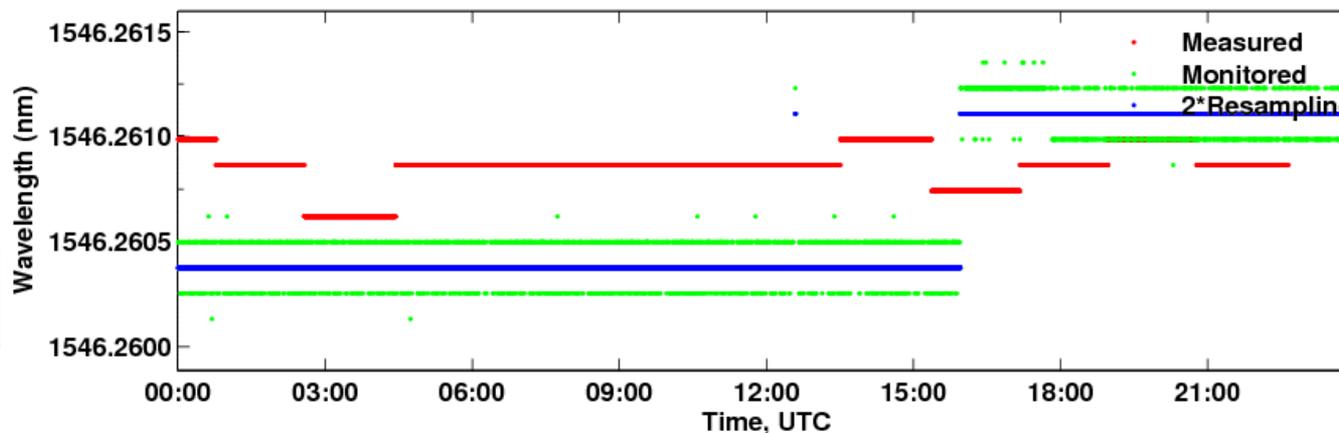
5. Abnormal inputs

16. Automatic/Manual re-tasking

- It is found that the interaction between Re-tasking procedure and the main processing line is extremely subtle. Anomalies caused by the bugs hidden in this part include: (i) sudden change of re-sampling laser wavelength; (ii) incorrect measured laser wavelength record; (iii) difficulty of indentifying CMO matrix used in the procedure.
- Several cases are prepared.

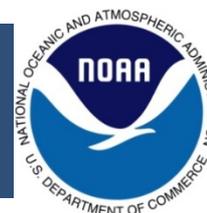
NPP CrIS Laser Wavelength: Measured/Monitored/Resampling,03/04/2014

Created at 03/06/2014 – 17:49:19 UTC





Conclusions



- **Proxy data is invaluable for evaluating algorithm and testing system robustness**
- **We have prepared abundant cases during the SNPP CrIS trending/monitoring/debugging and we are still collecting new cases. All of these cases will be part of the J1 proxy dataset**
- **We have convenient tools to manipulate the dataset to create new cases for new requirement for J1**