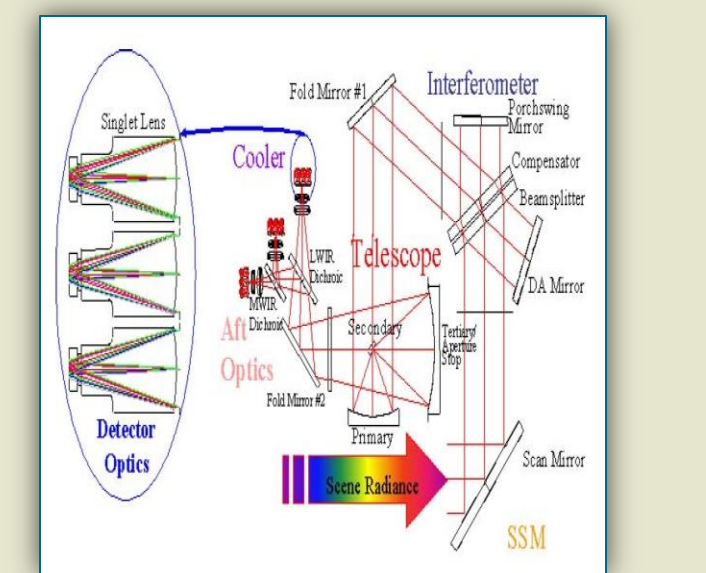


## Abstract

The Cross-track Infrared Sounder (CrIS) is a Fourier transform spectrometer flying on-board the SUOMI NPP satellite that was launched on October 28<sup>th</sup> 2011. The primary mission is to provide IR radiance measurement of the top of atmosphere that is assimilated directly into the NWP weather forecasting system. Reprocessing capability has become needed for several reasons: (1) Estimation of new calibration parameters allows one to see the impact on the SDR product, (2) Data format change during the mission currently does not allow backward capability, (3) Data set of the mission can be reprocessed with the same algorithm version and calibration coefficients for end-to-end comparison, (4) Reprocessing of high resolution data. To this end, NOAA has set up a reprocessing system. In this presentation, we present the hardware architecture, software data flow, and examples of reprocessed normal mode resolution SDRs.

## Instrument Characteristics and Attributes

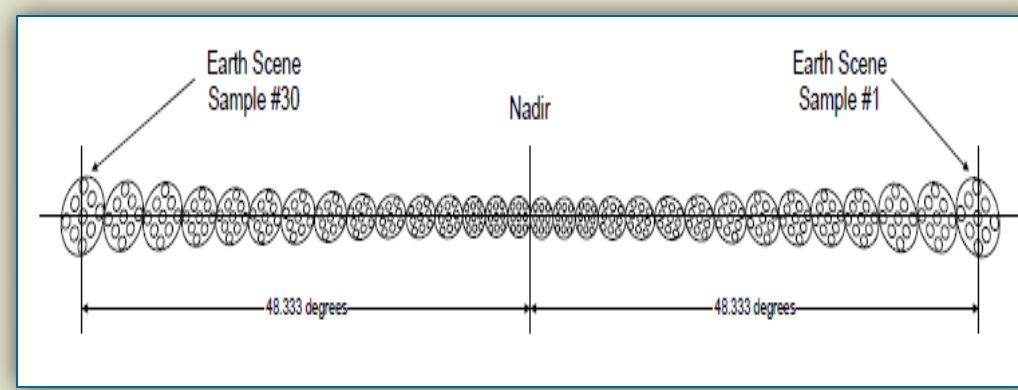
### CrIS Optical Schematic



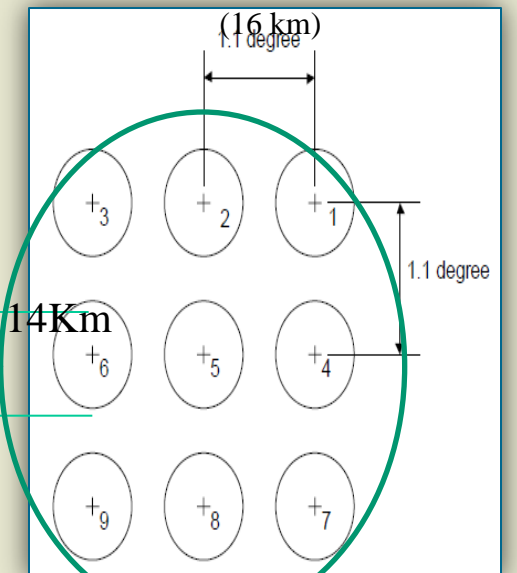
### Normal Acquisition Mode

Number of FOV	9
Number of FOR per Scan Line	30
Scan line Acquisition Period	8 seconds
Number of Scan line per day	10800
Number of Frequency Band	3
Total number of Spectra per Day	8.7 Million

### Scan Line (2200 Km Swath)

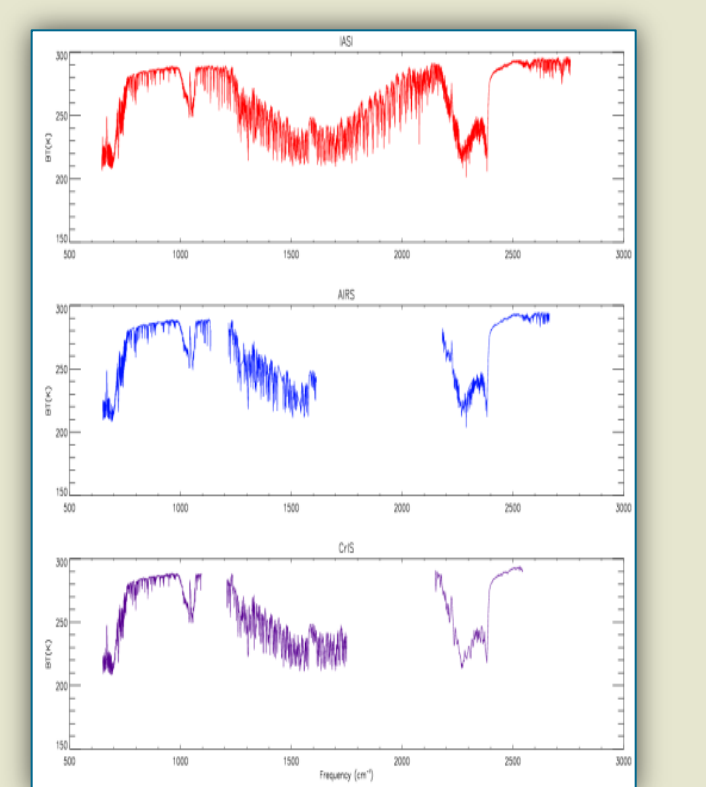


### Field Of Regard



### Spectral Characteristics

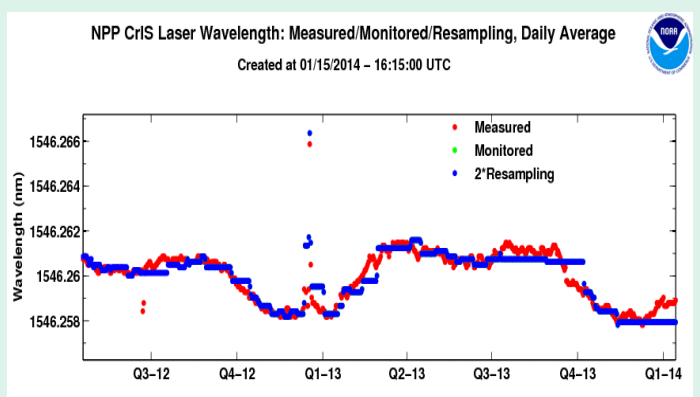
Band	Spectral range [cm <sup>-1</sup> ]	Spectral range [μm]	Band width [cm <sup>-1</sup> ]	Resolution [cm <sup>-1</sup> ]	MW [μm]
LR	130-150	15.4-11	40	0.25	3.9
MW	1210-1750	8.3-5.7	540	1.2	3.4
SW	2150-2250	4.6-3.9	300	2.5	3.2



- IASI has full spectral coverage from 645 cm<sup>-1</sup> to 2760 cm<sup>-1</sup>.
- AIRS and CrIS have 3 frequency bands as shown.
- CrIS has coarser spectral resolution in MW and SW. Request to download full spectral resolution (0.625 cm<sup>-1</sup> all 3 bands) is under consideration for JPSS-1 satellite (launch planned for 2017).

CrIS acquires 8.7 million spectra per day covering over 95% of the Earth surface.

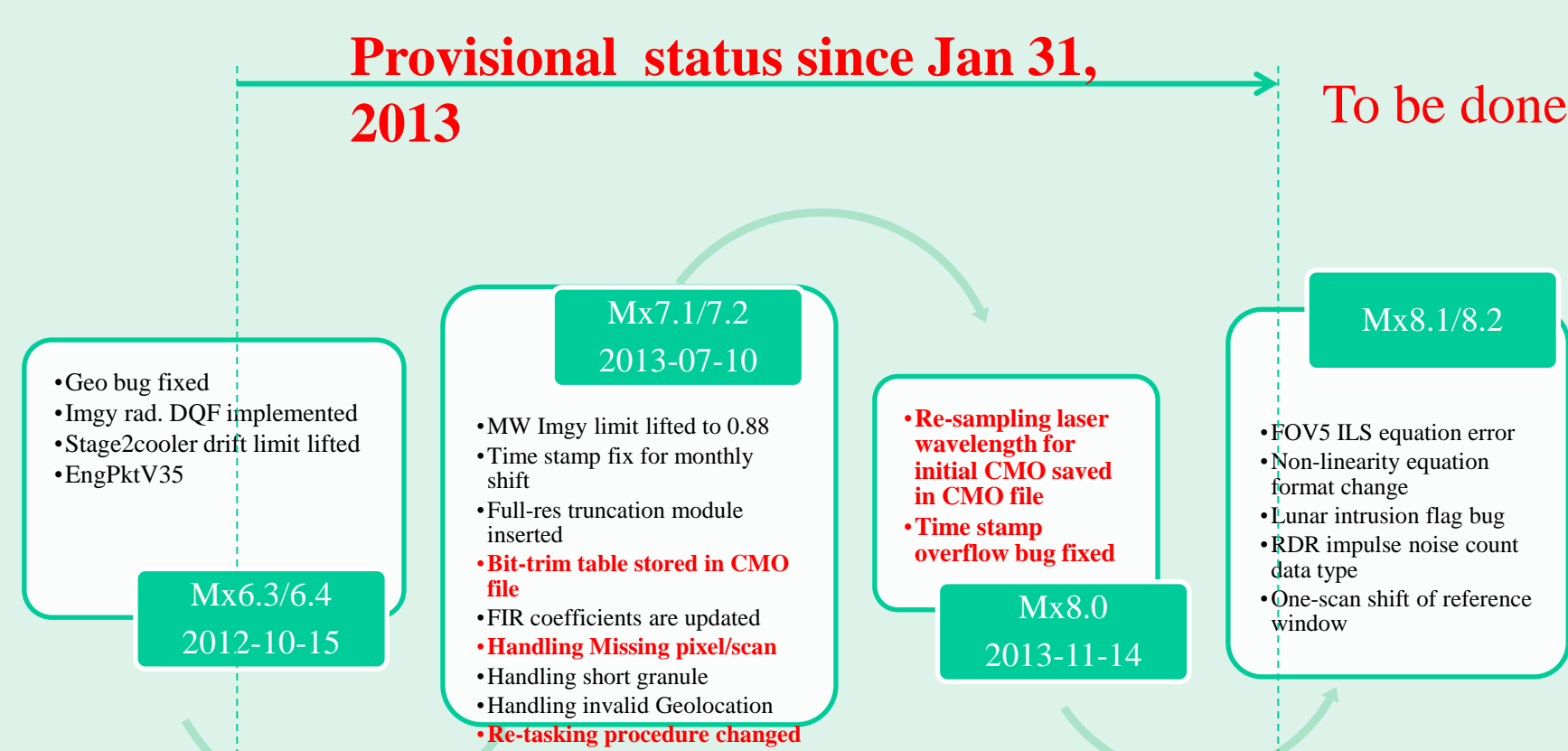
## Motivation



The CrIS instrument has been stable since the beginning of the mission (Feb 2012). Shown here is the laser wavelength.

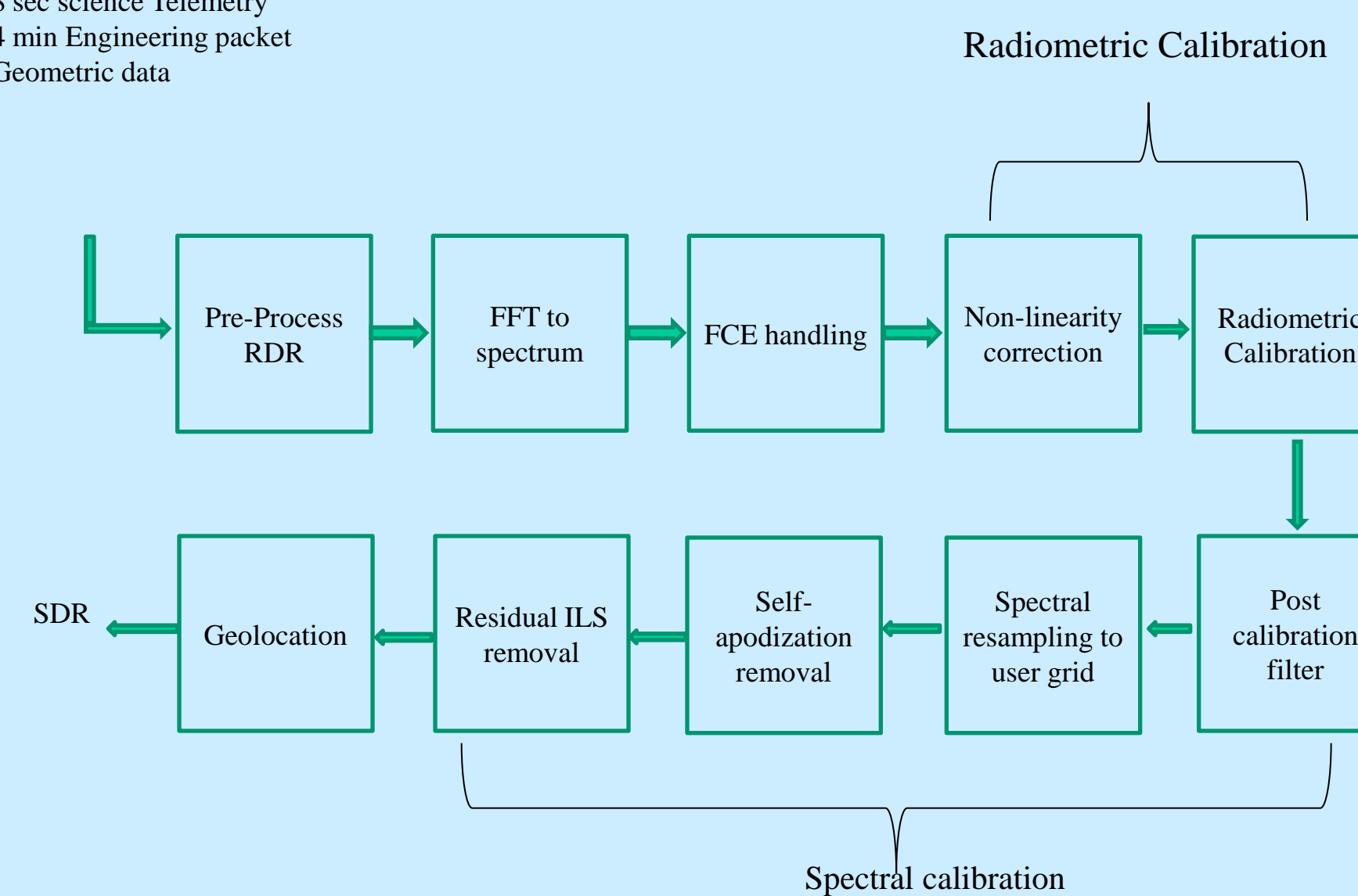
The CrIS SDR algorithm has undergone several code changes since the beginning of the mission. These changes focus on the science algorithm, refinements of the calibration parameters, bug fixes, the data quality flags tree logic, and threshold parameters tuning.

Therefore, the current CrIS SDR product does not have continuity of the science product and the data quality flags. Reprocessing will allow to have the entire CrIS SDR product to conform to the same software version.



## CrIS SDR Algorithm Data Flow

RDRs:  
Interferograms  
8 sec science Telemetry  
4 min Engineering packet  
Geometric data

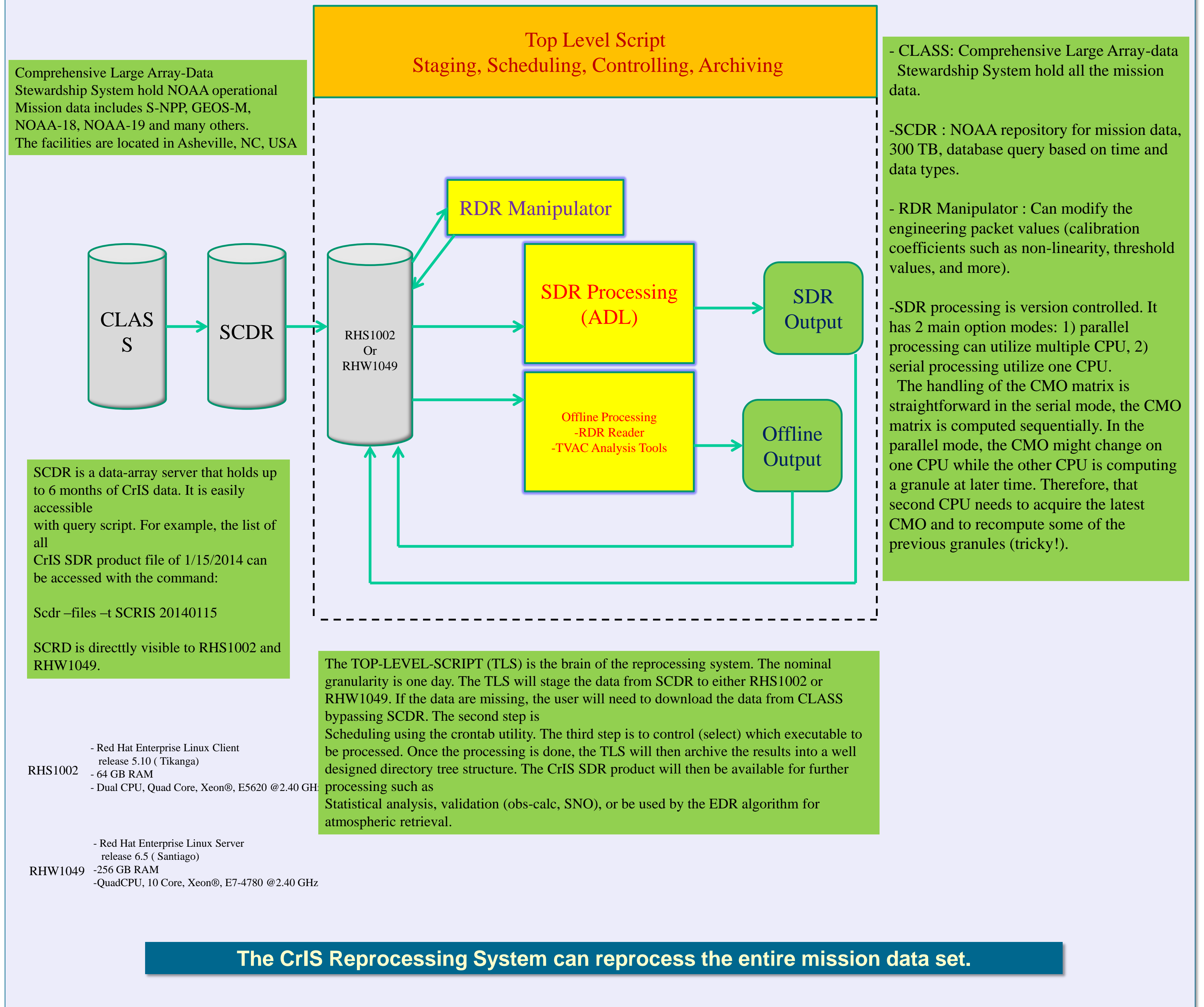


The CrIS SDR algorithm data flow is currently being reevaluated. The spectral resampling (to user's grid) step is performed before the Instrument line shape (ILS) correction which comprises the self-apodization removal. At the time of writing, 10 algorithm data flow candidates are being considered. The preferred new algorithm will reorder the steps such that the spectral resampling is performed after the ILS correction.

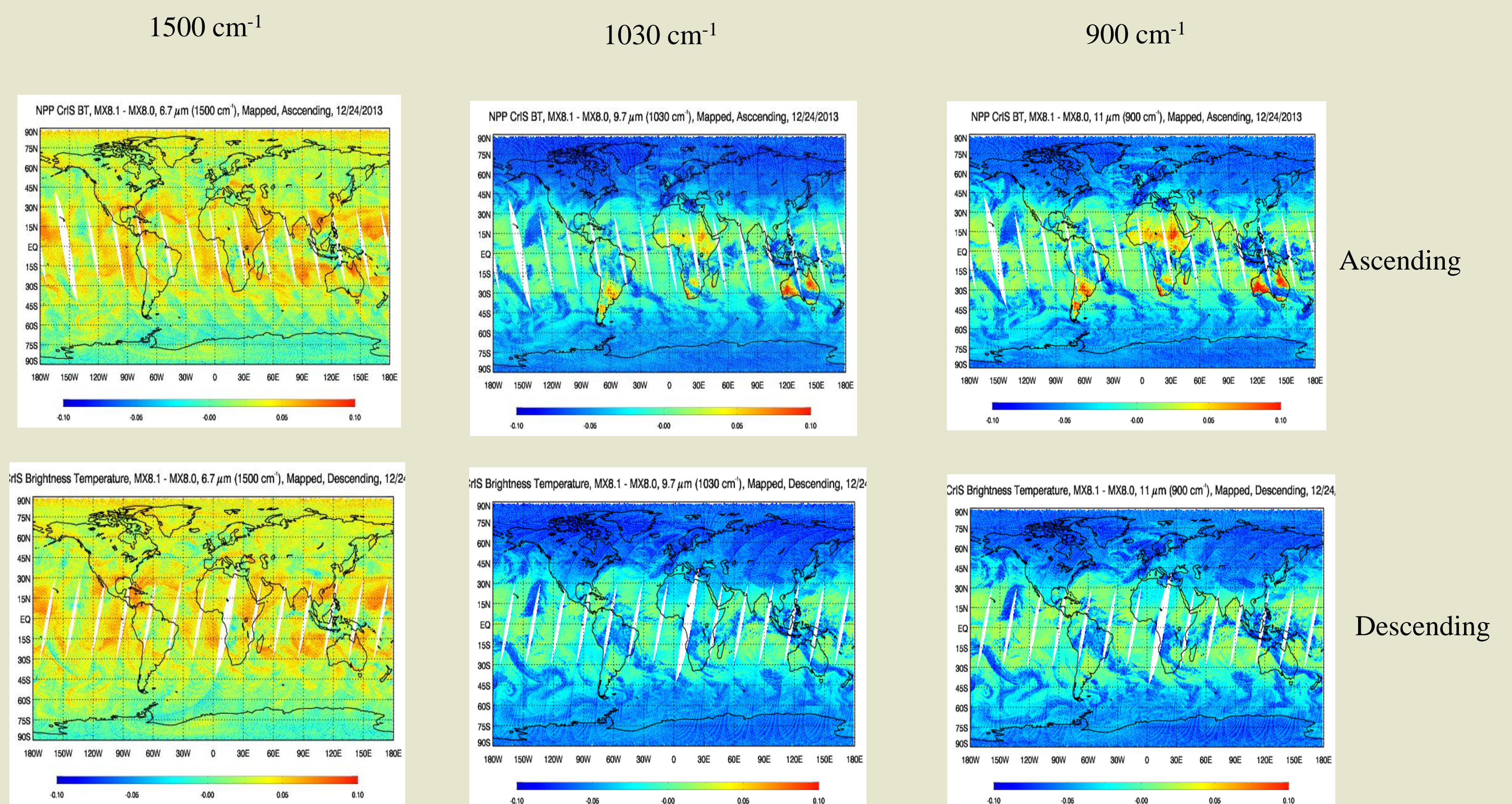
In order to select the next algorithm for JPSS-1 Data set (such as full resolution of 08/27/2013 - 08/28/2013) will need to be reprocessed multiple times.

CrIS SDR Algorithm product comprises the radiance, NEΔN (noise), geolocation, and data quality flags.

## Reprocessing Data Flow



## Example of Reprocessing: MX8.1 - MX8.0 on 12/24/2013



One year of data were reprocessed using the new non-linearity coefficients and the new ILS parameters that will be part of MX 8.1 operational software (will be available on Feb. 20<sup>th</sup> 2014). However, MX8.1 results will not be available to the users prior to Feb 17<sup>th</sup> 2014. The added value of reprocessing is to obtain a long time series of the same software (and calibration coefficients) that is continuous in time without discontinuity in the data time series.

In the example above, MX 8.1 minus MX8.0 is shown for December 24<sup>th</sup> 2013. There is up to 0.1 K difference in brightness temperature in the warm regions.

Data reprocessing can show the difference between algorithms. Here, the difference between MX 8.1 and MX 8.0 is shown.

## Summary

- The CrIS SDR reprocessing system is needed for further algorithm development.
- It allows the calculation of the impact of new formulation or calibration coefficients.
- Reprocessing is needed for establishing a climate record.