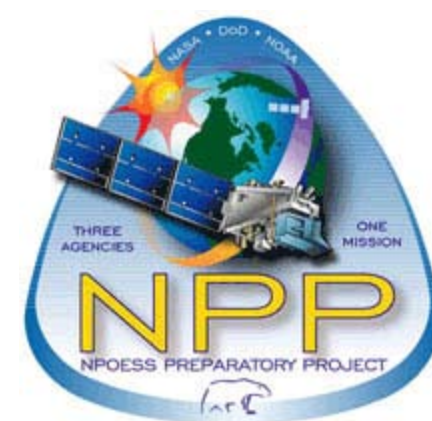# An Introduction To The CrIS Instrumental Trending/Monitoring System At NOAA/NESDIS/STAR

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Abstract

The Cross-track Infrared Sounder (CrIS) onboard the NPP satellite is the first operational hyper-spectral infrared sounding administrated by NOAA. The whole meteorological community is looking forward to its superior performance in providing quality atmospheric and surface information to improve weather forecast. Instrumental calibration/validation is inevitable for this purpose. Here we present a web-based long-term trending/monitoring system, which is a critical part of the calibration/validation project. This system covers a wide range of parameters in scan-level (8-second) resolution and updates every a couple of hours. It also provides the time series of daily-based statistics for each parameter. The system is robustly functioning for several months dealing with actual data with filled values from Raw Data Records (RDRs) and proxy Science Data Records (SDRs) since the launch of NPP.

1. RDR Parameters

Table 1: Telemetry RDR Parameters

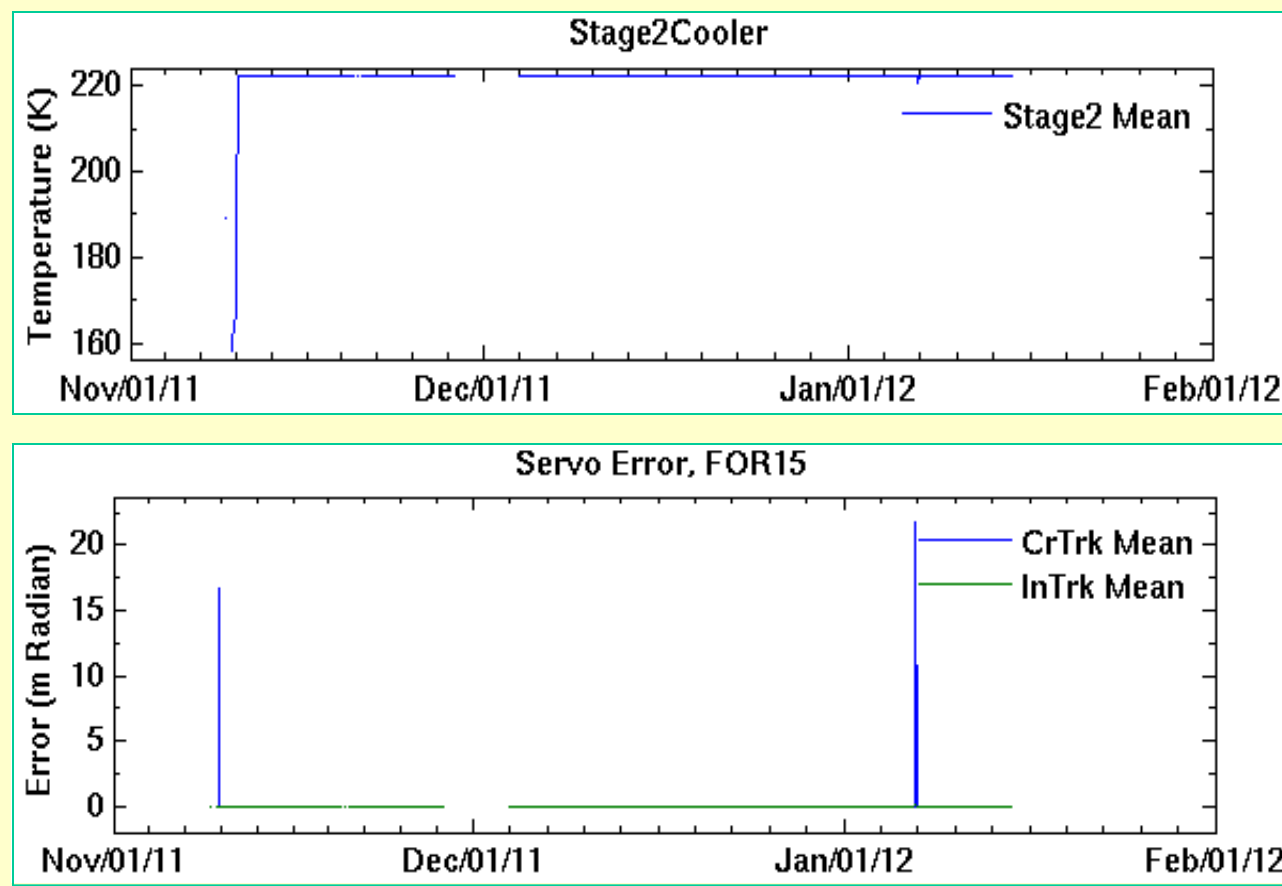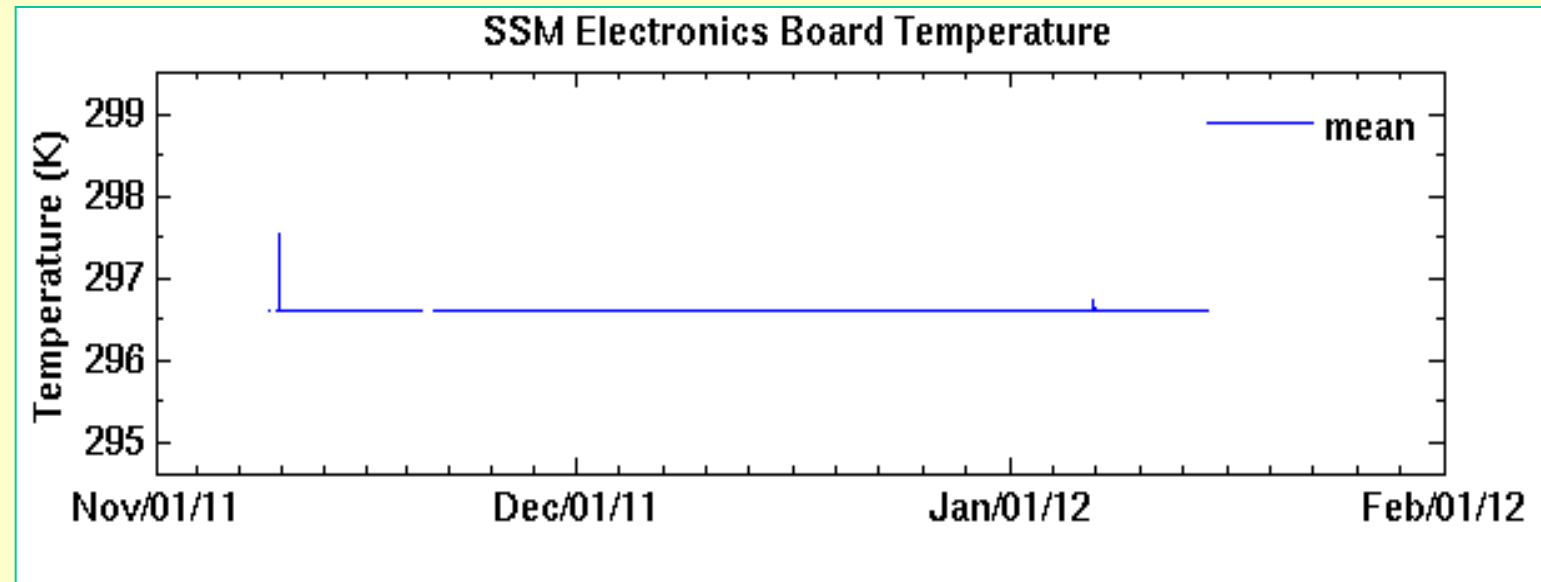| Name	Description
RDR_TLM_ICT_PRTTemp	ICT PRT #1 and #2 temperatures
RDR_TLM_OMA_Temp	OMA structure #1 and #2 temperatures
RDR_TLM_StageCooler_Temp	Stage 1/2/3/4 cooler temperatures
RDR_TLM_Other_Temp	BeamSplitter/ScanMirror/ScanBaffle/Telescope temperatures
RDR_Laser_Diode	Laser diode current & temperature
RDR_Servo_Error	SSM Cross/In-track servo error

Table 2: Housekeeping RDR Parameters

Name	Description
SSMelectronicsboardTemp	SSM electronics board temperature
ServoMotorwindingTemp	Cr- & In-Track motor winding temperature
PorchswingVelocity	Porch swing velocity
MotorCurrent	Porch swing/DA-X/DA-Y motor current
DA-TiltErr	DA-X & DA-Y tilt error

Table 3: Instrumental Response Parameters*

| Name	Description
RDR_NEDN	NEDT time series
RDR_GAIN	Instrumental gain time series
RDR_OFFSET	Instrumental offset time series

*: 12 channels (4 for each band) are selected as indicators and there is one value for each orbit. These channels include: 650/720/830/1050/1240/1375/1580/1710/2150/2210/2355/2515 cm^{-1}. Here the 830 cm^{-1} is sensitive to the ice crystal absorption and therefore can be used to detect any icing event on the sensor.

3. Data Transferring Statistics

For each day, we are supposed to receive: 2700 RCRIS-RNSCA, 2700 RCRIT, 2700 SCRIS, 2700 GCRSO, and 142 RNSCT granule files from the Government Resource for Algorithm Verification, Independent Testing, and Evaluation (GRAVITE) server. Sometimes, one granule is processed multiple times, resulting in redundant files.
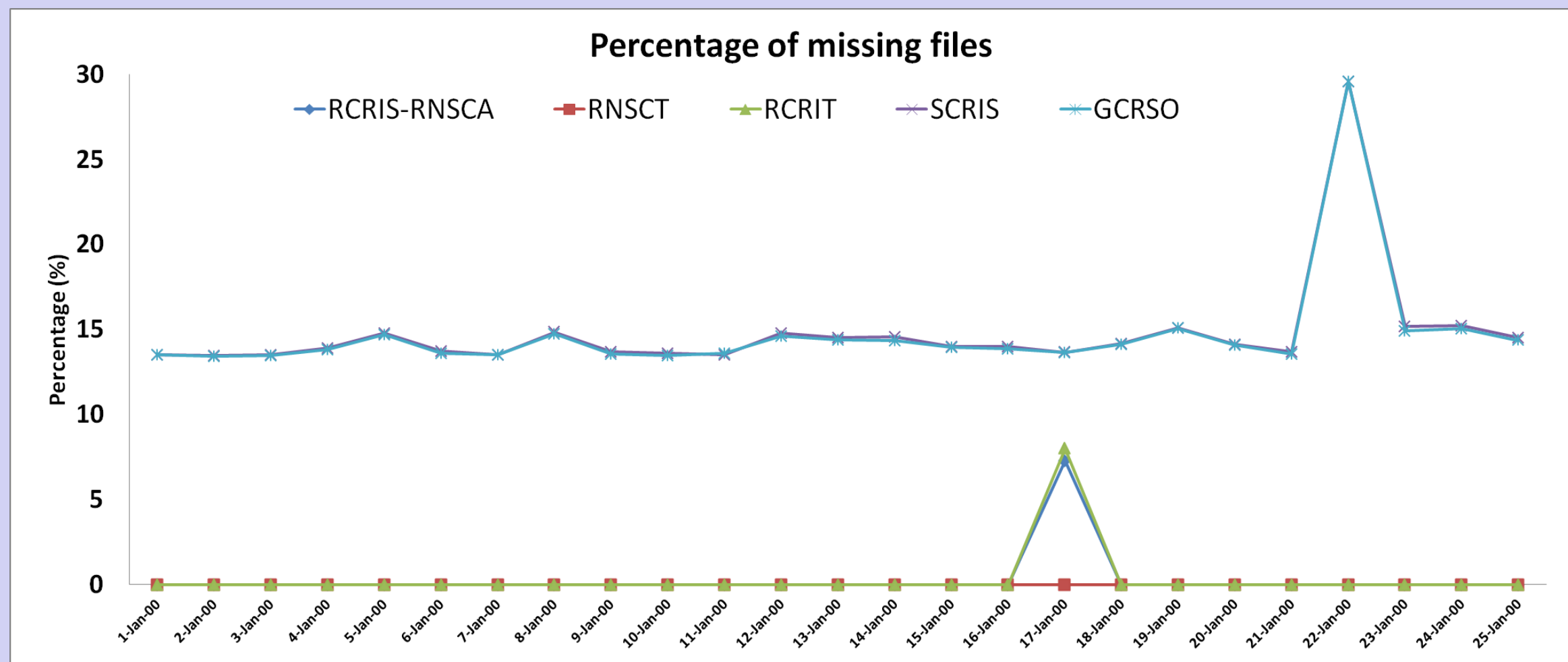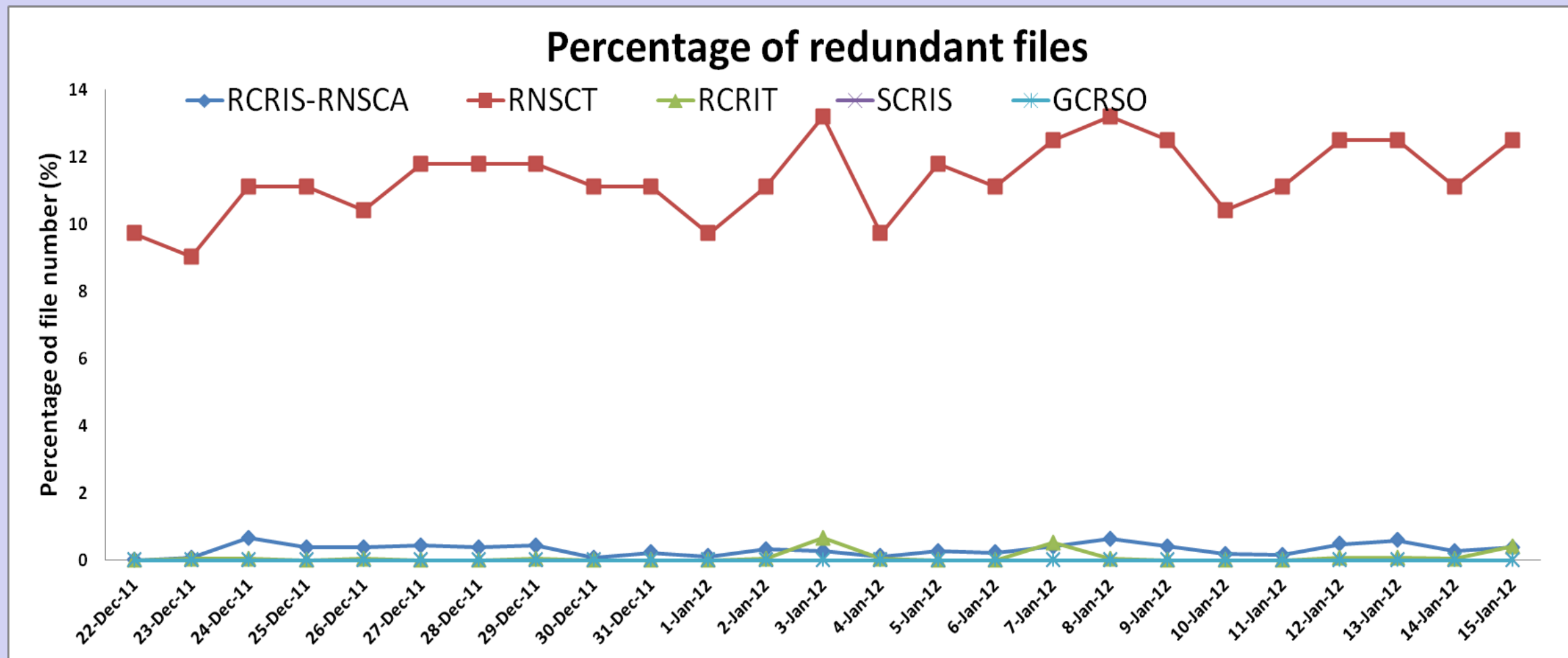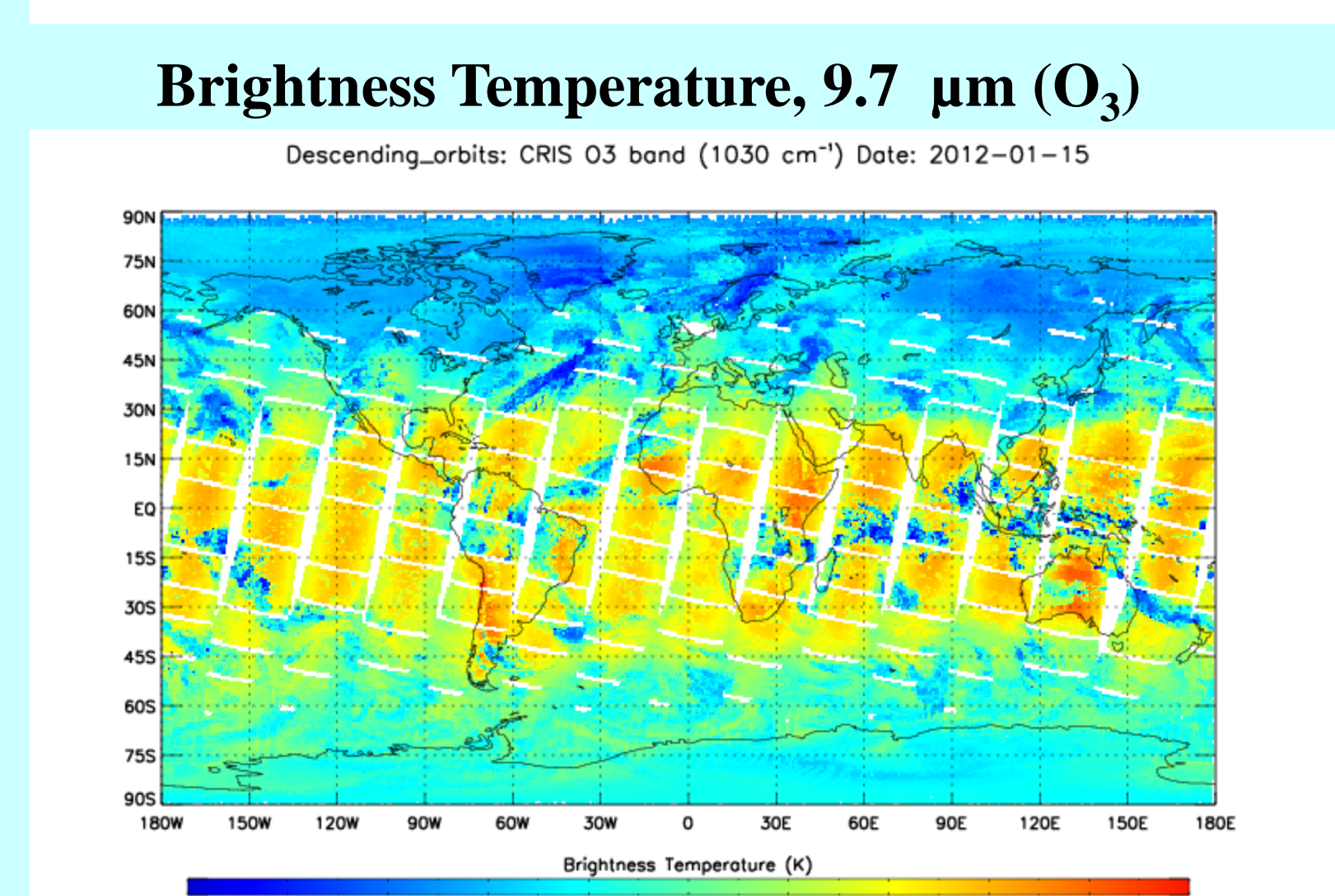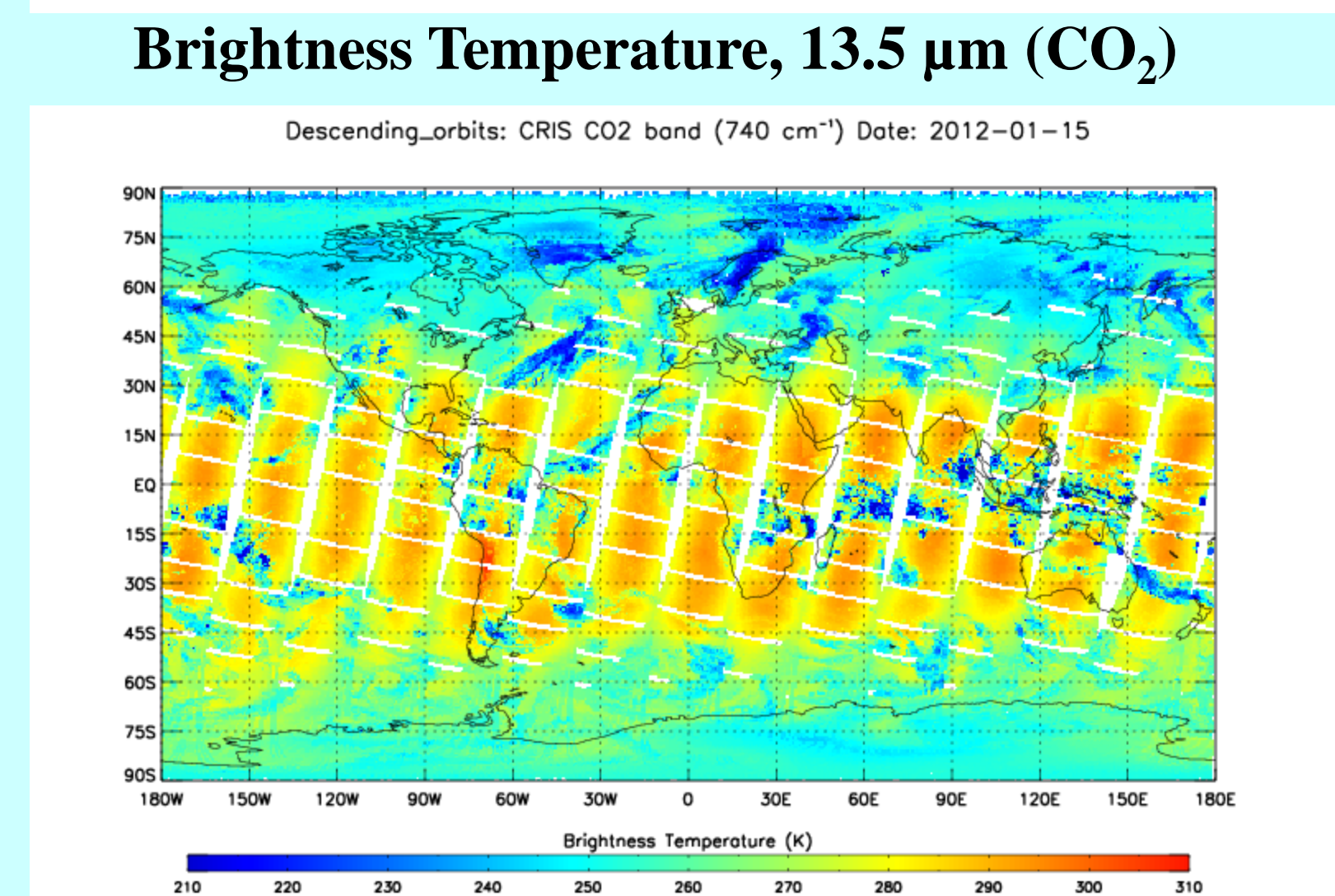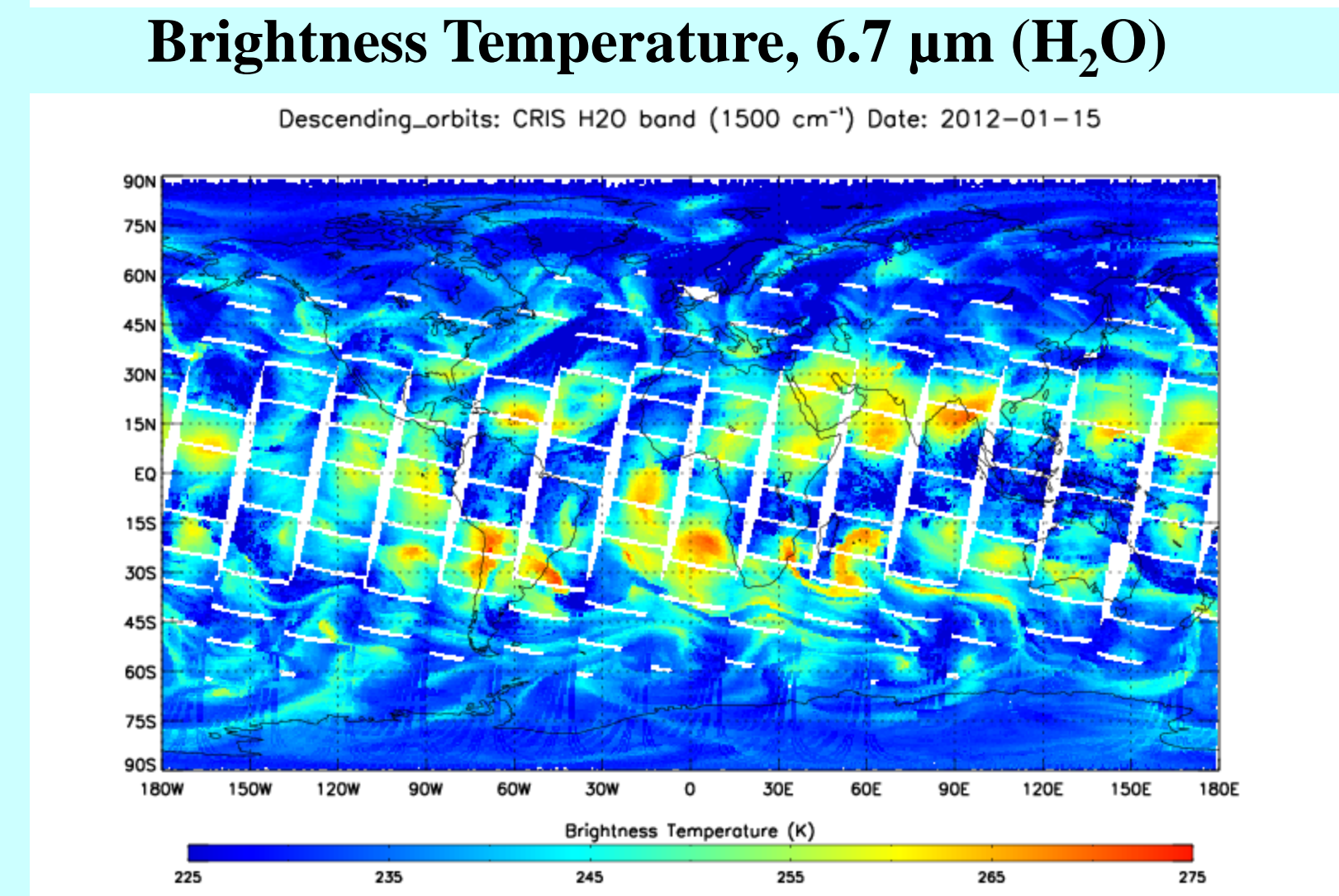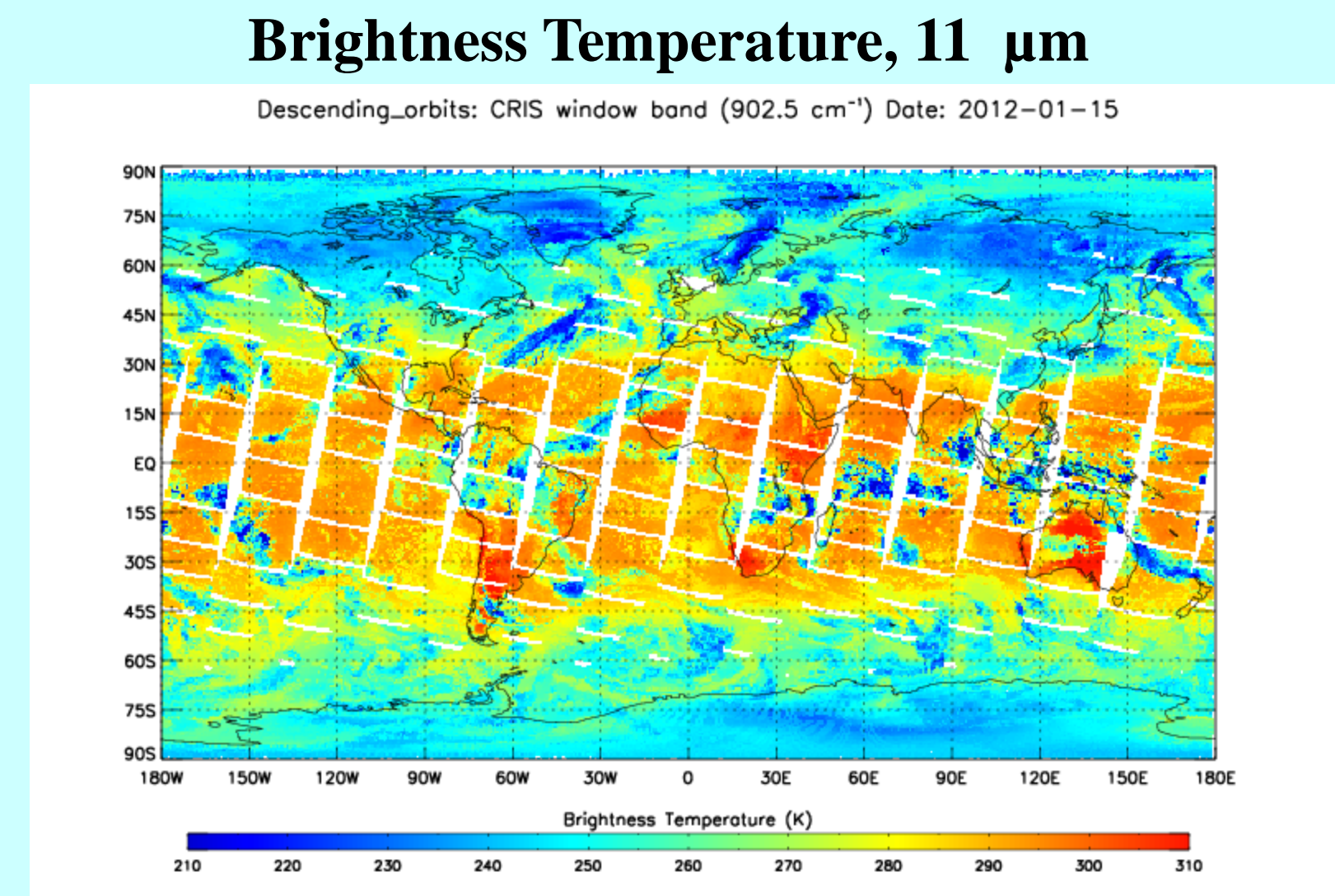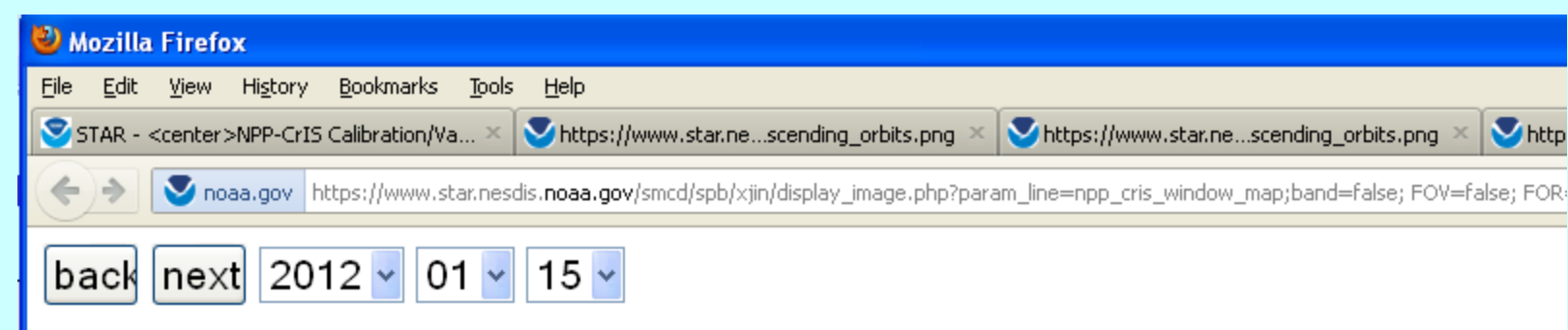

1. For science RDR (RCRIS-RNSCA), unless something unusual happens, such as that on Jan 7, 2012, we can always get all 2700 granules for each day. Meanwhile, we receive about 0.3% (8 files) redundant files.

2. For housekeeping RDR (RCRIT), the downloading performance is close to that of science RDR, we rare miss any files. However, unlike the science RDR, we receive much fewer number of redundant housekeeping RDR files, i.e. 0.08% (2 files).

3. For RNSCT, the number of redundant files for each day is pretty stable. On average, 16 files are redundant and no missing data.

4. For SCRIS and GCRSO, since these files are proxy data, not real-time satellite data, there are enough time to process them. Therefore the number of redundant files for each type is zero. But there are always about 14.7% (400 files) missing for each type.

2. SDR Parameters

Table 4: SDR Parameters

Name	Description
npp_cris_window_map	11 µm (902 cm^{-1}) brightness temperature (BT) geological map
npp_cris_H2O_map	6.7 µm (1500 cm^{-1}) BT geological map
npp_cris_CO2_map	13.5 µm (740 cm^{-1}) BT geological map
npp_cris_O3_map	9.7 µm (1030 cm^{-1}) BT geological map
npp_cris_SDR_Quality_map	SDR overall quality flag geological map
npp_cris_SDR_Quality	SDR overall quality flag time series
npp_cris_SDR_AVG_NEDN	Average spectral NEdN within a day
npp_cris_SDR_MAX_NEDN	Maximal spectral NEdN within a day
npp_cris_SDR_MAX_SD_imgy	Maximal standard deviation over one scan (30 FORs) for each band
npp_cris_sdr_Invalid_Radiometric_Calibration	Radiometric Calibration Invalidity quality flag
npp_cris_sdr_Invalid_Spectral_Calibration	Spectral Calibration Invalidity quality flag
npp_cris_sdr_FCE_Correction_Failed	Fringe-count-error correction Failed quality flag
npp_cris_sdr_FCE_Detection	Fringe-count-error Detection quality flag
npp_cris_sdr_Invalid_Geolocation	Geolocation Invalidity quality flag
npp_cris_sdr_Invalid_RDR	Invalid RDR quality flag
npp_cris_sdr_Bit_Trim_Failed	Bit Trim Failed quality flag
SDR_Laser_Wavelength	Measured/Monitored/Re-sampling laser wavelength
SDR_NumberOfValidPRTTemps	Number of valid PRT temperature count
Scan_Level_QF1	Scan-level quality flags: missing scan, timing sequence error, invalid laser wavelength calculation, invalid instrument temperatures, excessive thermal drift, suspect neon calibration
SDR_DS_Symmetry	Asymmetry in deep space interferograms
SDR_ICT_Temp_Stab_Cons	ICT temperature stability & consistency
SDR_DS_WindowSize	Deep space window size
SDR_ICT_WindowSize	ICT window size
SDR_DS_SpectralStability	Deep space spectral stability
SDR_ICT_SpectralStability	ICT spectral stability
SDR_ImpulseNoise_Count	RDR impulse noise count
SDR_SDRFringe_Count	SDR Fringe count
SDR_ES_ZPDFringe_Count	Earth scene (ES) zero path difference (ZPD) fringe count
SDR_ES_ZPDMagnitude_Count	ES ZPD Magnitude
npp_cris_sdr_Day_Night	Day/Night flag
SDR_Lunar_Intrusion_QF2	Lunar Intrusion flag
npp_cris_SDR_Spectrum_NP	Spectral Radiance/BT at North Pole
npp_cris_SDR_Spectrum_EQ	Spectral Radiance/BT at Equator
npp_cris_SDR_Spectrum_SP	Spectral Radiance/BT at South Pole

Brightness Temperature, 11 µm

Brightness Temperature, 6.7 µm (H$_2$O)

Brightness Temperature, 13.5 µm (CO$_2$)

Brightness Temperature, 9.7 µm (O$_3$)

Summary

The CrIS long-term trending/monitoring system is ready for the real data stream at NOAA-STAR.