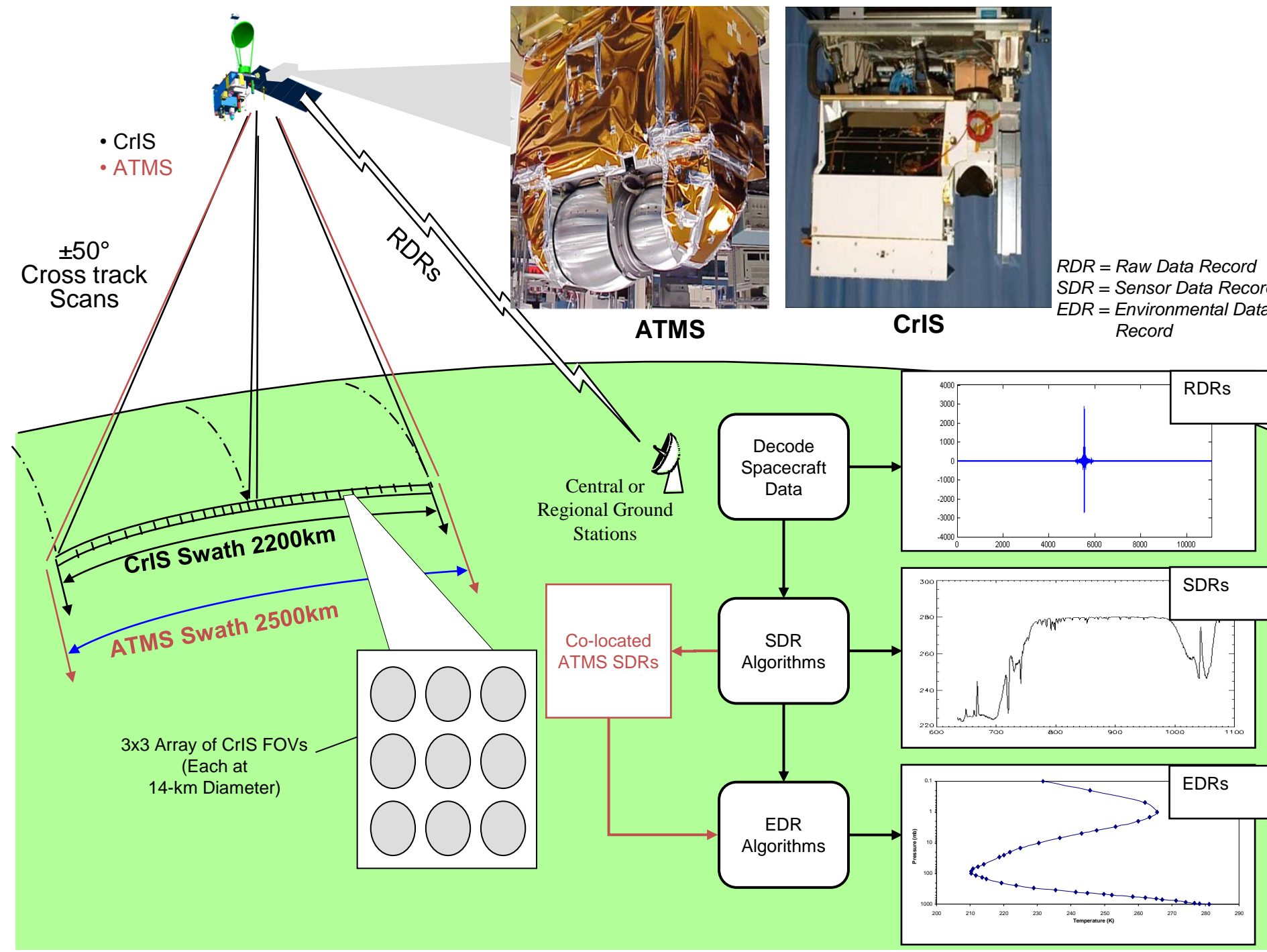


Vladimir Zavyalov, Mark Esplin, Mark Greenman, Deron Scott, Ben Esplin, Brandon Graham, Charles Major, and Kevin Grant.

CrIS sensor overview:

The Cross-track Infrared Sounder (CrIS) is part of the Cross-track Infrared and Microwave Sounding Suite (CrIMSS) instrument suite that will be used to produce accurate temperature, water vapor, and pressure profiles on the NPOESS Preparatory Project (NPP) mission and upcoming Joint Polar Satellite System (JPSS) operational missions.

The NPP satellite has been launched on the October 28, 2011.



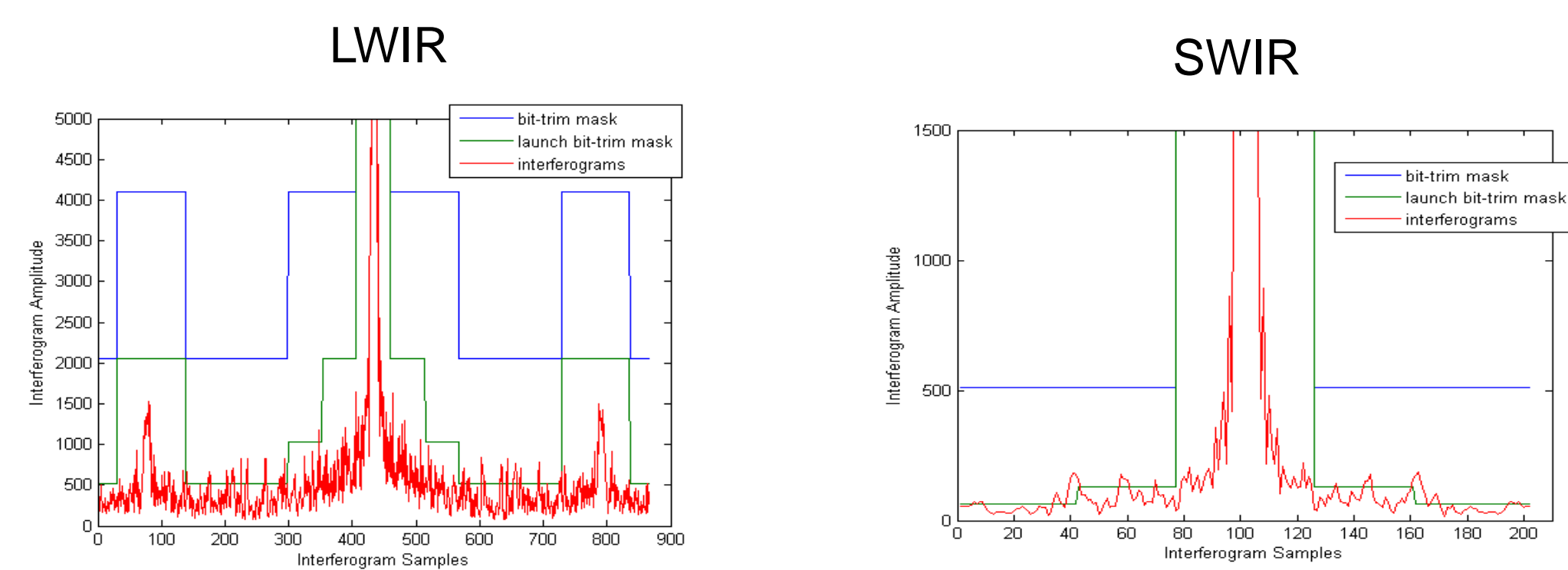
Key Technical aspects of CrIS:
Fourier Transform Spectrometer
Spectral Range 650 to 2550 cm^{-1}
Spectral resolution:
SWIR 2.5 cm^{-1}
MWIR 1.25 cm^{-1}
LWIR 0.625 cm^{-1}
14 km nadir FOV spatial resolution
Fields of Regard 3x3 FOVs
Photovoltaic detectors in 3 bands
4-stage Passive Detector Cooler
On-board calibration target ICT

CrIS acceptance testing:
Supplier: Exelis/ITT
CrIS FM1 has completed Thermal Vacuum testing:
Vibration & EMI tests
FOV Shape / Coregistration
Spectral Accuracy / ILS
NEDN
Radiometric uncertainty
Linearity testing and correction
Short Term Repeatability
Long Term Repeatability
Integration on S/C and TVAC test.

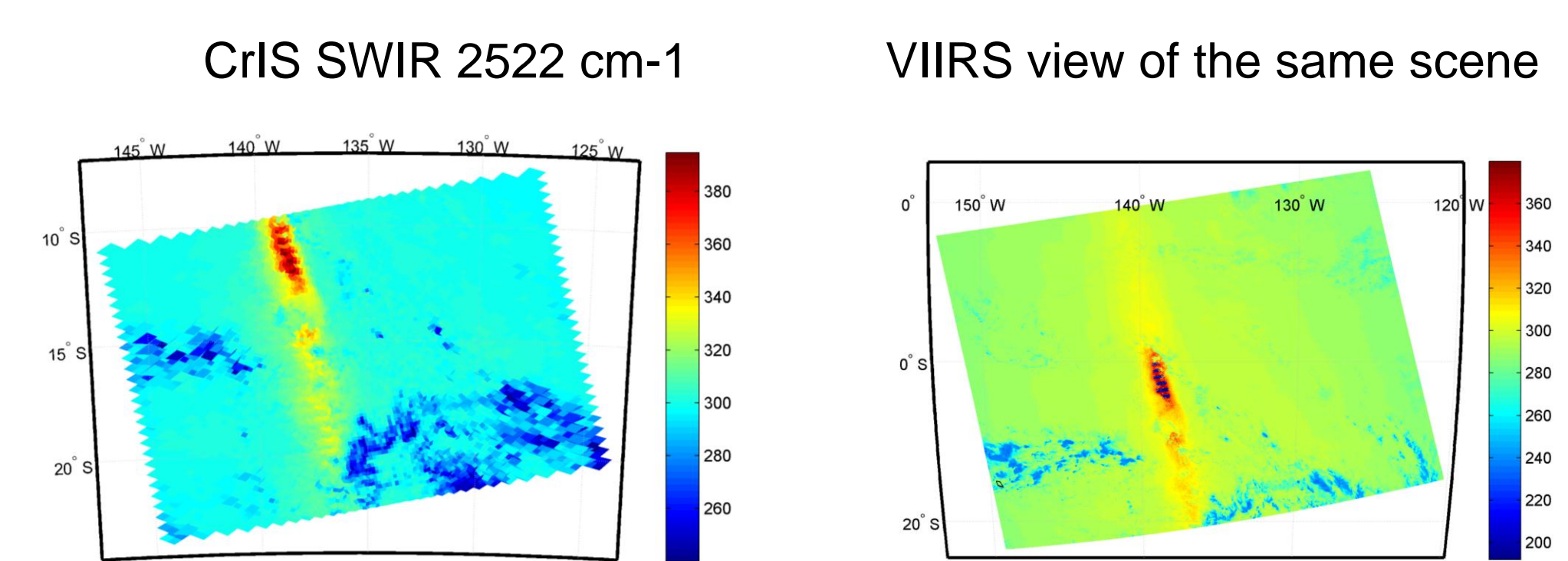
CrIS on-orbit check-out and calibration activities:

- End of outgassing and release Cooler Door - 01/18/12
- IM power up to nominal mode - 01/18/12
- Signal processor Power up, Orbit 1194 - 01/20/12
- PGA gain adjustment - 01/21-26/12
- Optical ZPD offset adjustment - 01/23/12
- Bias tilt optimization - 01/23/12
- Bit trim mask optimization - 01/23/12
- Bit trim and impulse noise adjustment - 01/30/12
- Bit trim mask update - 02/06/12
- Spectral calibration, Ne-lamp check - 01/08-09/12
- Linearity check - 01/08-09/12
- Preliminary Cal table upload (EP V. 32) - 01/31/12
- NEDN check - 02/09/12
- Full resolution data acquisition - 02/22/12
- Non-linearity coefficient setting (a2, Vinst) - "Golden day"
- "Golden days" - 02/24-26/12
- Updated Cal table upload (EP V. 33) - 03/23/12

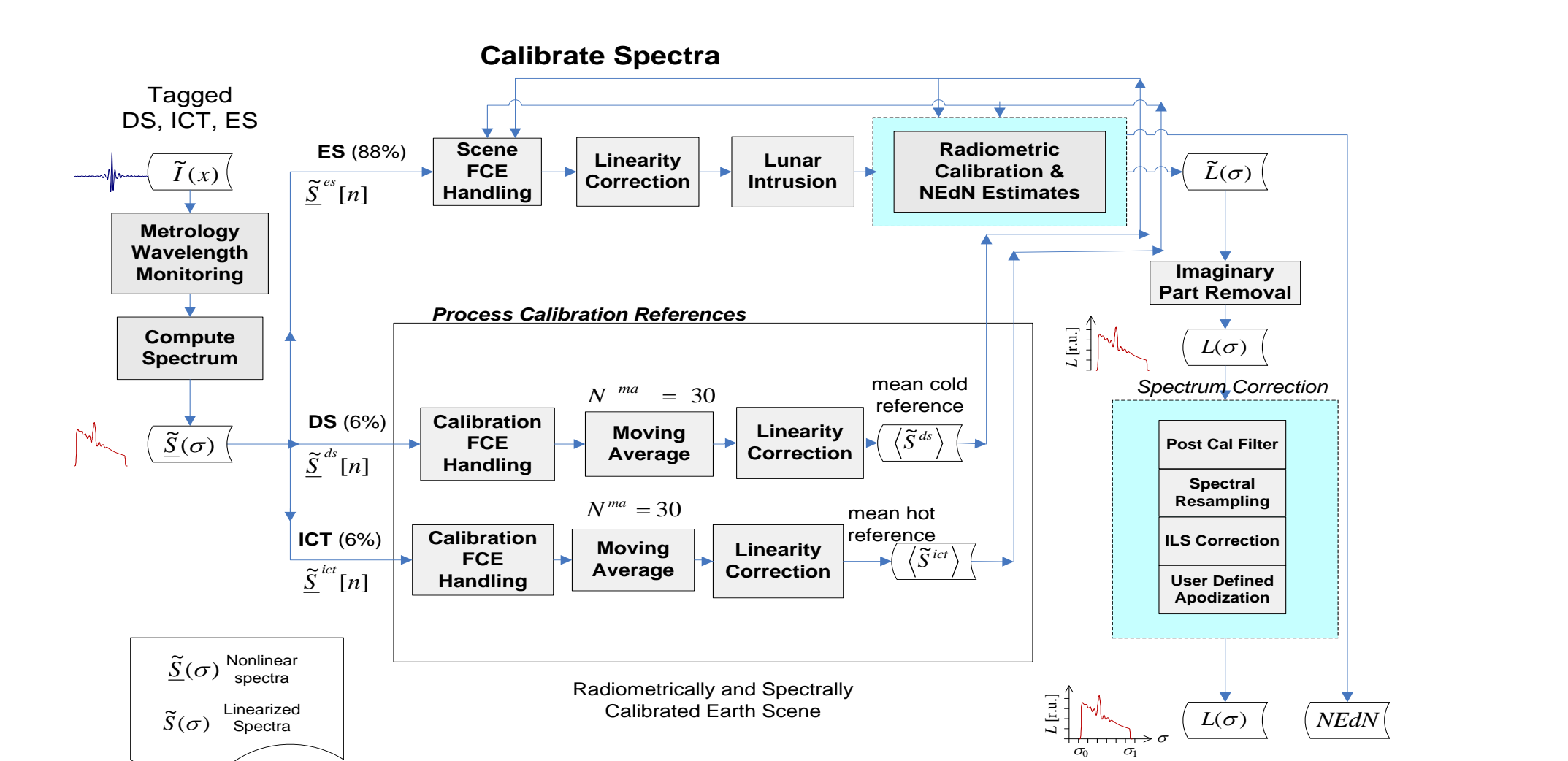
Bit trim mask optimization



Sun Glint Induced Saturated interferograms on February 10, 2012



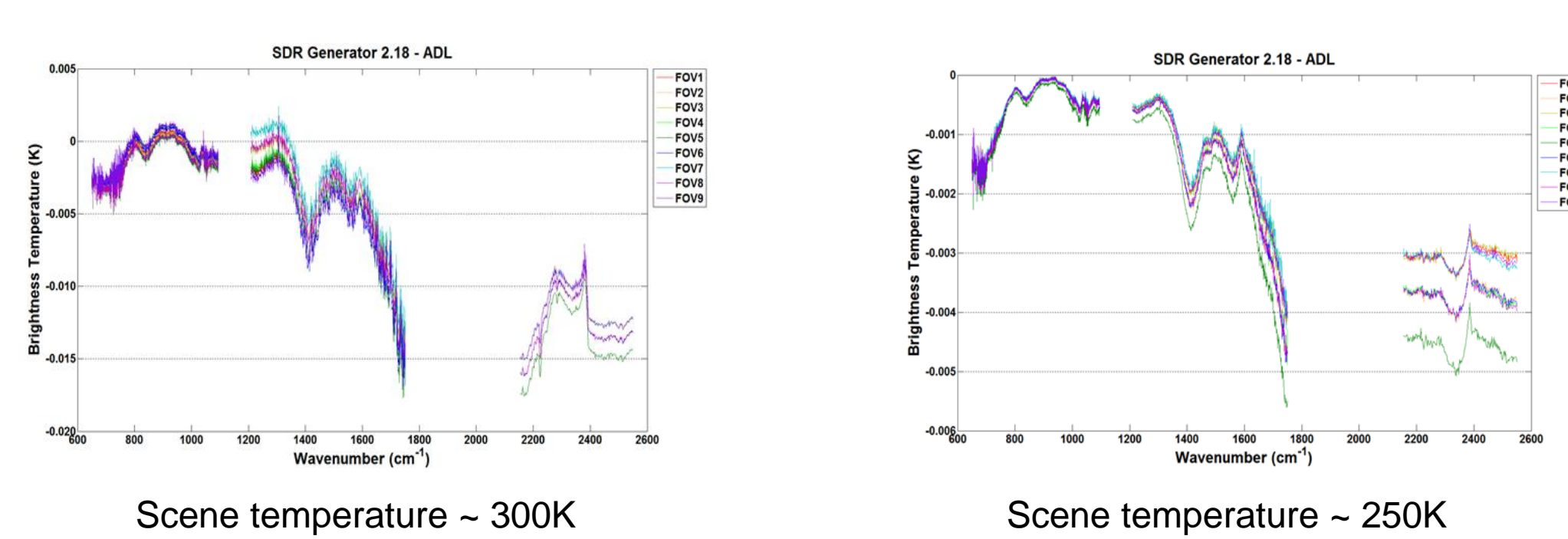
SDR calibration process:



CrIS Level 0 to Level 1C processing is provided by the Sensor Data Record (SDR) process:
• SDR algorithm was developed by ITT in parallel with the sensor testing
• SDR performance was validated by using the SDR software to process synthetic, proxy, and TVAC data
• SDR process has been updated to correct non-linearity and compensate for ICT emissivity
• On-orbit data collections addressed non-linearity, absolute radiometric and spectral calibration

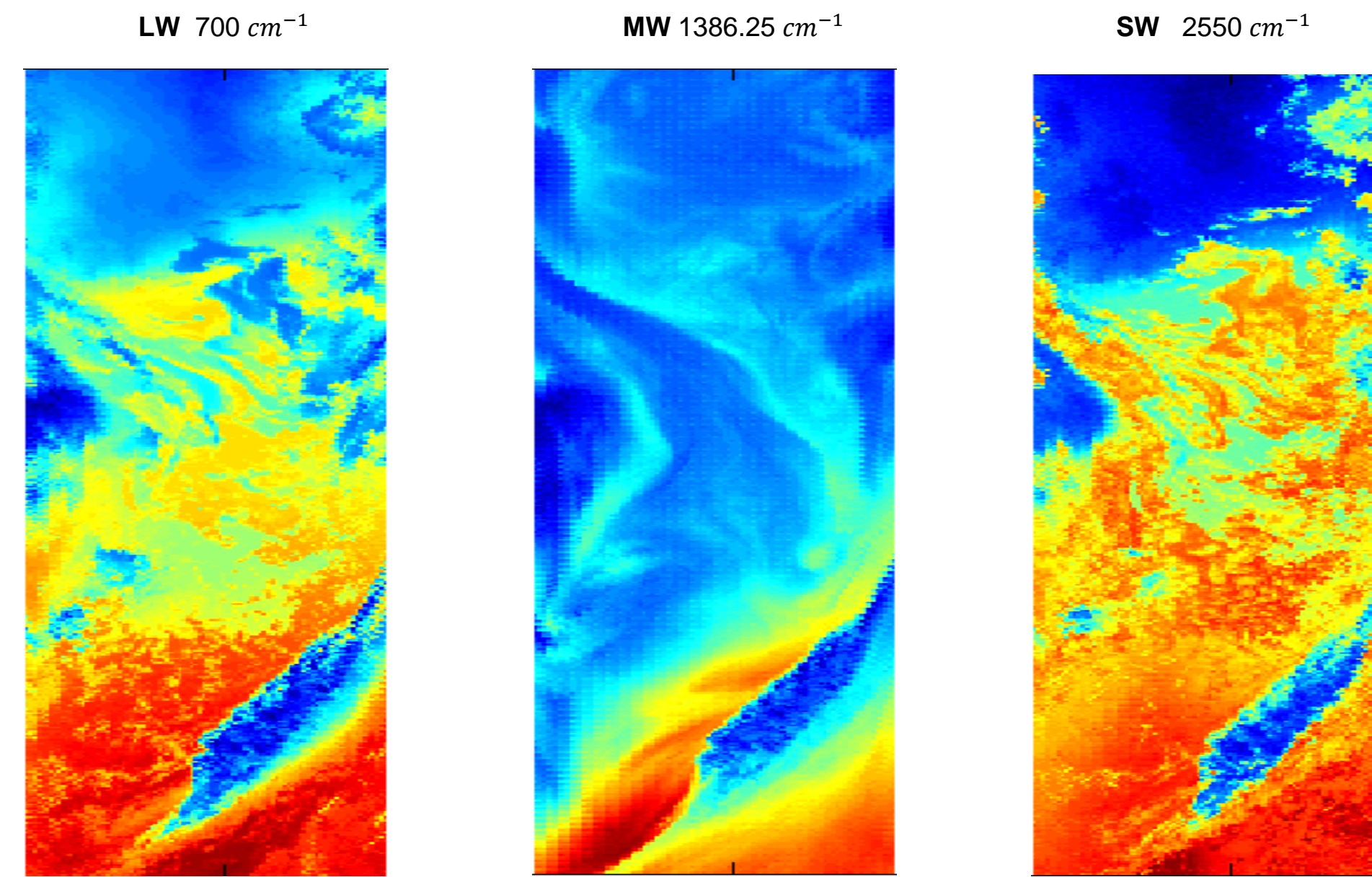
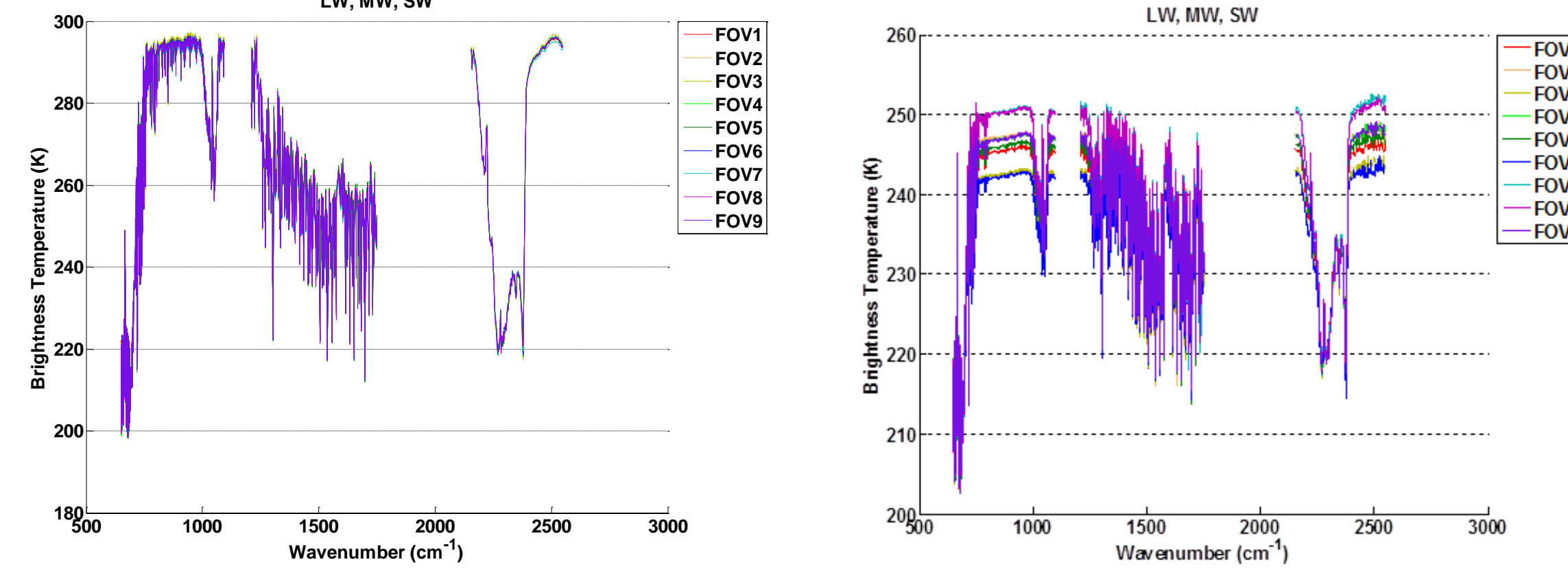
On-orbit Operational SDR algorithm validation.

BT differences between science and operational codes.

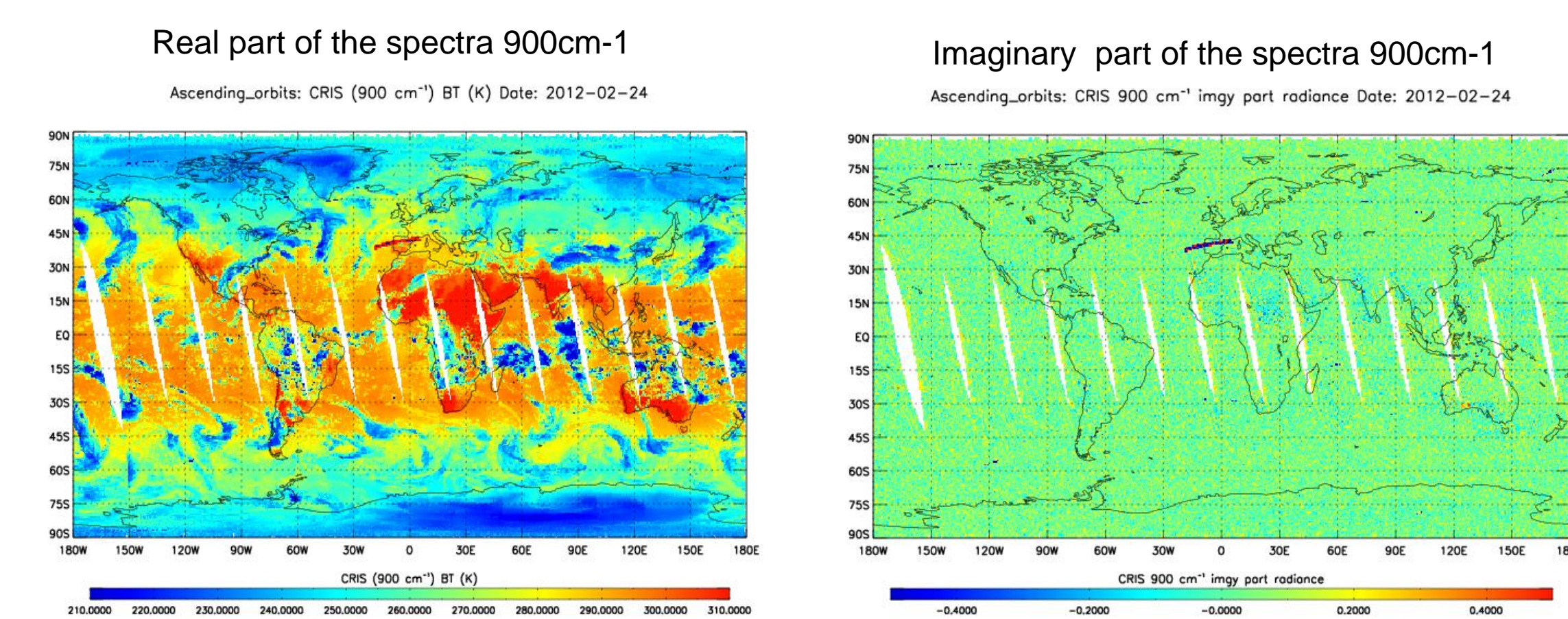


First spectra and images from CrIS:

Orbit 1194, January 20, 2012

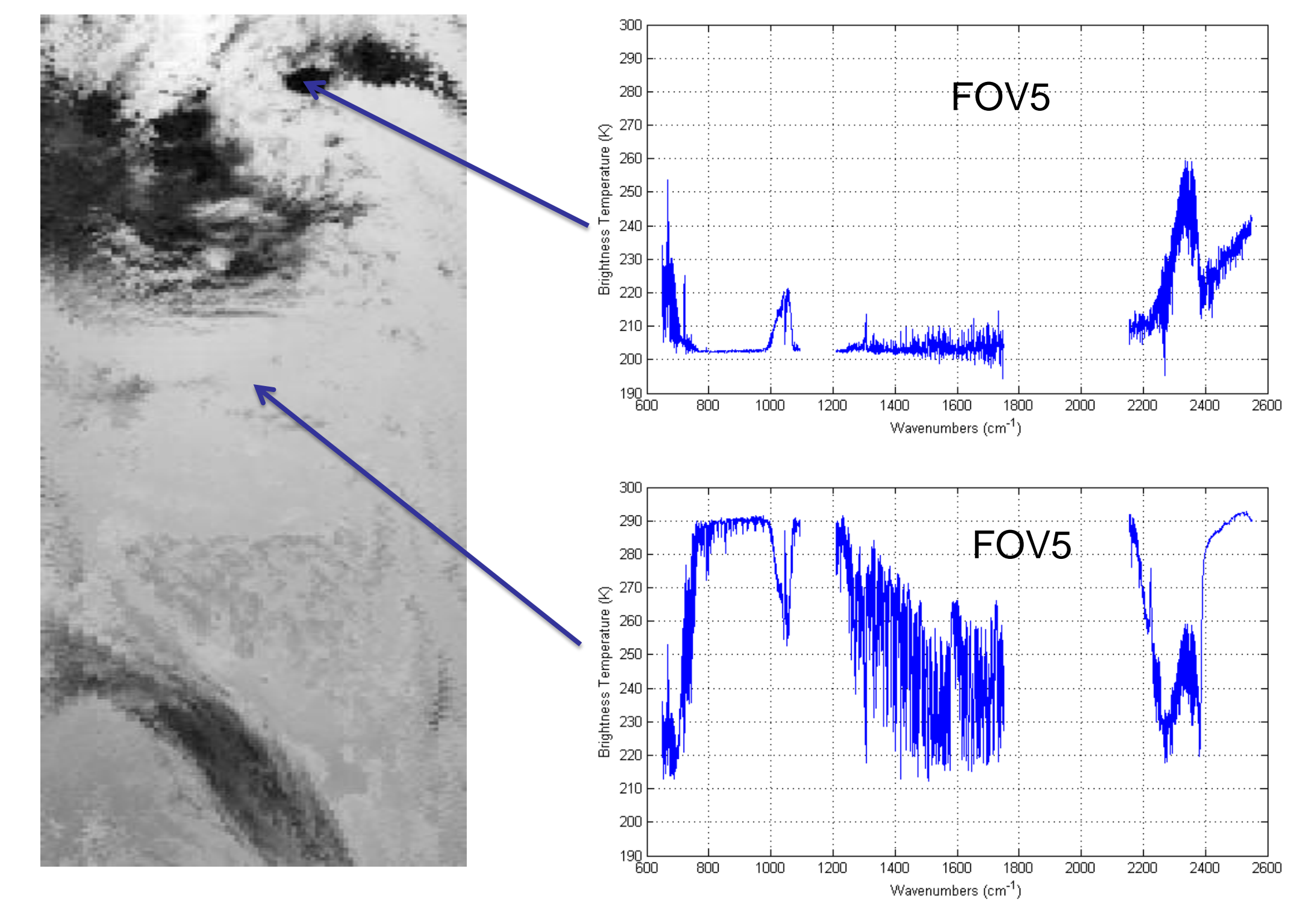


NOAA/STAR: "Golden Day" February 24, 2012



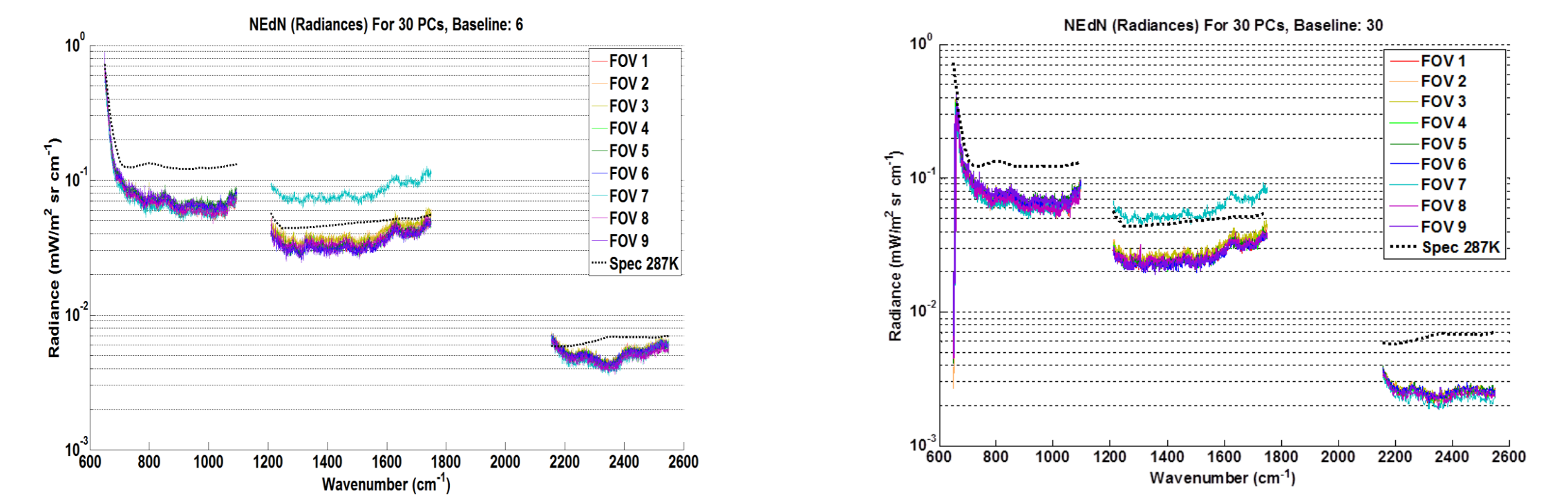
CrIS full spectral resolution test, February 22, 2012:

Calibrated spectra in "hot" and "cold" spots:



NEDN estimated from Earth Scene data using PCA technique

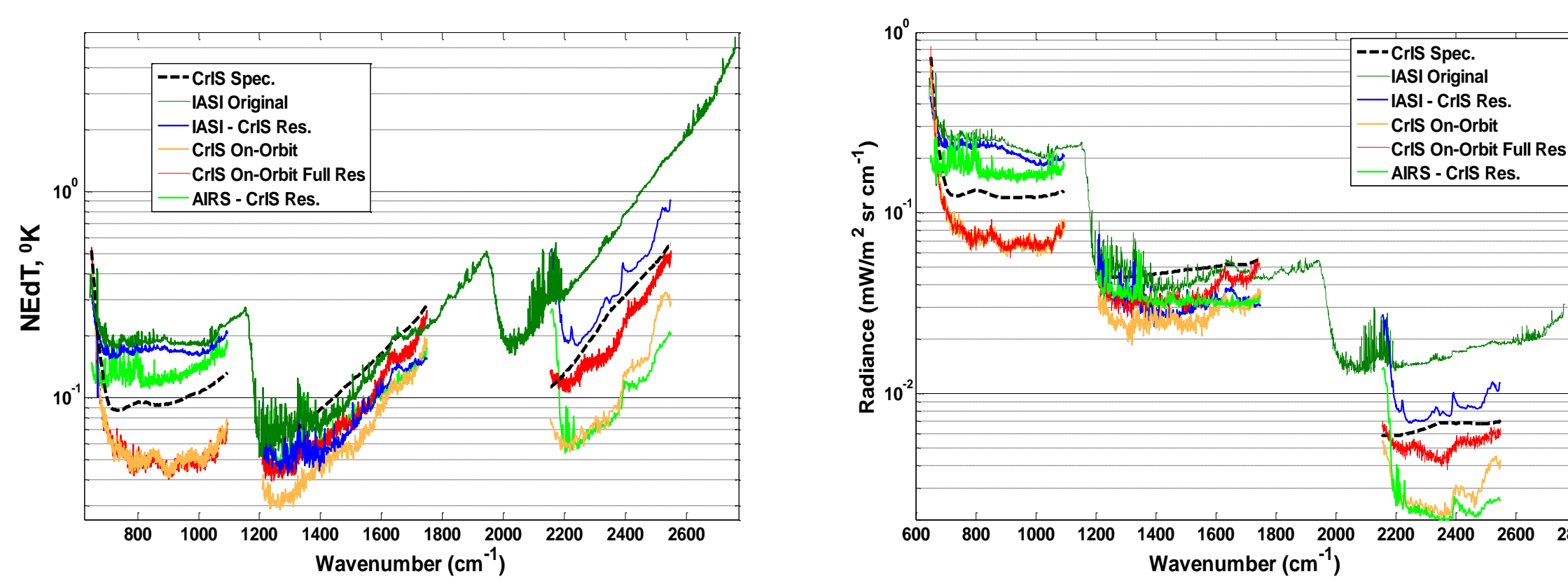
Full resolution, 02/22/12 Standard resolution, 02/21/12



Full resolution NEDN is larger in MWIR (~x1.5) and SWIR (~x2) bands as expected

- > Full resolution data collection was successful
- > Full resolution test has shown that CrIS is fully capable to provide full resolution data at 0.625 cm^{-1} resolution in all spectral bands
- > Expected full resolution in MWIR and SWIR spectral bands was seen
- > No significant problems were observed during this test
- > Operational processing of full resolution data could be implemented

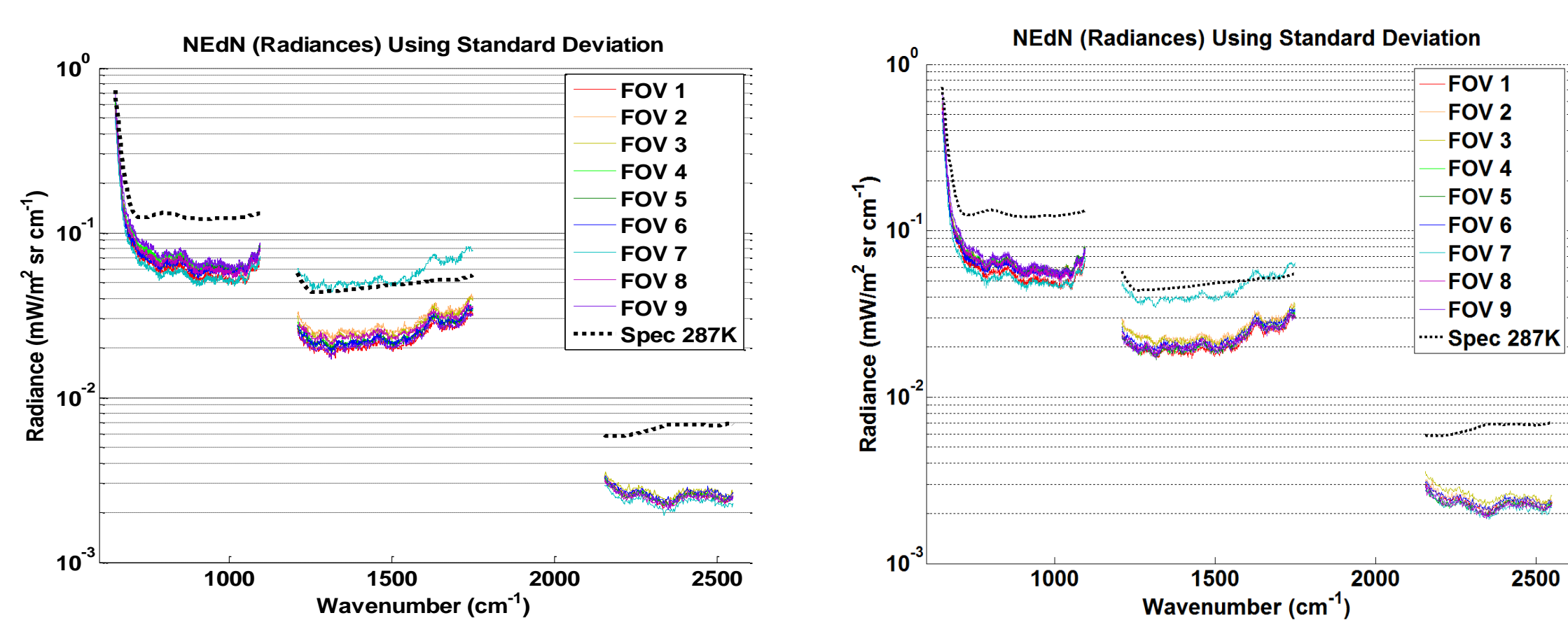
Instrument noise: NEDN/NEDt vs. IASI and AIRS



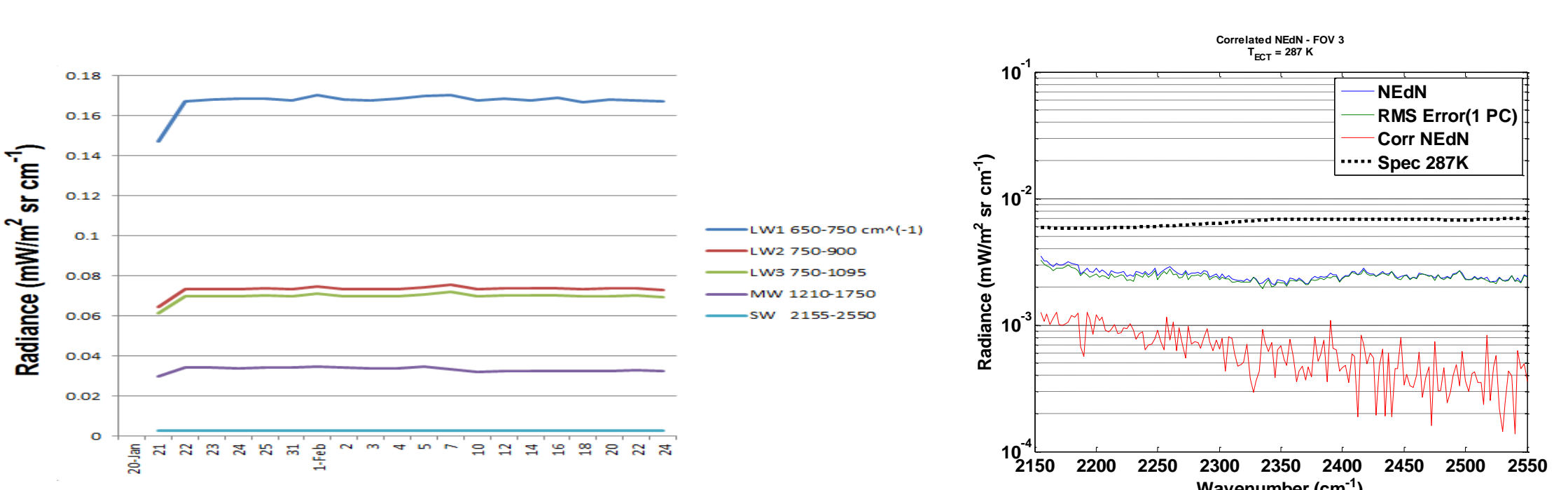
CrIS NEDt vs AIRS and IASI at native instrument resolution (T=270K):
• CrIS has smaller noise levels than AIRS and IASI
• NEDt performance exceeds spec. even at full spectral resolution in MWIR and SWIR spectral bands

CrIS NEDN vs IASI noise at CrIS spectral resolution:
• NEDN is estimated using SDL PCA approach with 30 PCs
• CrIS exhibits smaller noise level in LWIR (~x3.5) and SWIR (~x3) spectral bands than noise estimated from IASI observations reduced to CrIS spectral resolution

On-orbit CrIS noise performance was estimated using ICT and DS targets:



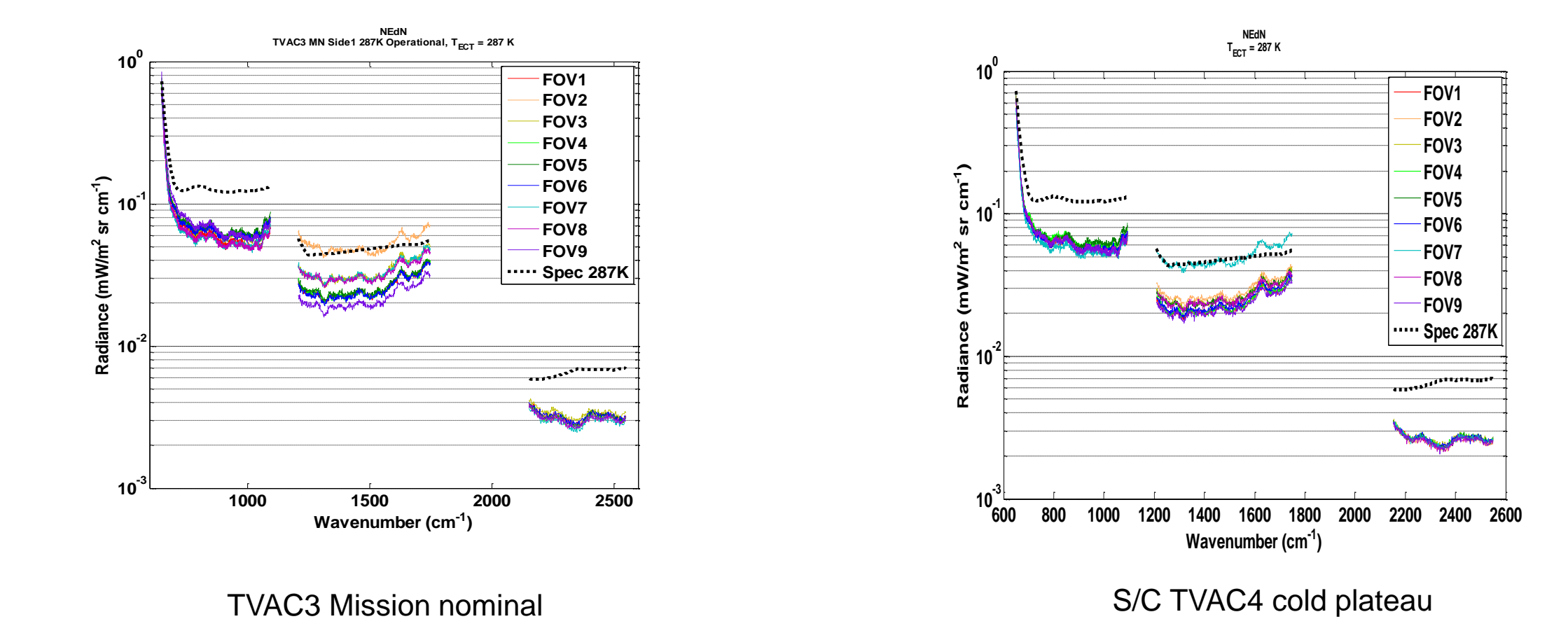
NEDN trend: January-February DS SWIR correlated noise contribution



Instrument noise is very stable
NEDN was averaged over all FOVs and over spectral regions:
LWIR: 650-750, 750-900, and 750-195 cm^{-1}
MWIR: Entire band 1210-1750 cm^{-1}
SWIR: Entire band 2155-2550 cm^{-1}

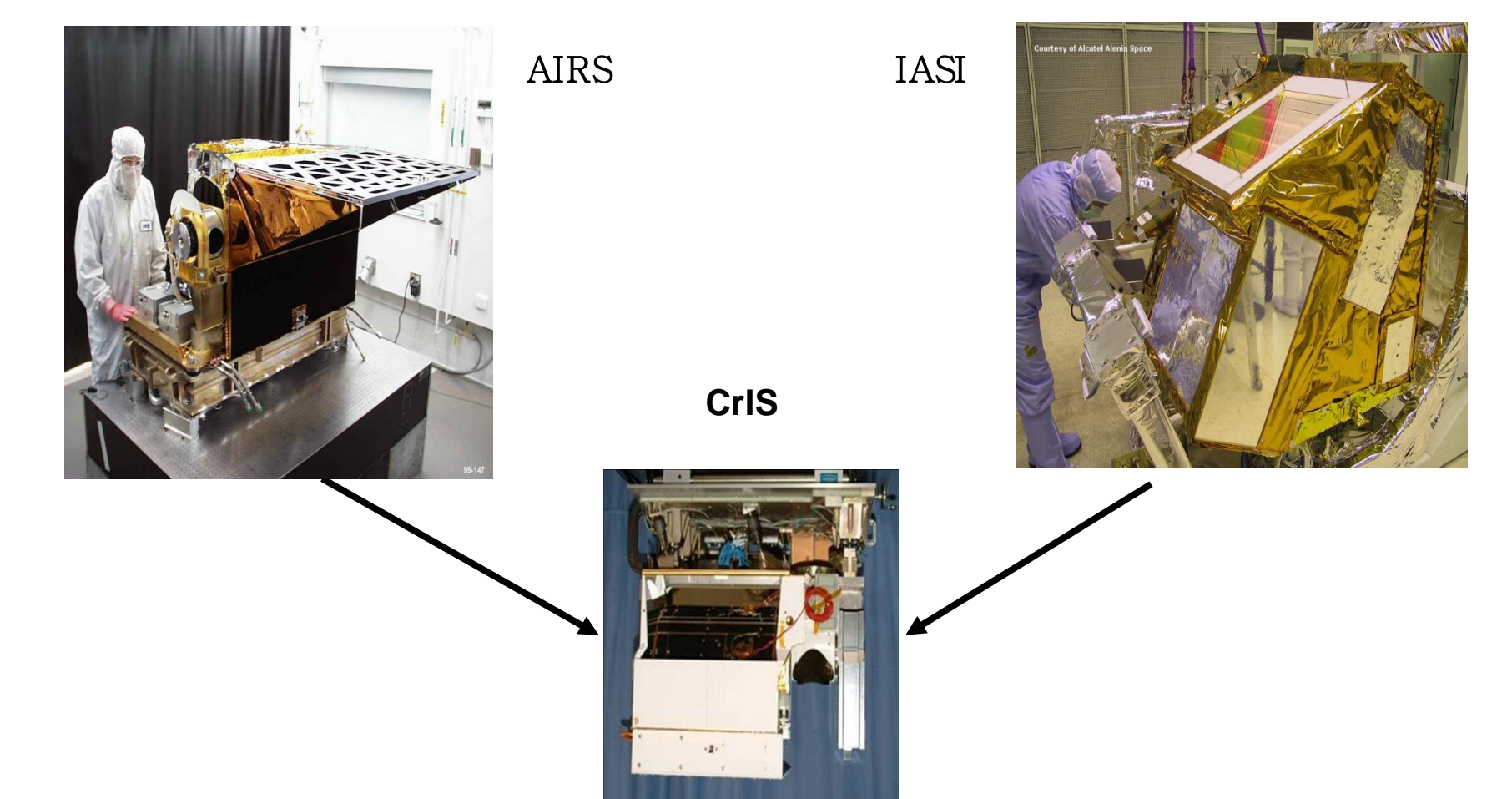
Overall CrIS noise performance is outstanding (well below spec)
NEDN of MWIR FOV7 is out of family as it was during TVAC4 and S/C ground tests
During ground tests analogues outages were observed in MWIR band for several FOVs: MWIR FOV2 (TVAC3) and MWIR FOV7 (TVAC4, S/C TVAC)
Root cause: detector diode material changes with warmup-cooldown cycles
NEDN estimated from Earth view (PCA approach), ICT, and DS targets agree very well
CrIS instrument noise is very stable during two months on orbit

NEDN performance during ground TVAC3 and S/C TVAC testing:



Cal/Val Activities are underway:

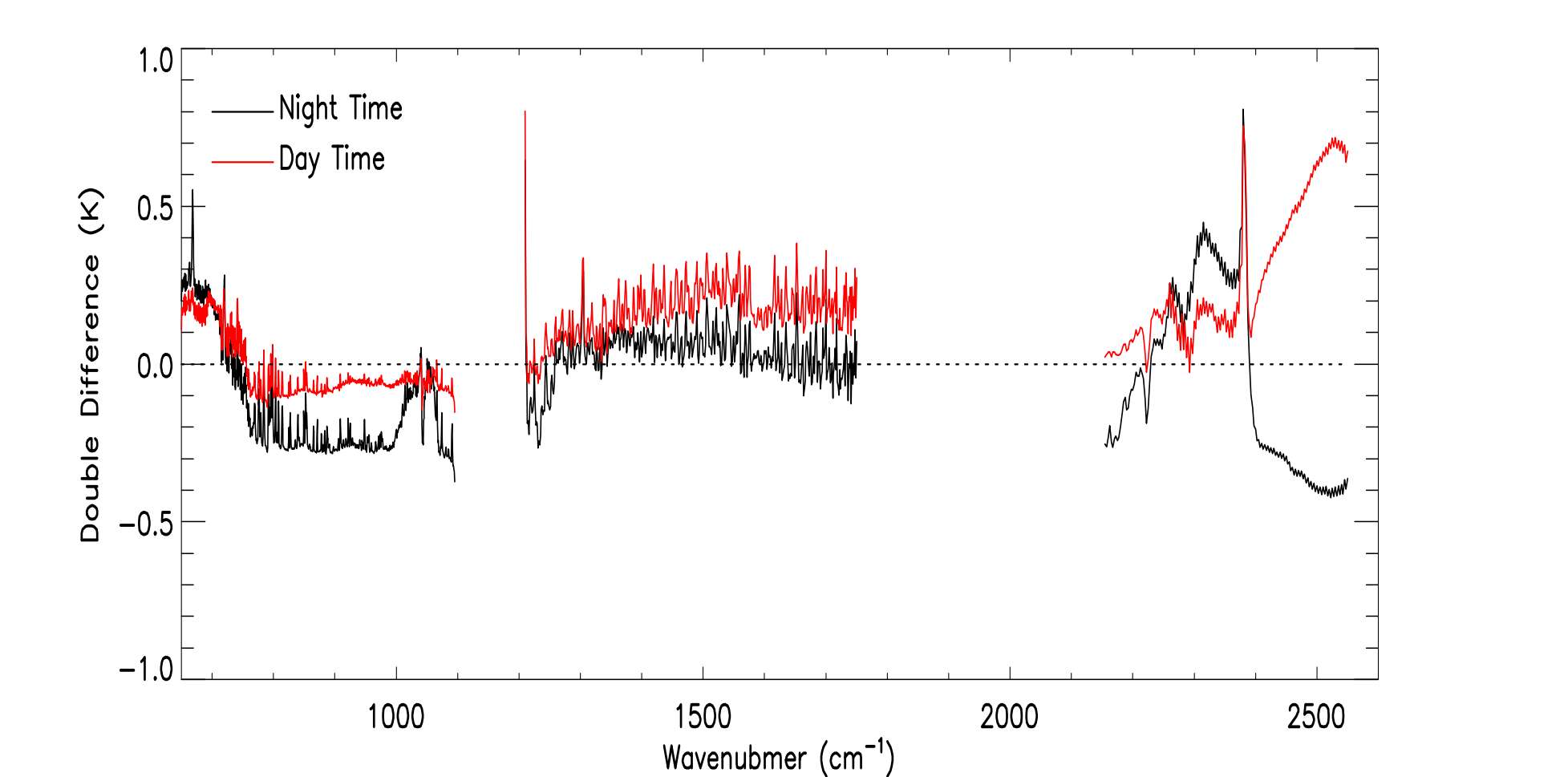
CrIS follows two great, well calibrated instruments
SDR Cal/Val has/will utilize similar procedures
Co-existence enables direct comparison from GSICS
Cal/Val team brings direct AIRS/IASI experience



CrIS SDR Cal/Val plan is a joint effort of industry and government team:

- > Plan incorporates a comprehensive list of SDR tasks
- > Instrument on-orbit operating procedures
- > Cal/Val tools
- > On-orbit characterization and SDR algorithm updates
- > Team members linked by Internet and teleconferencing links
- > System was tested during TVAC and pre-launch exercises
- > Cal/Val team members have extensive experience working with AIRS and IASI

NOAA/STAR: Double difference between CrIS and IASI, February 25, 2012



Summary:

- > CrIS instrument on-orbit performance is excellent and stable
- > Instrument noise is very low and stable
- > Preliminary results confirmed CrIS excellent spectral calibration
- > Early sensor checkout and validation has been completed
- > Intensive calibration activities is in process to upload Calibration Table (EP #33) based on the on-orbit optimized parameters
- > Careful, in-depth coordination of CrIS SDR and CrIMSS EDR teams and software/tools is critical to timely and accurate post-launch validation.
- > In development and testing for intensive Cal/Val activities: Cal/Val tools and procedures