

J1 SCDB Analysis, Conversion to LUT, and Testing

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Outline

- Sensor Characterization Databases
- Algorithm Lookup Tables
- Plan Forward and Schedule

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Sensor Characterization Databases

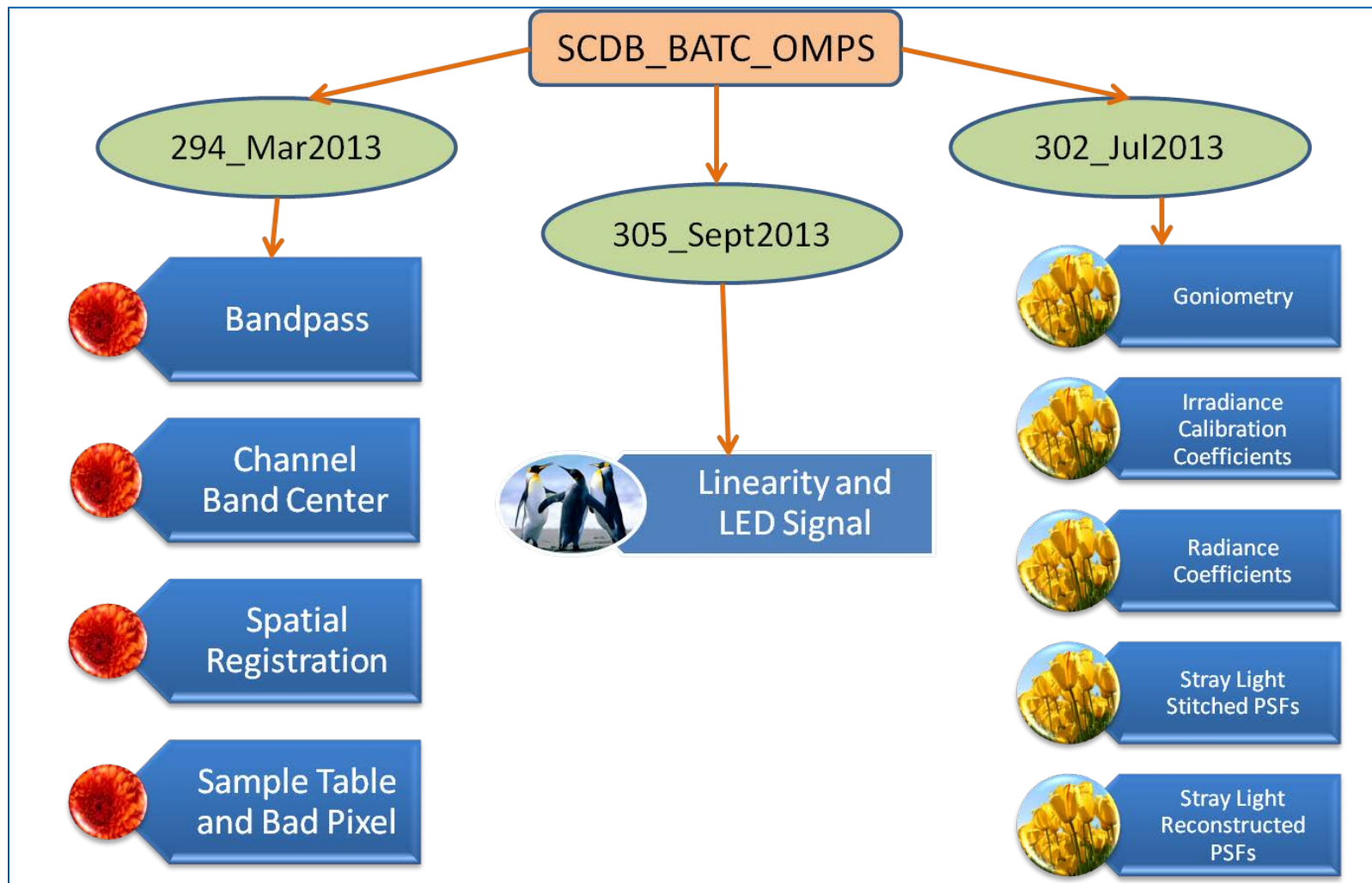
Sensor Characterization Databases

- Sensor characterization databases (SCDB) provide the best estimate of OMPS sensor characteristics based on ground-based measurements
 - Measurement: Sample Table (STB), Timing Pattern (TGP)
 - TPG are based on On-Orbit Operators Manual (OOOM)
 - Spectrometric: Channel Band Center (CBC), Band Pass (BPS)
 - Radiometric: Radiance Coefficients (RAD), Irradiance Coefficient (IRD), Stray Light (SLT)
 - Geolocation: Spatial Registration (SRG)
- SCDB evaluation includes
 - Review of accompanying DADD for product requirements , product generation algorithm, test and verification procedures
 - Review of product metadata and database structure in HDF file
 - Inspection of product database dimensions and values
 - Values, Range, Fill, Offsets, Flags

Sensor Characterization Databases

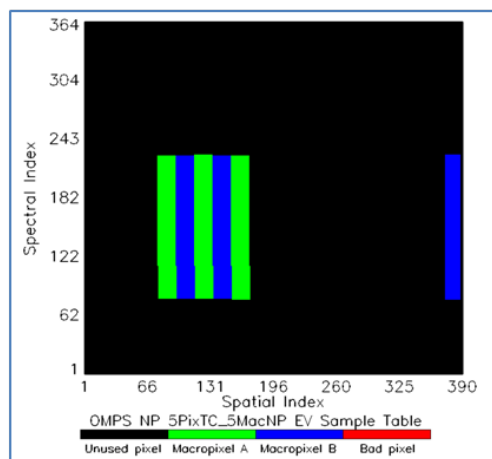
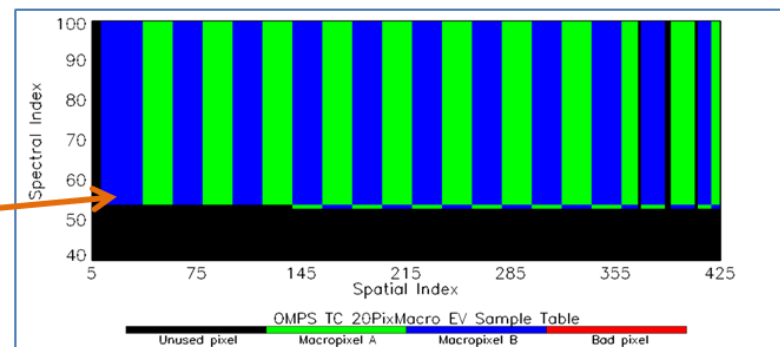
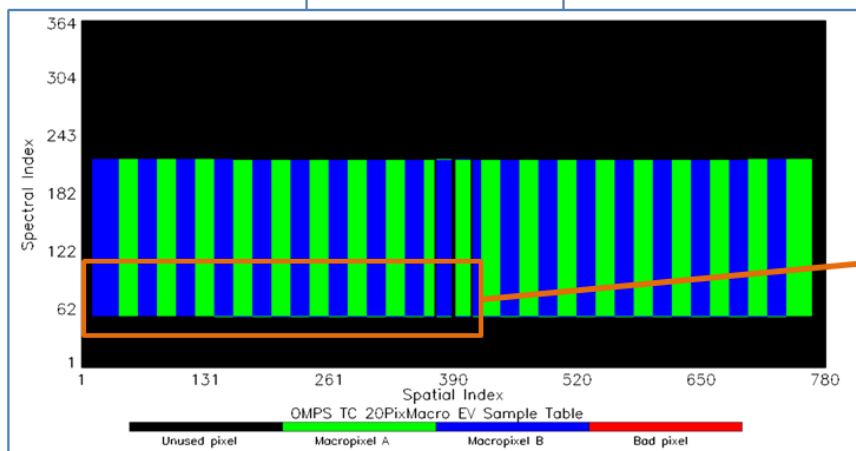
- SCDB evaluation includes (continued)
 - Analysis of product database
 - Execute a sample of BATC test procedures
 - Visualization of product database
 - Conversion to product database to SDR algorithm LUT
 - Verification of SDR algorithm LUT

Summary of Database Content

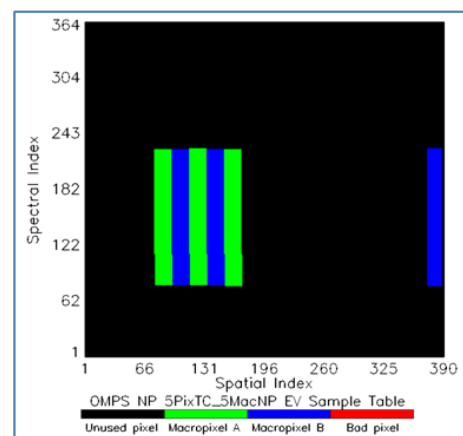


Flight-like Earth View Sample Table (NM and NP)

NM 20-pixel

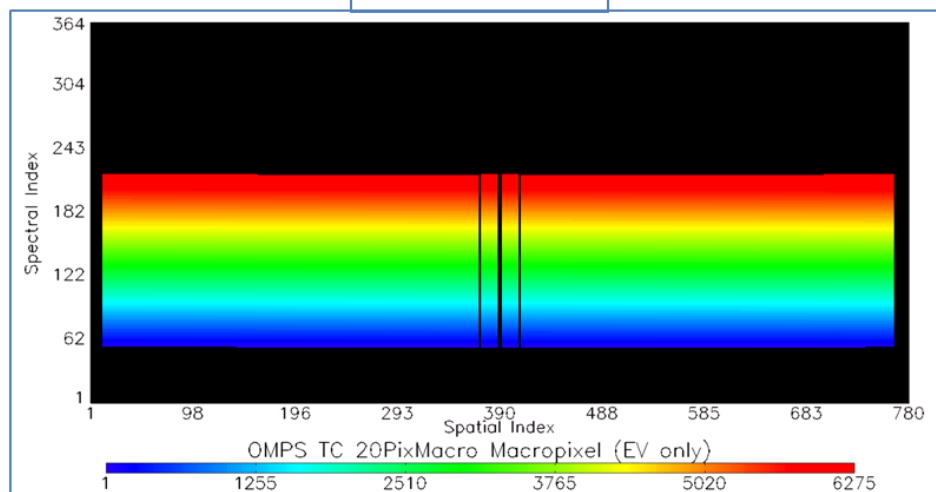


NP

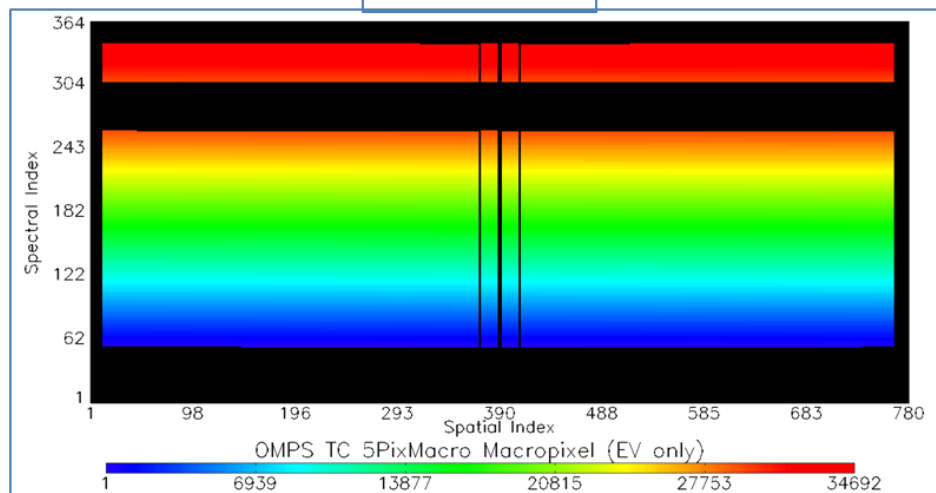


Earth View Macropixel Table

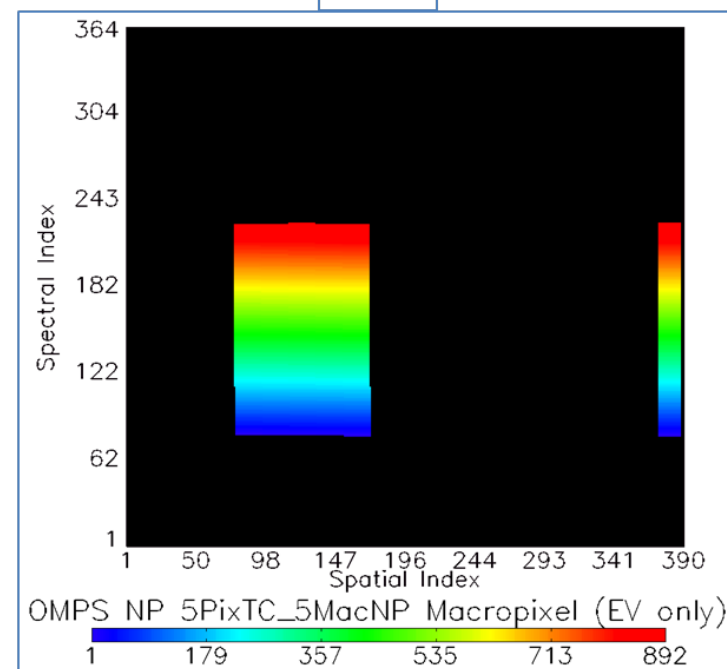
NM 20-pixel



NM 5-pixel



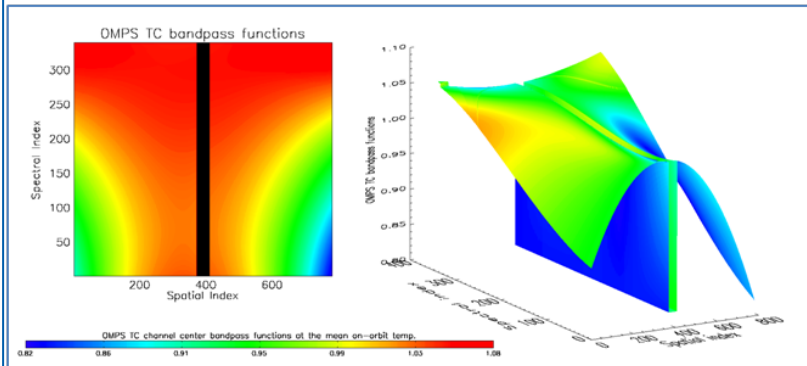
NP



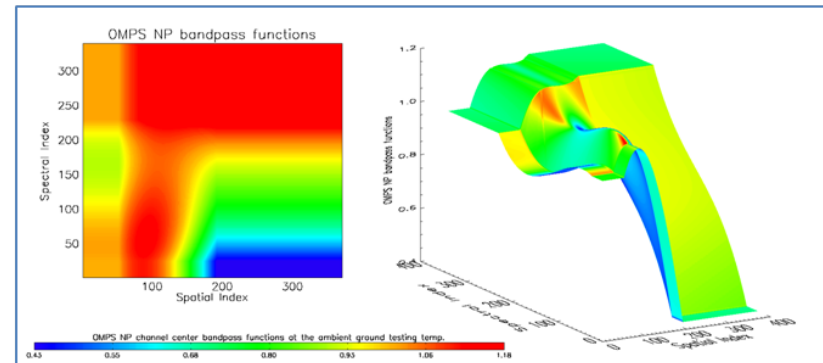
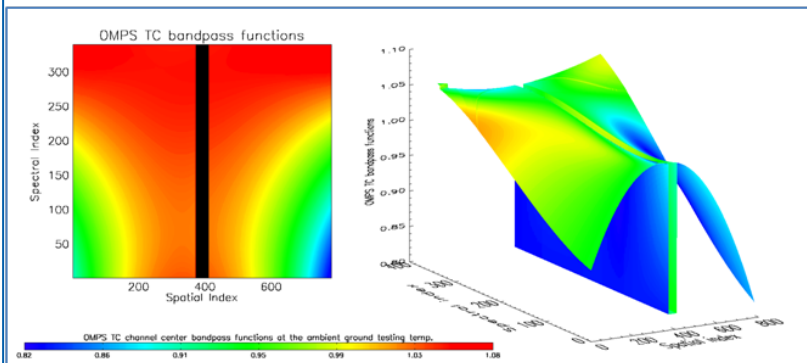
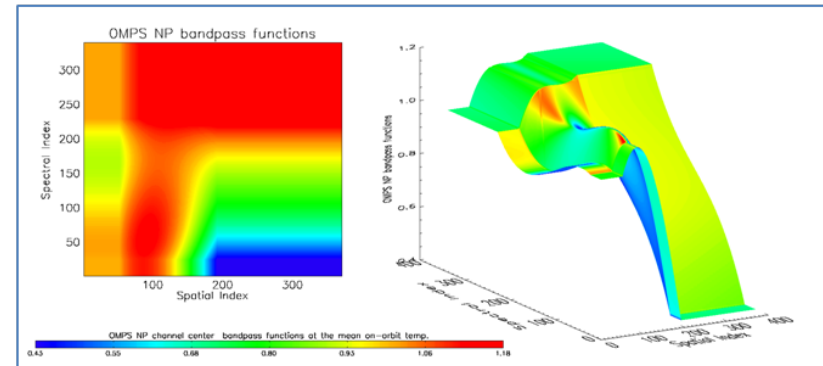
- NM 20-pixel macropix #: 1-6275
- NM 5-pixel macropix #: 1-34692
- NP macropix #: 1-892

Two sets of Band-pass Functions at Channel Centers: On-orbit Temp (Top) and Ambient Temp. (Bottom)

NM



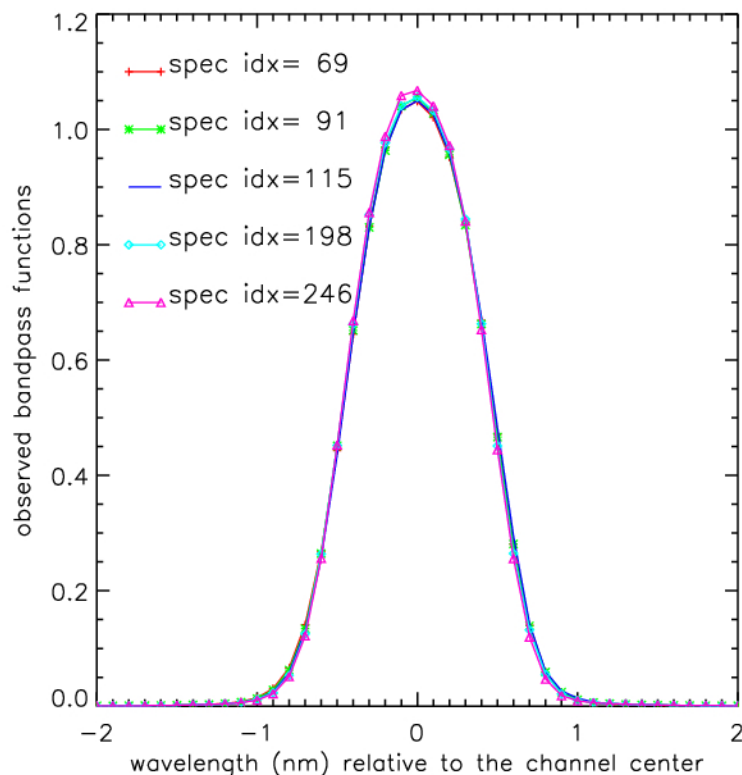
NP



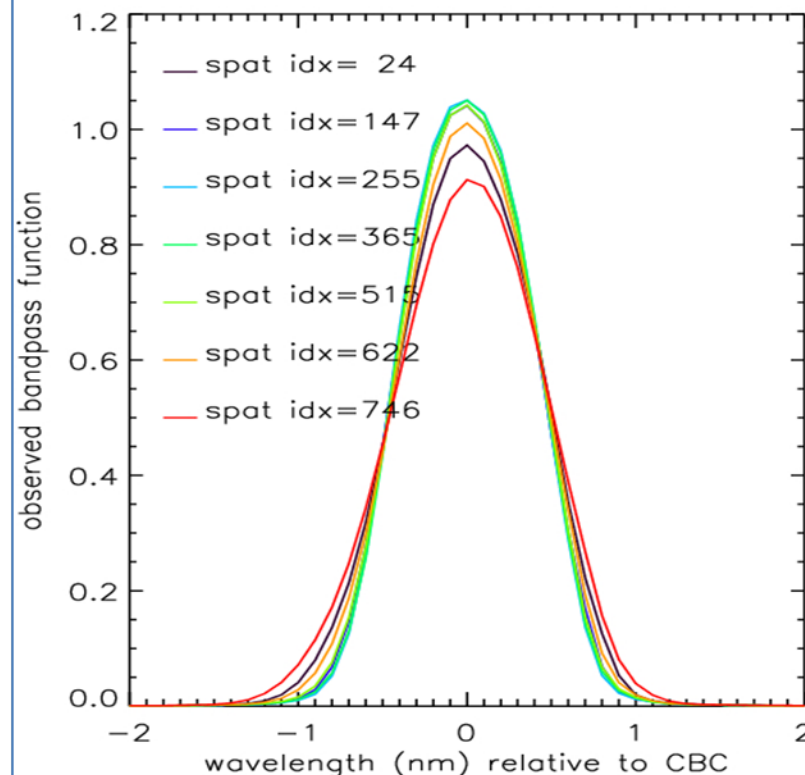
J1 OMPS BPS is temperature independent!

Band-pass Functions Spatial and Spectral Variations

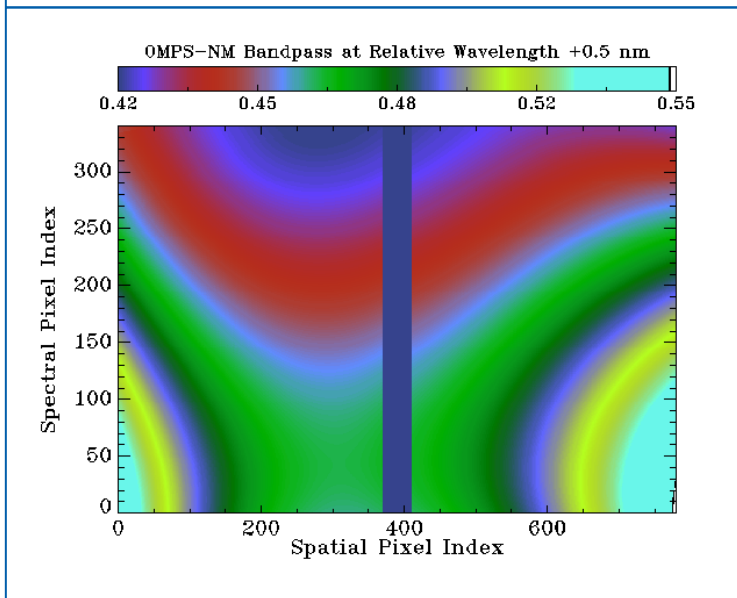
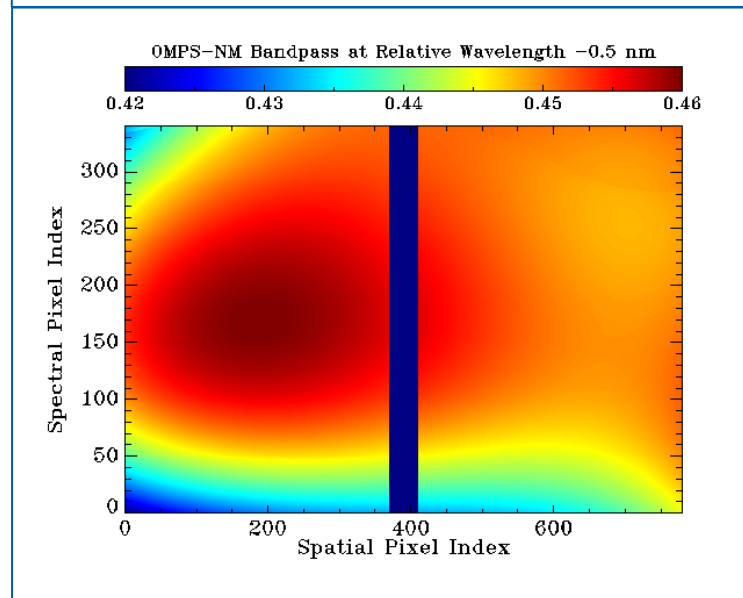
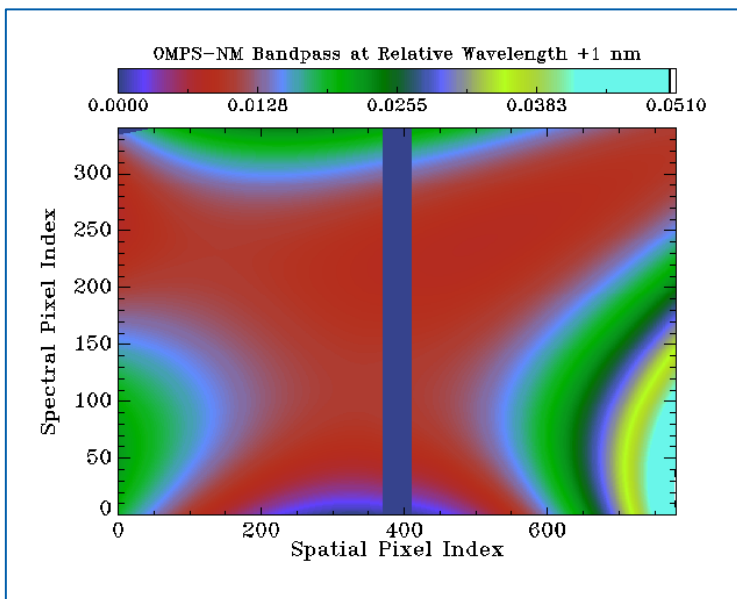
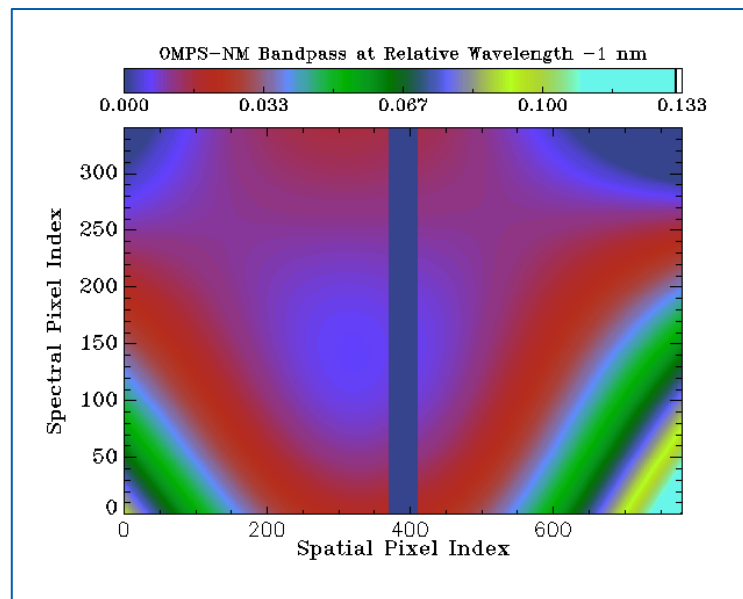
Spectral Variation at Spatial #365



Spatial Variation at Spectral #115

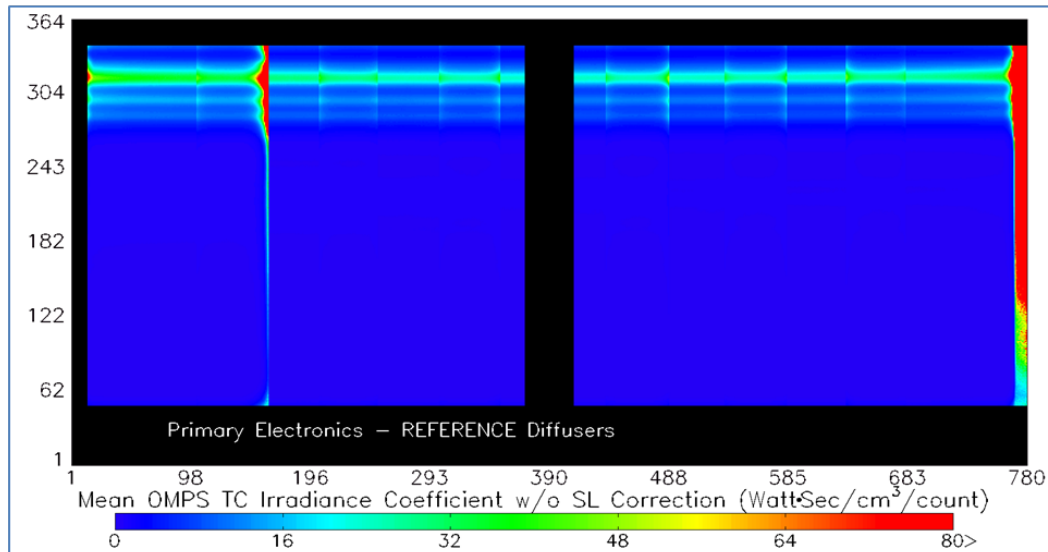
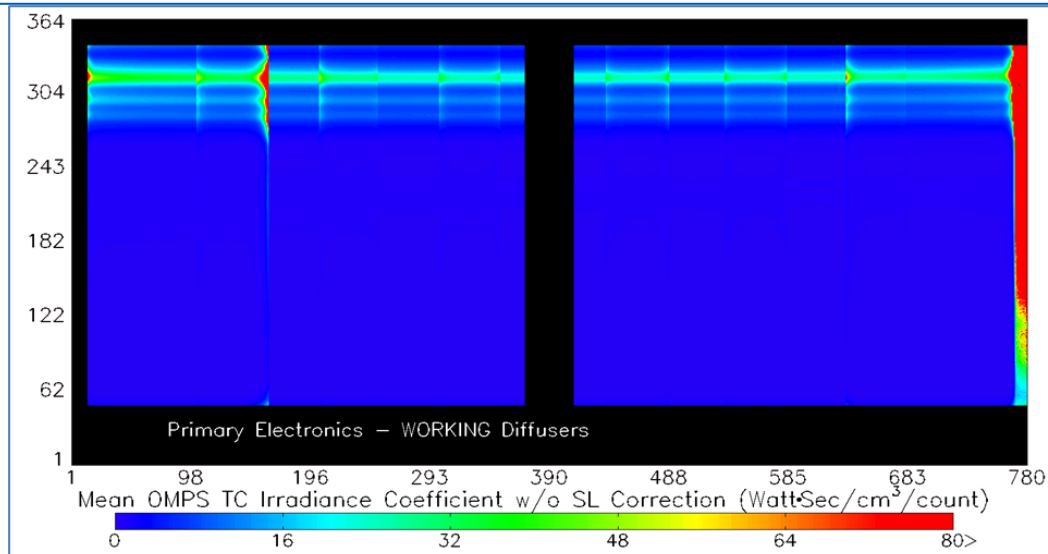


OMPS-NM Ground Band-Pass J1 SCDB

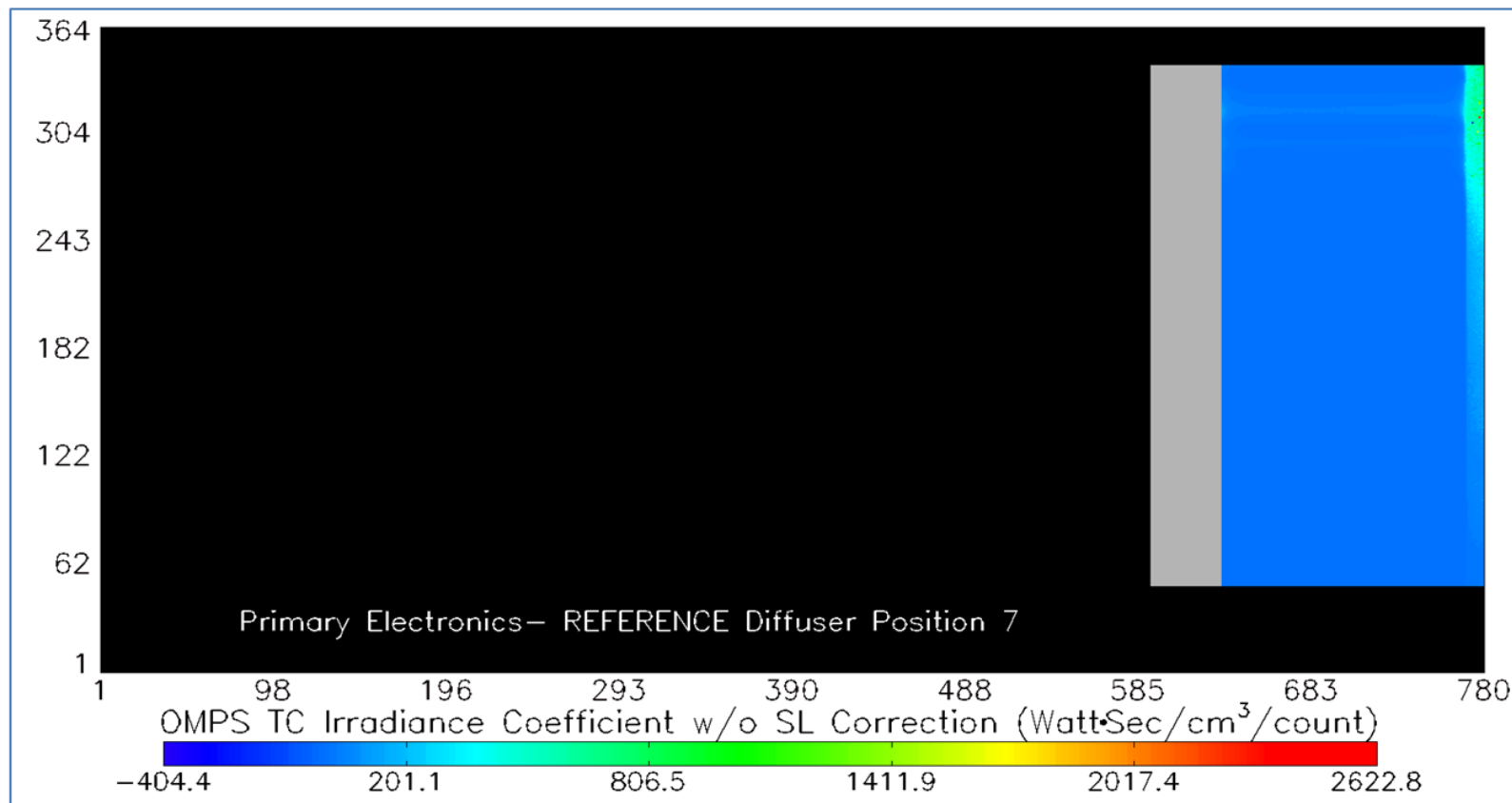


NM Irradiance Calibration Coefficient

1. Combined coefficients of seven diffusers.
2. Overlapped regions show the mean values.



NM Irradiance Calibration Coefficient of the Reference Position 7 Diffuser

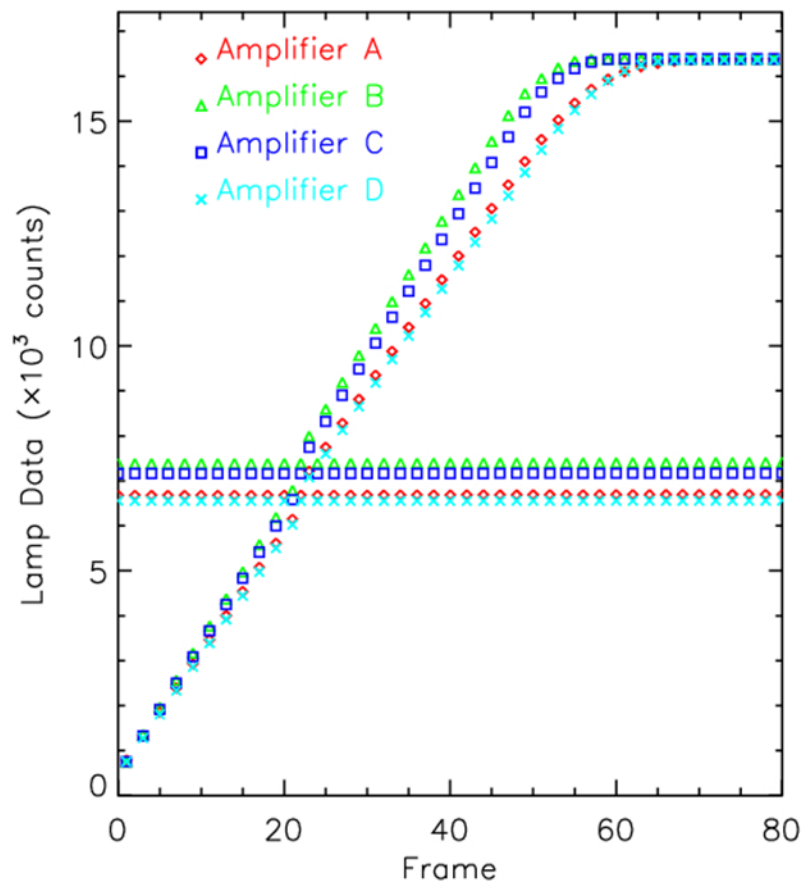


Negative irradiance calibration coefficient:

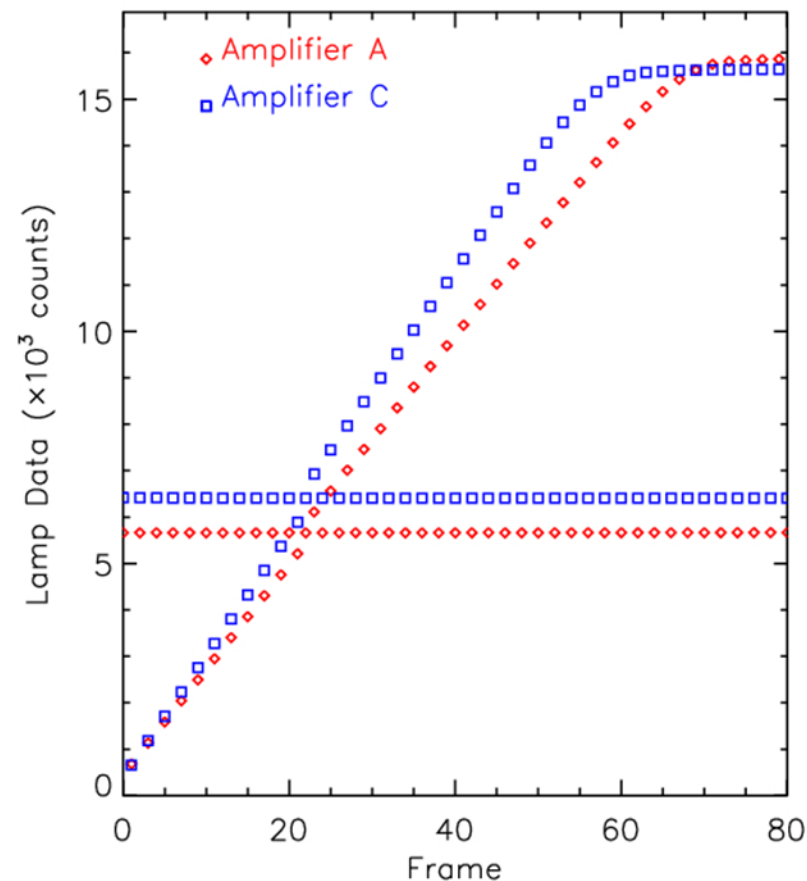
- *Value = -404.38 watt·sec/cm³/count*
- *position = [773, 310]*

Region of Interest (ROI) for NM:
188 (spatial) × 294 (spectral)

Lamp Data: NM (Left) and NP (Right)



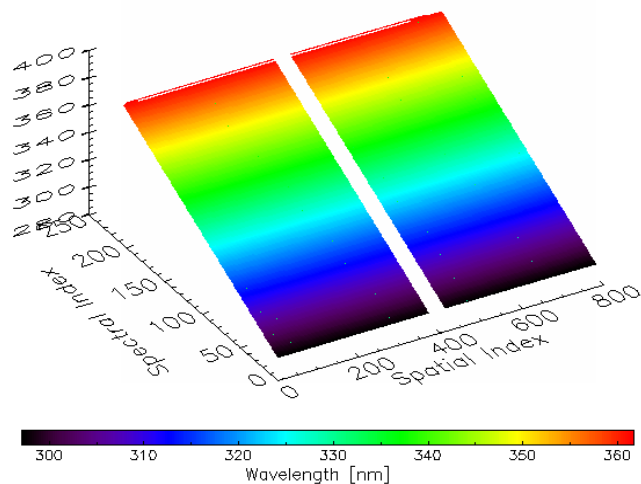
NM lower tie point (counts): 795,755,748,753
 NM upper tie point (counts): 12000 for all four amplifiers



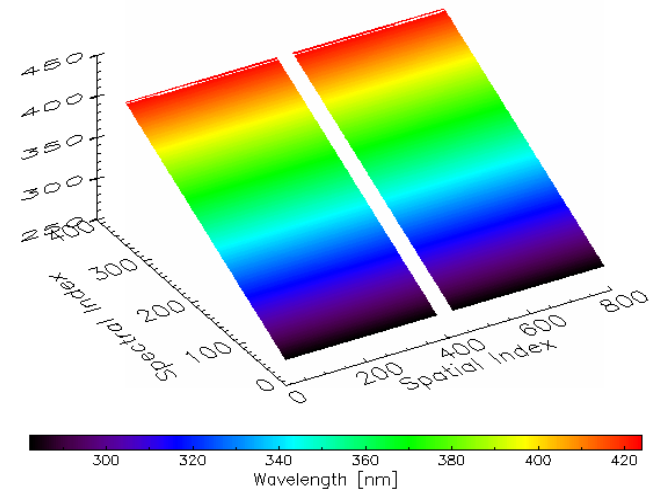
NP lower tie point (counts): 678, 656
 NP upper tie point (counts): 12000 for both amplifiers

OMPS Channel Band Center SCDB: NPP and J1

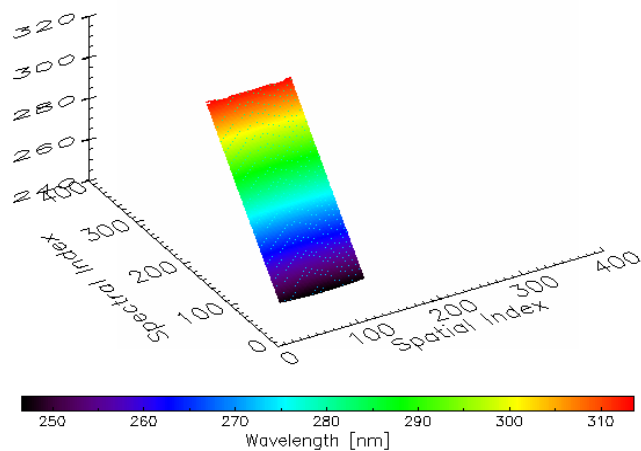
NPP OMPS-TC Channel Band Center SCDB



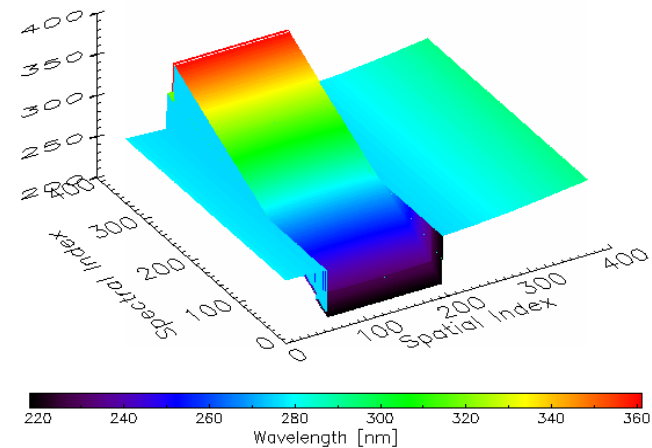
J1 OMPS-TC Channel Band Center SCDB



NPP OMPS-NP Channel Band Center SCDB

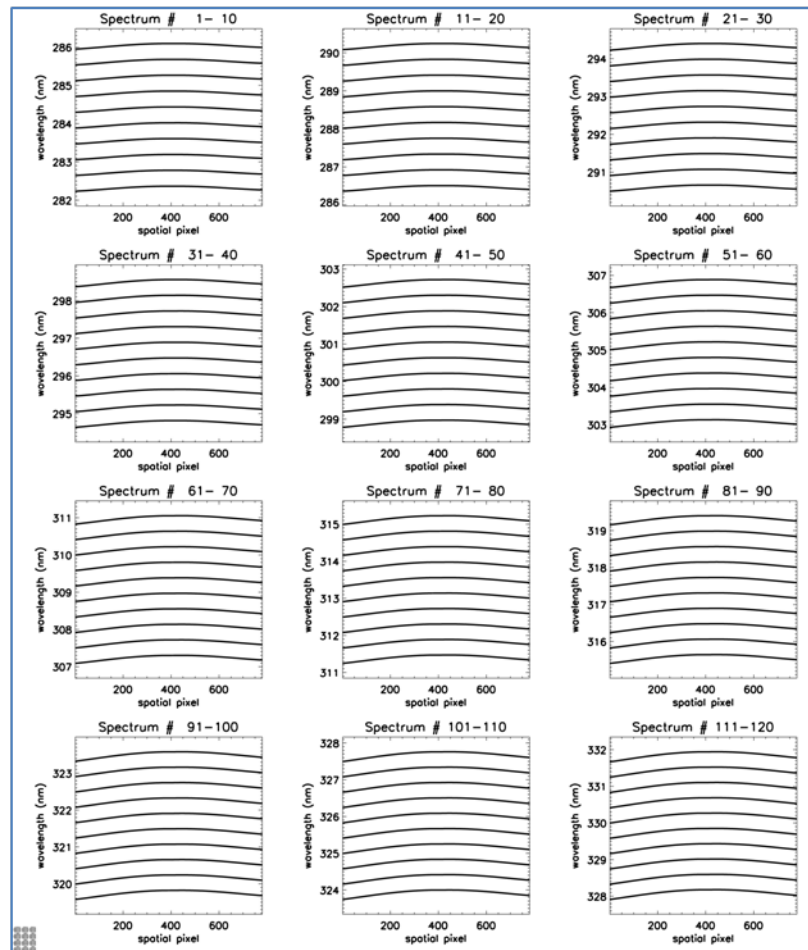


J1 OMPS-NP Channel Band Center SCDB

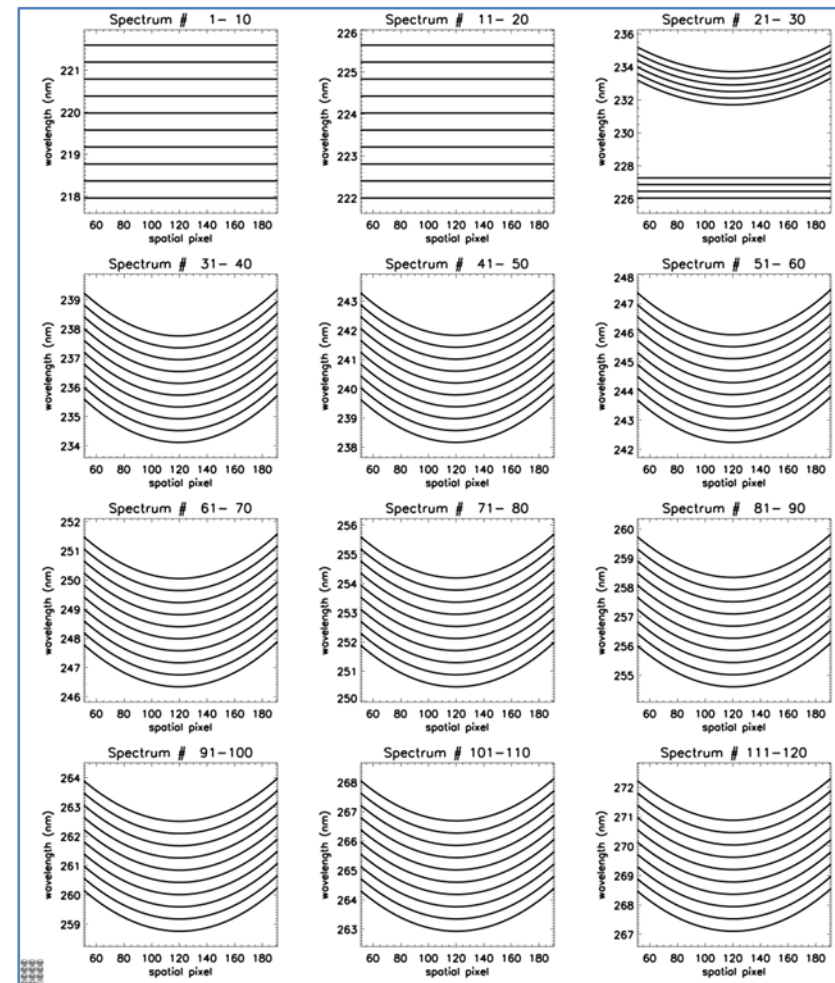


Spatial Distribution of J1 OMPS Band Centers

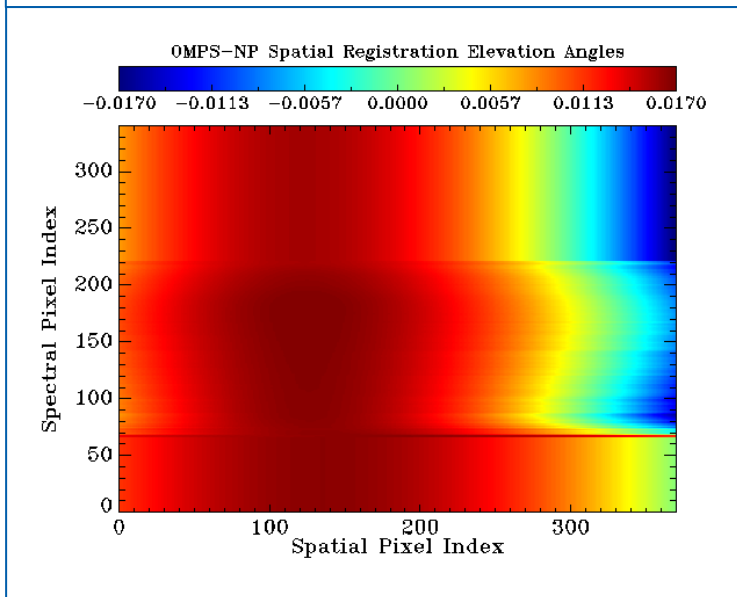
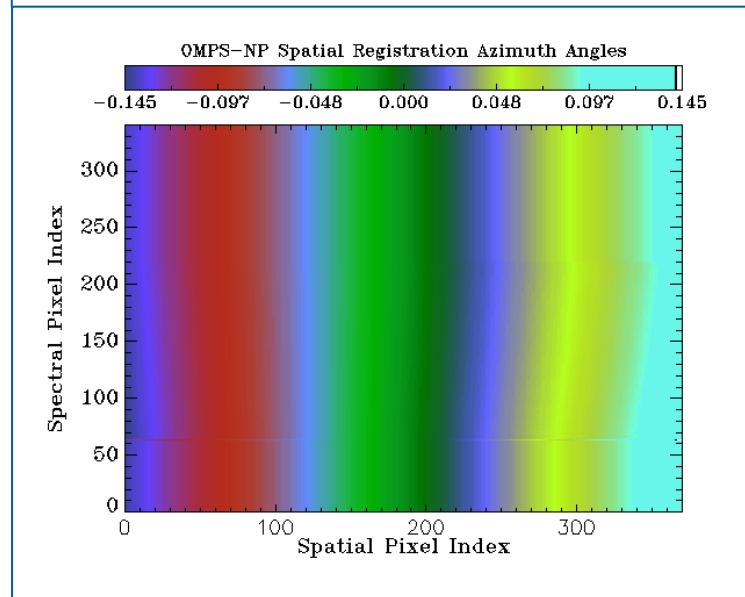
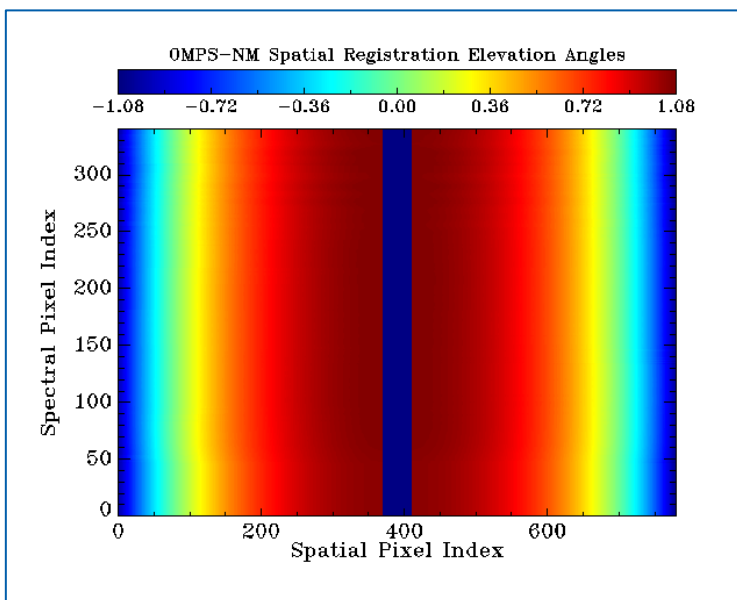
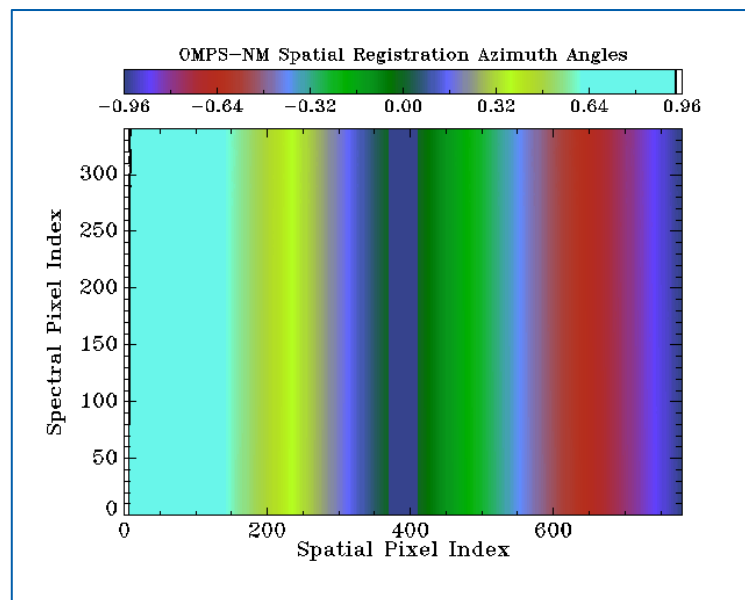
NM



NP



OMPS-NM Spatial Registration J1 SCDB



Algorithm Lookup Tables

Path Forward and Schedule

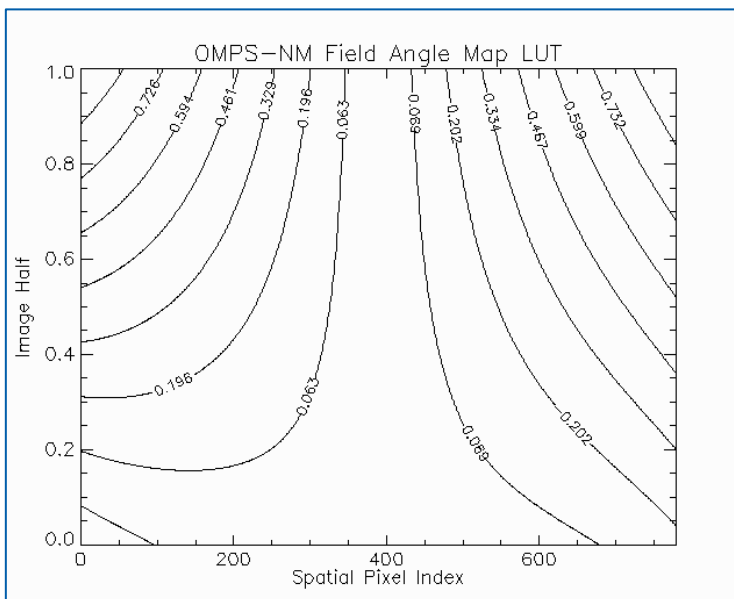
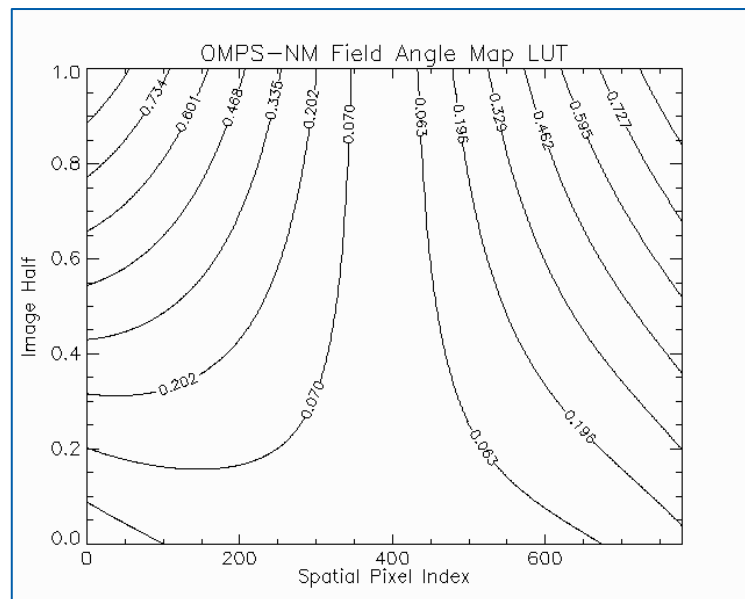
SDR Algorithm Lookup Tables

- OMPS algorithms do not use product SCDB directly
 - Algorithm lookup tables (LUTs) are generated from the SCDB which are then read and processed, as necessary
- SDR algorithm LUTs
 - Measurement: Earth View Sample Table, Macrotable, Timing Pattern
 - Spectrometric LUTs: Spectral Response, Spectral Registration, Wavelengths
 - Radiometric LUTs: Calibration Coefficients, CF-Earth, Darks, Linearity, Stray Light, Solar Irradiance, Observed Solar, Predicted Solar
 - Geolocation LUT: Field Angle Map
 - Table version LUT map OMPS NM and NP measurement tables to SDR algorithm LUT

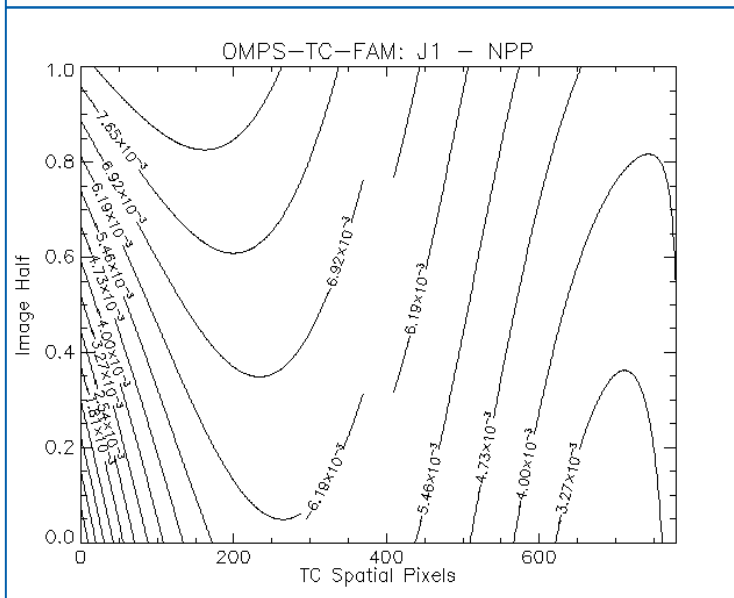
Generate and Verify SDR Algorithm LUTs

- NG code converts and formats SCDB contents to algorithm LUTs
 - Written in Matlab and IDL
 - Under CM control
 - Reads BATC provided SCDB
 - Construct Sample Tables and LUTs (BPS, CBC, IRD, RAD, SRG, ...)
 - Construct reference solar spectrum, convolved solar spectrum
- LUTs will be tested using prototype J1 SDR algorithm
 - NPP OMPS proxy measurements will be used where spatial and spectral domains overlap with J1 sensor
 - Synthetic datasets will be used to test spatial and spectral domain of J1 sensor beyond NPP sensor capabilities
 - AURA OMI proxy measurements could be used
 - Discuss with NOAA and NASA team members

Example of OMPS-NM Spatial Registration LUT



Figures show OMPS-NM spatial registration angle NPP LUT contours (upper left), J1 LUT surface (upper right) and the difference between J1 and NPP LUT (bottom right). The angular difference at nadir is $\approx 7 \times 10^{-3}$ rad. It corresponds to a linear shift in geolocation of ≈ 5 km from a 720 km orbit. The 417 nm channel on J1 OMPS will allow the science team to correct nadir geolocation with much greater accuracy by using the VIIRS M1 band.



Path Forward

- Generate SDR algorithm LUTs
 - SRPM, CALCONST and FAM LUTs based on preliminary CBC, RAD (no_slcorr) and SRG SCDB, respectively, generated
 - Investigating details on generating the SRF LUT (based on BPS SCDB)
 - NPP scheme may still work after extending wavelengths to 417 nm
- J1 LUT evaluation
 - Process J1 SDR LUTs individually and collectively in ADL
 - Update macropixel calculation for OMPS-NP
 - Update SL correction for spectral sparse measurements on Feb 8 – 9
 - Other code changes to test J1 LUT (versus general J1 SDR), if necessary
 - Process Feb 8 – 9, 2014, NPP measurements
 - Nominal and higher spatial resolution EV measurements available in nominal APID
 - Open to suggestion on using other NPP measurements (e.g., limited spectral sample)
 - Remap Feb 8 – 9 STB to “J1-like” STB (i.e., move in spectral direction)

Path Forward

- J1 LUT evaluation
 - Process proxy (synthetic) measurements for full range of J1 sensor
 - Is it necessary?
 - If necessary, need to define dataset soon
- J1 LUT evaluation risks

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The logo features the company name in a bold, italicized, blue sans-serif font. Below the text is a thick blue horizontal line that begins to curve downwards on the left side, ending as a straight line on the right.