J1 OMPS GROUND SYSTEMS TESTS AT STAR

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Outline

- Review of J01 Uppers in BLK2.0
- The RDR test Datasets, medRes and HiRes
- Analysis Tools created: readers, converters, RDR aggregator.
- JCT Delivered tables, at launch tables
- Medium and High resolution TC SDR
- Medium Resolution NM-SDR

474-CCR-15-2432 **OMPS TC EV SDR J1 Upper Modifications** - ADR 7248 - 7340 - Phase 2
474-CCR-15-2469 **NP SDR Modification for Medium Resolution** Phase 2 - ADR 7249

OMPS Decompression - SZIP decompression, compression factor is better than 2. Both NM and NP are compressed. Only the measurement counts are compressed.

sparse spectral RDR – Not all measurement counts in RDR, to limit the amount of data downlinked from OMPS certain wavelengths are excluded in the RDR. There are bandwidth constraints on the amount of data that can be transferred during the ground contact.

NM High and Medium resolution Modes. Unlike S-NPP NM the nominal operating mode will have 17kmx17km ground pixel size and J01 NM will have many more ground pixels than S-NPP.

spatial aggregation – The number of pixels measured in the field of view dimension may be as high as 210 pixels. The IDPS product size is limited to 105. Pixel aggregation is done reduce the spatial dimension to 104 across-track pixels.

temporal aggregation - Along track pixels can be combined. The IDPS data product size is limited to 15 scans per granule. The J01 is capable of measuring 30 scans per granule. The number of scans per granule or orbit is reduced my an integral value.

Modified LUT table formats – NM In / Out aggregation specified by Sample, Macro, timing patterns.

NP 5x5 SDR – There will be 400 scans per orbit and 5 Cross-Track pixels per scan. There will be 25 times as many ground pixels as NPP – Nadir Profiler.

BLK2.0 Supports Sparse Spectral

Sparse Spectral Radiance at Scan 19
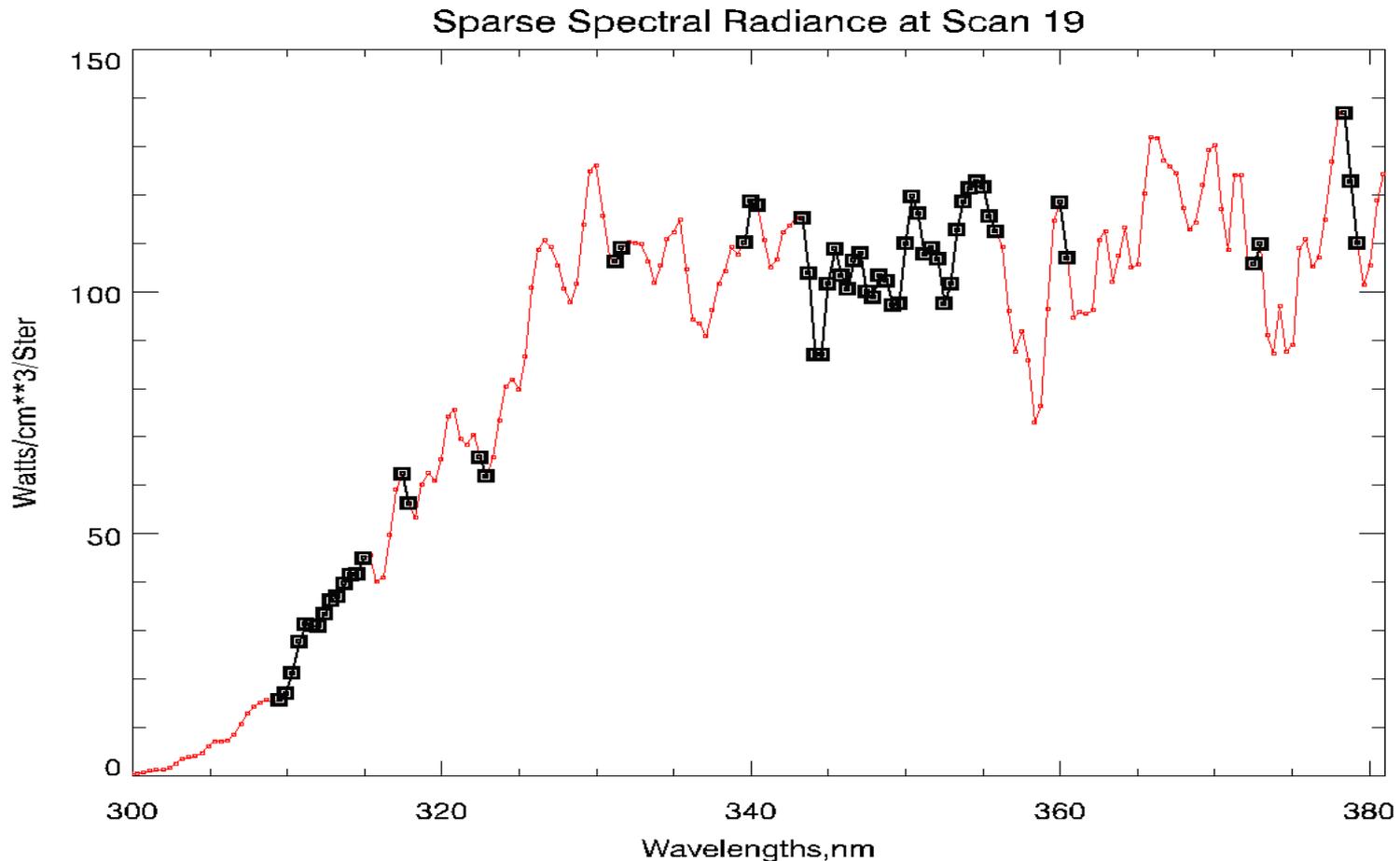
Sparse Spectral example. The black squares are the measurements in the RDR. The red line shows where the measurements are clipped. The measurements are made but not included in the RDR. There are 61 measured values, 135 values are not present.

Ground System Test Data

- **OMPS MDR43A NPP Proxy data**
- **OMPS MDR43B BBMEB**

  sparse spectral HiRes, compressed, entire day, proxy is derived from NPP. BBMEB is dark measurement.

- **JCT2 Medium Resolution**
- **JCT3 High Resolution**

  full spectral, med & HiRes, compressed, several orbits, no spacecraft diary,

  at launch configuration. Dark measurement.

- **S-NPP diagnostic 2016/04/02**

  full spectral, 35x5 NM and 5x5 NP. Real data, used primarily to generate test SDR for Version 8 ozone algorithms. NM also upsampled to 103x5 SDR for EDR testing.

J01 Test Data RDR Configurations

| Description	NmacroPixel	Spectral x Spatial	nTimes	Source
OMPS43A NM RDR MedRes	10042	61 x 156	30	S-NPP
OMPS43A NM RDR HiRes	30870	147 x 208	30	J1 Electronics
OMPS43B NP RDR MedRes	894	147 x 5	5	S-NPP
OMPS43B NP RDR MedRes	942	157 x 5	5	J1 Electronics
JCT2 NM RDR	36040	340 x 104	15	J1 Electronics
JCT3 NM RDR	31952	340 x 146	30	J1 Electronics
JCT3 NP RDR	900	150 x 5	5	J1 Electronics
S-NPP NM Diagnostic	7448	196 x 36	5	S-NPP
S-NPP NP Diagnostic	882	147 x 5	5	S-NPP

J1 At-Launch Tables Delivered

DR 8211 CCR 16-2962 Nadir Mapper
DR 8212 CCR 16-2963 Nadir Profiler

- Second Delivery of table has passed DPES testing.
- Expecting J01 SDR fast track status soon.
- LoRes, MedRes, HiRes Nadir Mapper tables
- MedRes 5x5 Nadir Profile Tables
- Nadir Version Table(NVT) developed by NASA PEATE.
- Includes Mounting matrix derived from post-environment testing(but will be updated later due to unforeseen complications).
- Major accomplishment for STAR SDR team.

Radiance for JCT Tests are Dark
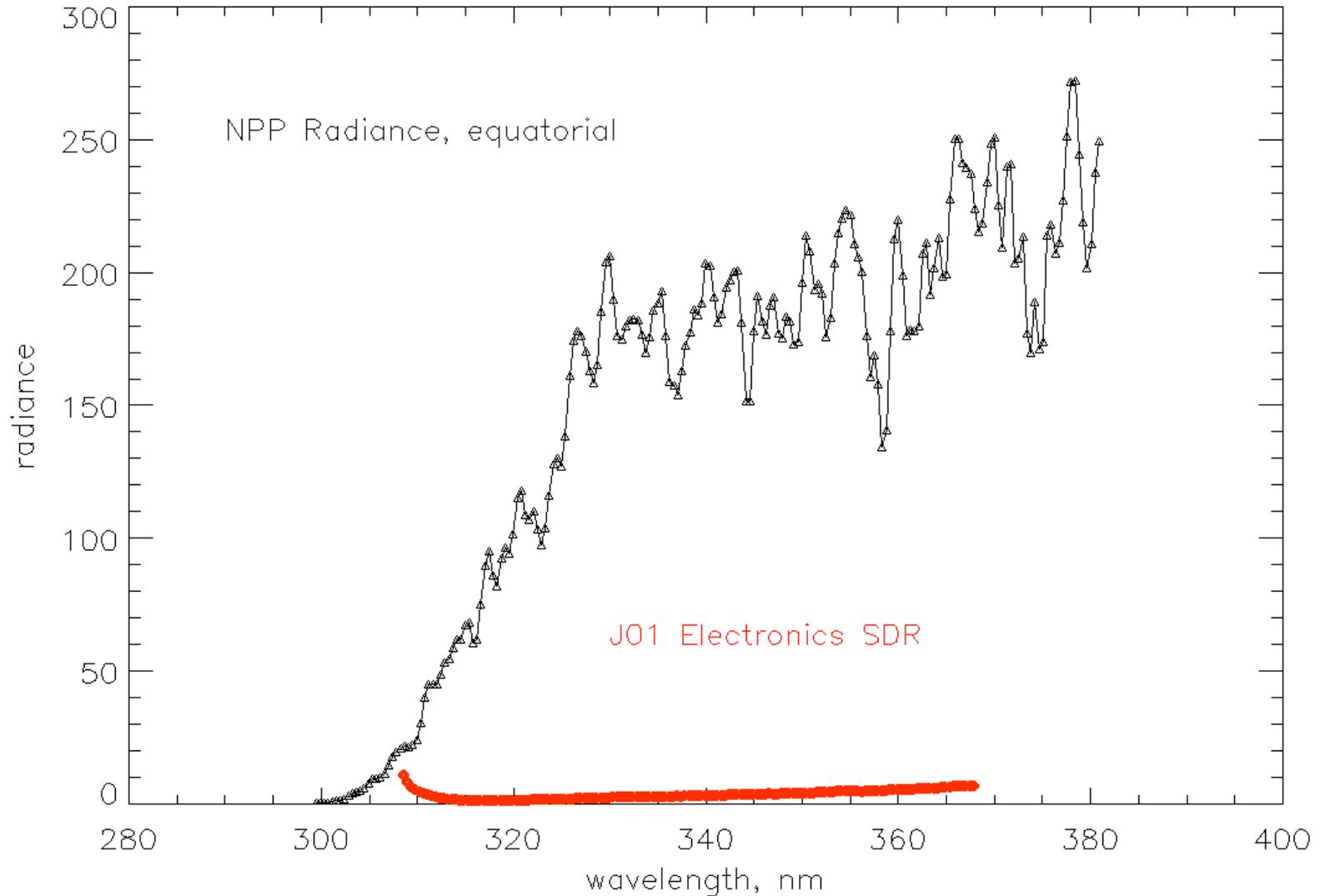
OMPS 43A 103 x 15 TC Radiance
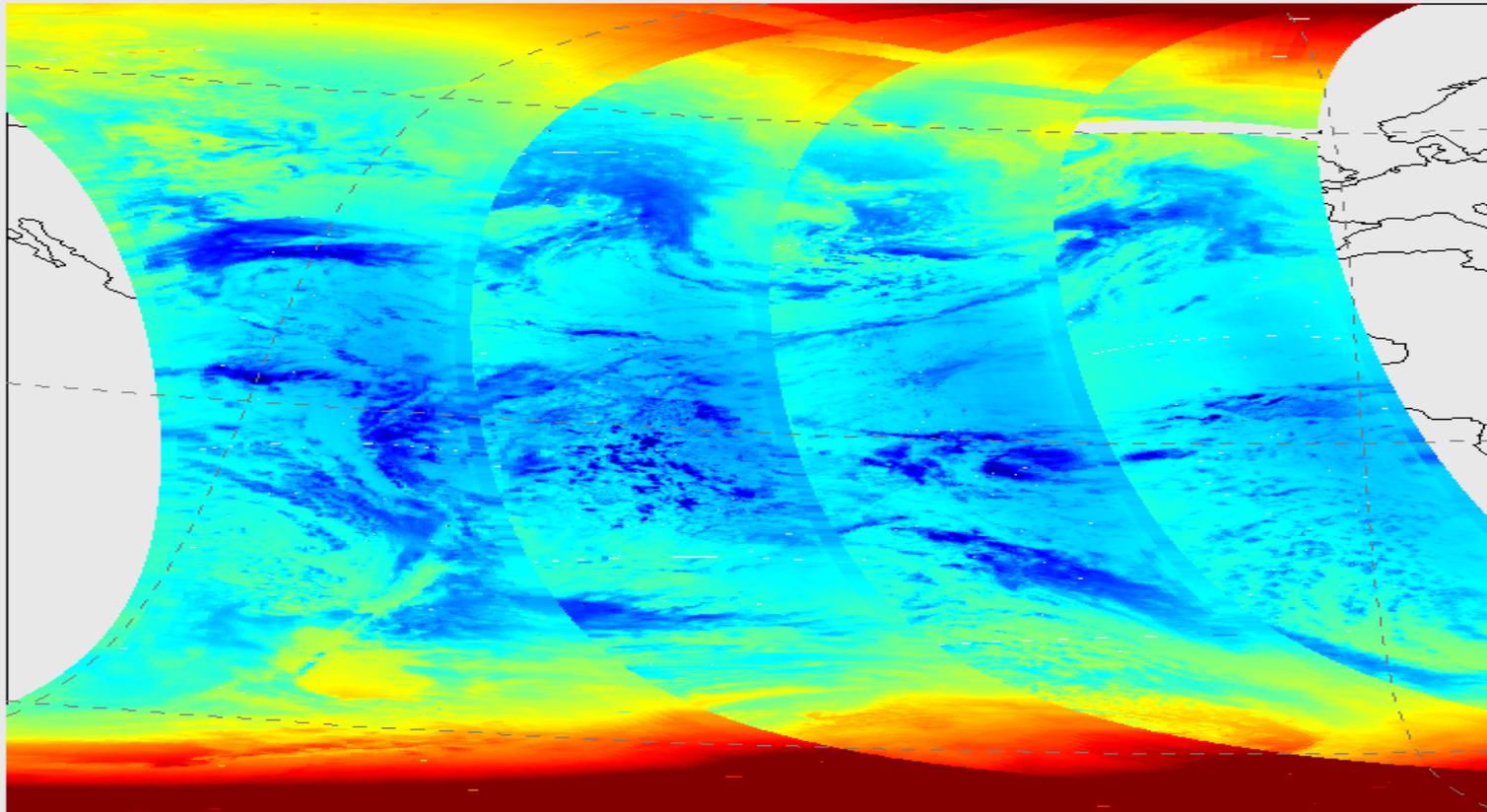
J01 OMPS TC Normalized Radiance at 317.93nm

55.00   79.00   103.00   127.00   151.00   175.00   199.00
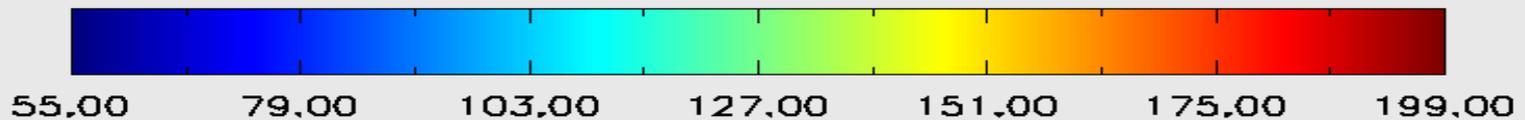
OMPS43A NP-SDR 5x5 Radiance
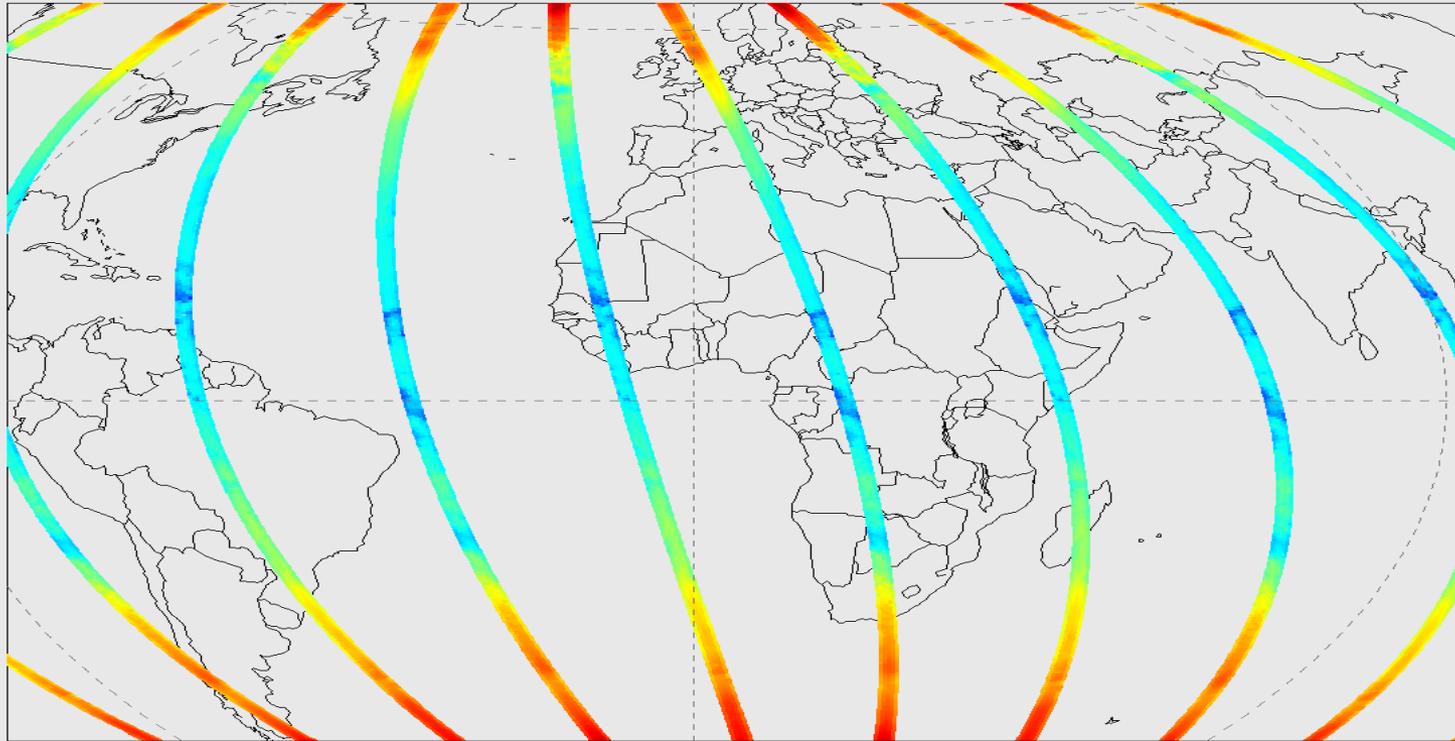
J01 OMPS NP Normalized Radiance at 303.69nm
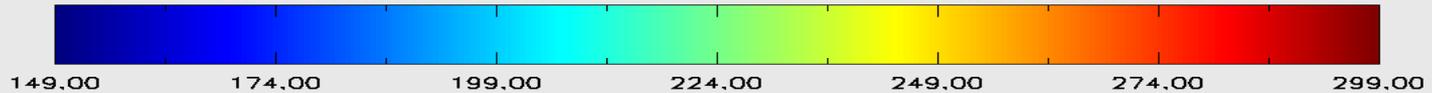
- RDR Readers for the new APIDs, compression, measurement modes.
- Off-line scripts to convert from measurement counts to radiance. This is an IDL implementation of the ADL OMPS science code(does not do geolocation).
- APID converter(developed by Derek Stuhmer, Raytheon). Convert diagnostic RDR to nominal RDR(the ADL can only handle nominal APID modes). This is a new tool in BLK2.0.
- RDR aggregation tool. This is a tool to create ~38 second scan RDR datasets from the S-NPP diagnostic mode datasets. It is an IDL script to aggregate a sequence of RDRs into a single RDR(subsequent slides).
- Ozone retrieval algorithms: A very good check on the SDR is to run ozone retrievals. If there are problems with the measurements they will be apparent in the retrieved ozone.
- Radiative Transfer comparisons: See presentation on validation by RT by Fuzhong Weng and Shouguo Ding.

S-NPP Diagnostic with BLK2 medRes

- No requirement to process OMPS diagnostic data with ADL.
- Necessary to generate datasets for testing medRes NDE ozone retrieval algorithms for J01.
- April 2, 2016 S-NPP/ Nadir Profile RDR are in diagnostic mode with 5x5 NP 35x5 NM. We converted to nominal APID RDR.
- This configuration of SDR is what we expect in the first year of OMPS NM and NP measurements.

Conversion to Nominal APID

BLK2.0 has a tool to convert OMPS RDR APIDs, for example :

./writeOmpsFile.exe -i InputRDR_Blob 3 577 -o OutputFile   NPP 3 561

**Converter executable found in $ADL_HOME/tools/bin**

One TODO with the ADL writeOmps tool is to implement RDR aggregation.   The utility converts one granule at a time. All of the diagnostic RDR we've encountered have one scan per granule. So the resulting SDR files each have one measured scan and 4 fill valued scans.   ADL / IDPS enforces the 38 seconds granule time by inserting fill values for the scans not found in the input RDR.

To create an SDR without fill value scans we aggregate the RDR into 5 scans(assuming the RDR scan time is ~7.5 seconds). An IDL script was written to aggregate the RDR.

When the RDR is aggregated the RawHeader, ApidList, and PacketTracker need to be updated. A new GranuleID is assigned according to the rules for OMPS granules.

Next page: Demonstration of converted diagnostic data. The image shows the global ozone field.

S—NPP OMPS Total Ozone
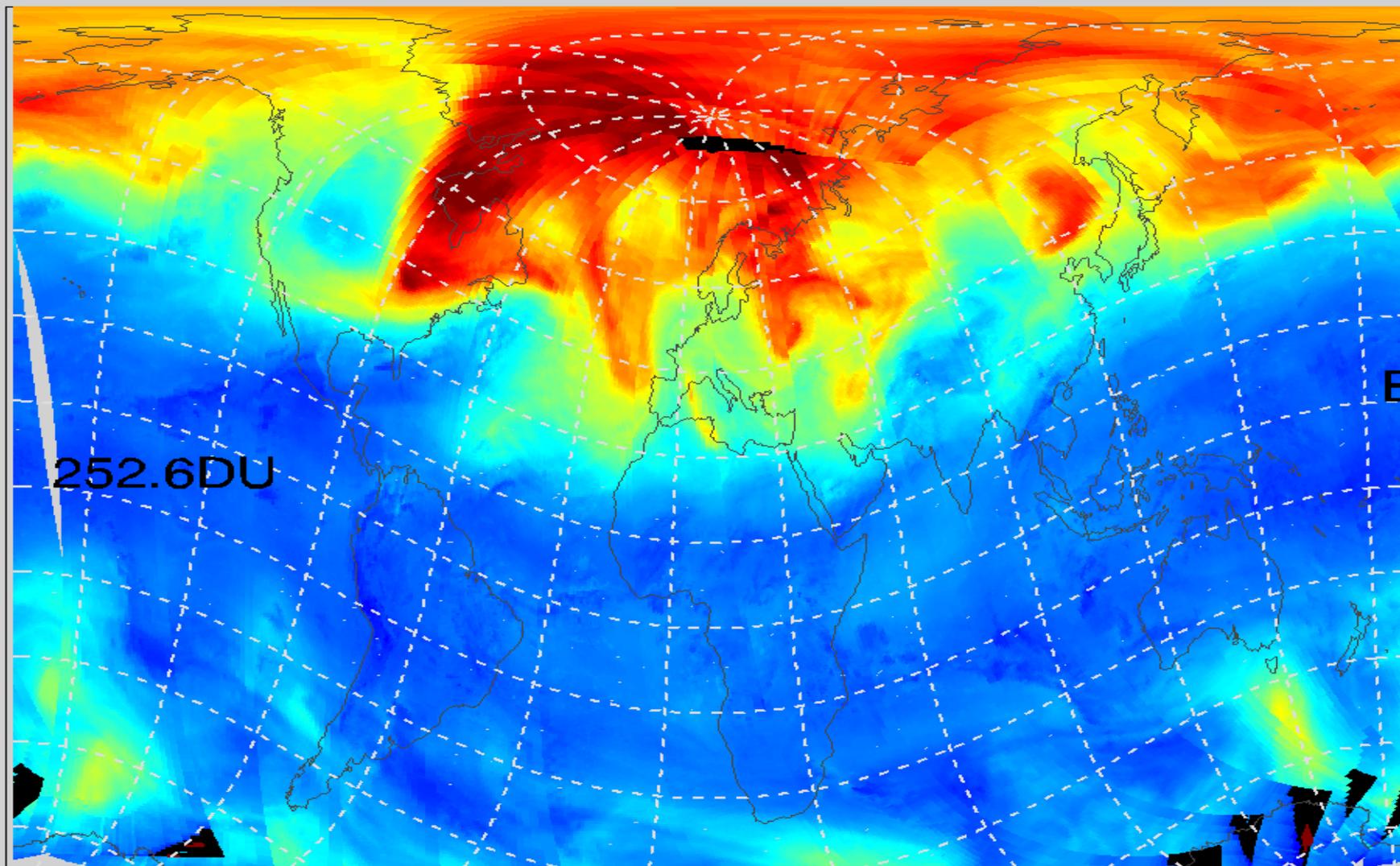
252.6DU

Equ

V8 NDE 2016/04/02 Ozone Columns, DU
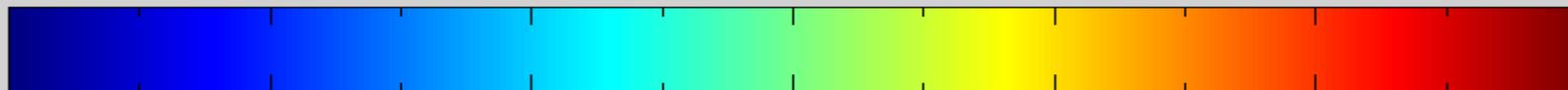
175.   229.   283.   338.   392.   446.   500.

S-NPP OMPS Total Ozone

251.7DU

Equ
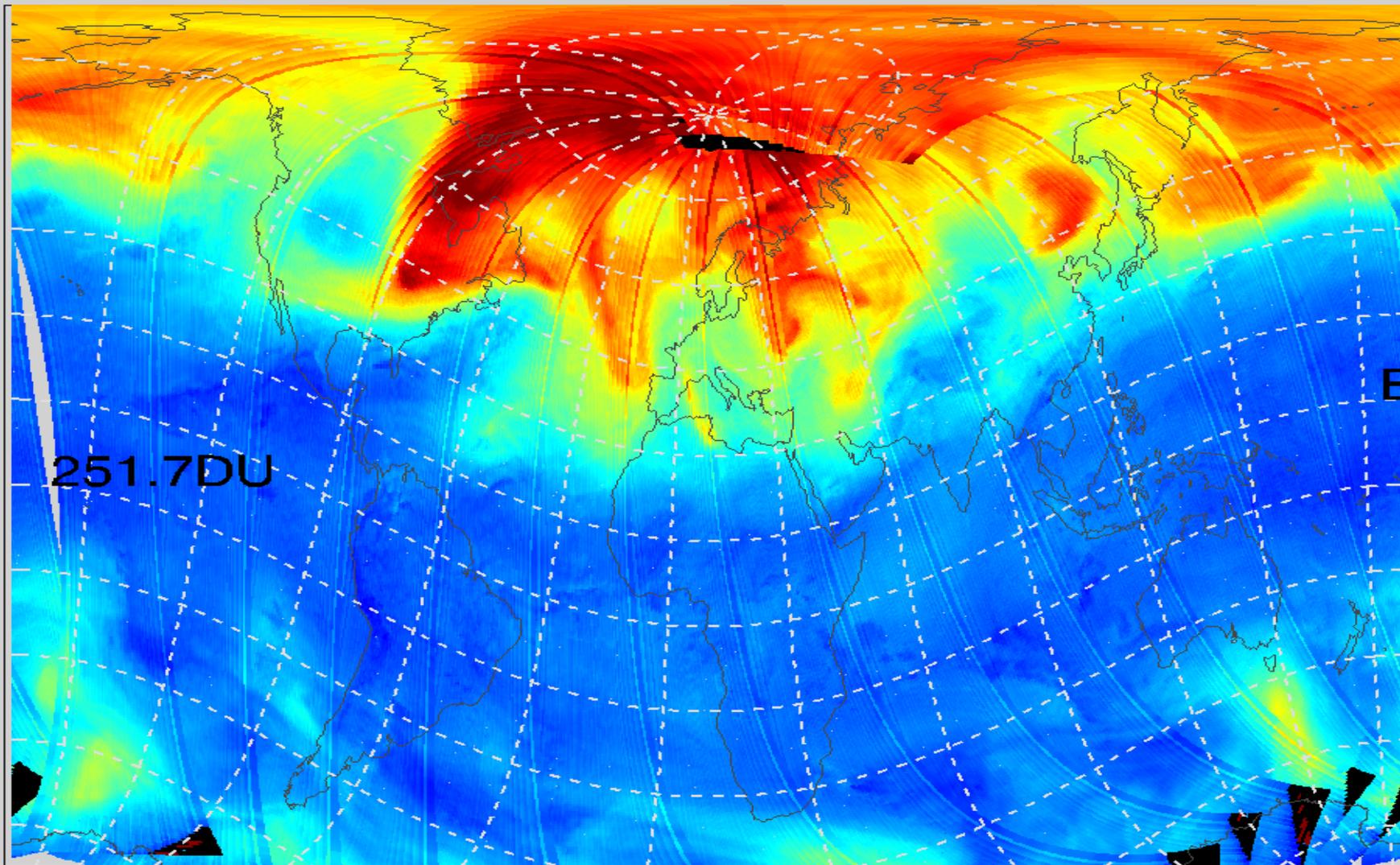
V8 NDE 2016/04/02 Ozone Columns, DU

175.   229.   283.   338.   392.   446.   500.

NP End-to-End test

- The Nadir Profile diagnostic converted to nominal APID and run through ozone profile EDR.
- Next slide shows 5x5 retrieved ozone profile sum for the same day, 2016/04/02.
- Identified problem with wavelength registration from 2016/04/02 5x5 SDR processing.
- EDR processing is useful to find problems with SDR.
- See talk by T. Beck in afternoon session, "*Omps Small Field of View Products*" on 5x5 EDR ozone profile algorithm.

NP EDR 5x5 Test

S-NPP OMPS Total Ozone

NP_5x5_NDE_ Retrieved Profile Sum, DU

175.   229.   283.   338.   392.   446.   500.
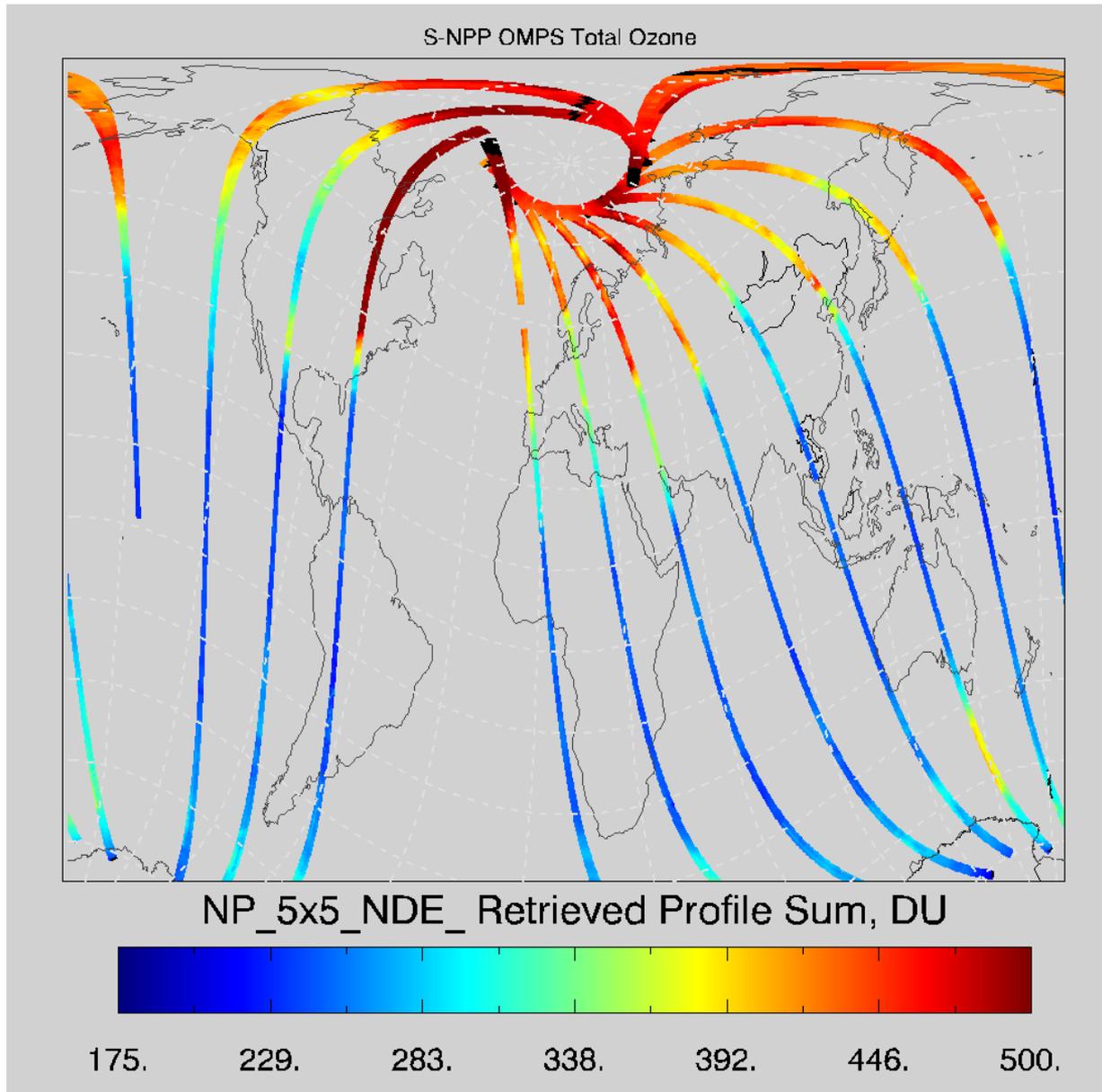
Conclusion

- Worked with partners to implement and test J01 code updates for IDPS BLK2.0 system.
- Delivered at launch J01 tables for OMPS-NM and OMPS-NP.
- Developed tools to read and convert J01 RDR diagnostic and nominal datasets.
- Demonstrated that BLK2.0 PSAT21 and later are capable of processing medium resolution data with a minor XML configuration changes(103x15 J01 TC-SDR output). *next slide lists the required change.*
- Short granule problems still remain, this impacts capability in of the SDR processor to handle 30 scan granules.