OMPS SDR OVERVIEW

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Outline

- Cal/Val Team Members
- S-NPP Algorithm Performance
- OMPS EDR Products
- Reprocessing and LTM
- JPSS-1 Readiness
- Future Improvements
- Summary and Path Forward

Cal/Val Team Members

PI	Organization	Team Members	Roles and Responsibilities
Trevor Beck, Chunhui Pan	NOAA, UMD-CICS	Eve-Marie Devaliere, Shouguo Ding, Sri Madhavan, Ding Liang	Coordination; instrument and product performance monitoring.
Glen Jaross	NASA	Tom Kelly, Rama. Mundakkara, Mike Haken, Colin Seftor	Instrument scientist; TVAC data acquisition and analysis; SDR algorithms
Laura Dunlap	STC/AMP		Algorithm Changes; DR and issues tracking
Sarah Lipscy	BATC		Instrument Scientist; prelaunch test
Wael Ibrahim	Raytheon	Derek Stuhmer, Daniel Cumpton	IDPS Operations

JPSS-1 OMPS Instrument Overview

- Configuration
  - Two grating Spectrometers:
    - NM 300-380nm, 420nm
    - NP 250-310nm
  - Actively cooled CCD detectors

- Onboard Calibration
  - LED provides non-linearity calibration
  - Reference Diffuser and working diffuser together provide method to track degradation

- Products
  - Global coverage every 24 hours total ozone.
  - 250km swath ozone profile, 14 orbits per day, 400 profiles per orbit
  - Estimated SO2

- Enhanced Spatial Resolution compared to S-NPP
  - OMPS-NP has 5 times as many ground pixels in both alongtrack and cross-track spatial dimensions, 50km by 50km.
  - OMPS-TC capable of 10Km^2 ground pixel size, due to increased downlink bandwidth and data compression.

Limb Profiler not present on J1, returns on JPSS-2.

OMPS SDR Algorithm

- Algorithm Overview
  - Inputs: spacecraft ephemeris, instrument counts, look-up tables
  - Outputs: geolocation, radiance, wavelength, solar flux, algorithm and quality flags, various metadata(algorithm version, percent missing packets , etc.)
  - S-NPP SDR reached validated Maturity in September 2015

  - S-NPP Lessons learned
    - Straylight correction
    - Weekly dark current correction
    - Wavelength registration
      - OMPS-NP has seasonal temperature variation
      - OMPS-NM has orbital temperature variations

      JPSS-1 will likely have similar wavelength registration behavior

S-NPP NM Performance

SDR Budget Term	L1RDS APU Thresholds	On-Orbit Performance
Non-linearity Accuracy	< 0.2%	<0.2%
SNR	1000	>1000
Straylight Out-of-band &out-of-field response	<2%	<2%
Orbital thermal wavelength shift	0.02nm	~0.006nm
Absolute irradiance Cal accuracy	<7%	<7% For most channels
Absolute radiance cal accuracy	<8%	<8%
Albedo calibration Accuracy	<2%	<2% For most channels

S-NPP NP Performance

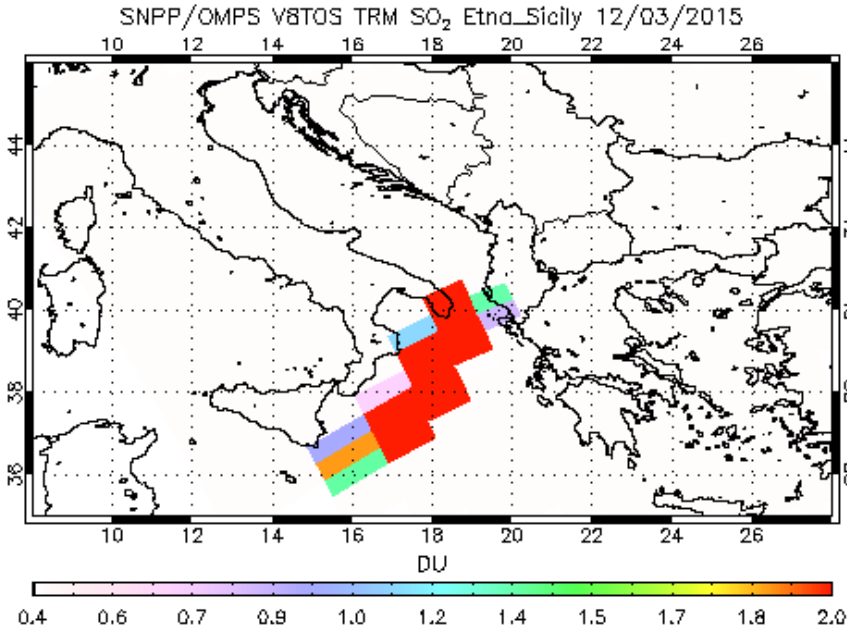
SDR Budget Term	L1RDS APU Thresholds	On-Orbit Performance
Non-linearity Accuracy	<0.2%	<0.2%
SNR	45-400 channel dependent	Meets requirements
Straylight Out-of-band &out-of-field response	<2%	<2% for most channels
Orbital thermal wavelength shift	0.02nm	Meets requirement with biweekly LUT updates
Absolute irradiance Cal accuracy	<7%	<7% for most channels
Absolute radiance cal accuracy	<8%	<8%
Albedo calibration Accuracy	<2%	<2%

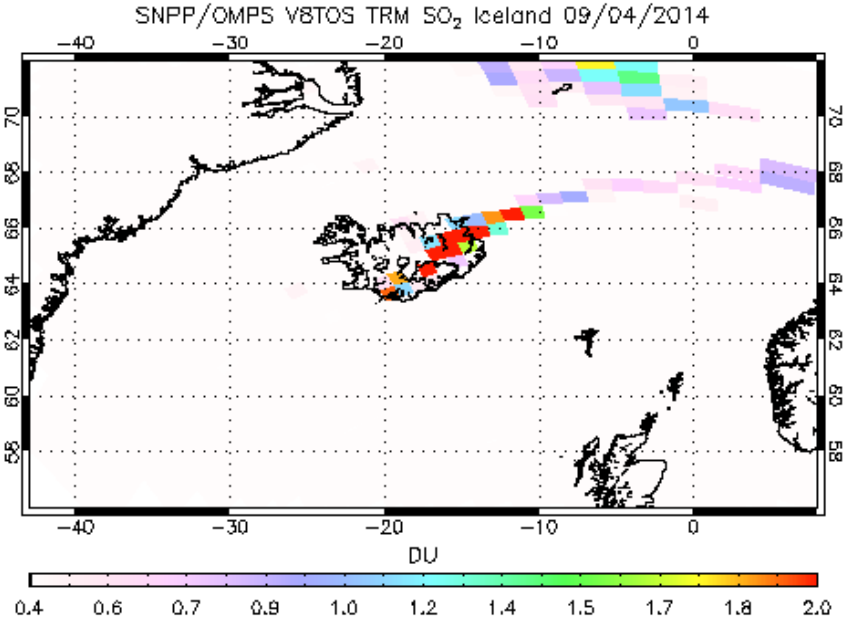
OMPS EDR Products

There are three EDR algorithms for JPSS-1 OMPS in NDE

- SO2, Linear Fit SO_2 method(LFSO2)
- Total Ozone, using the version 8 algorithm
- Ozone profile, using the version 8 algorithm.

Below: Estimated SO_2 over active volcanos; Mt. Etna and Iceland, courtesy of Jianguo Niu.





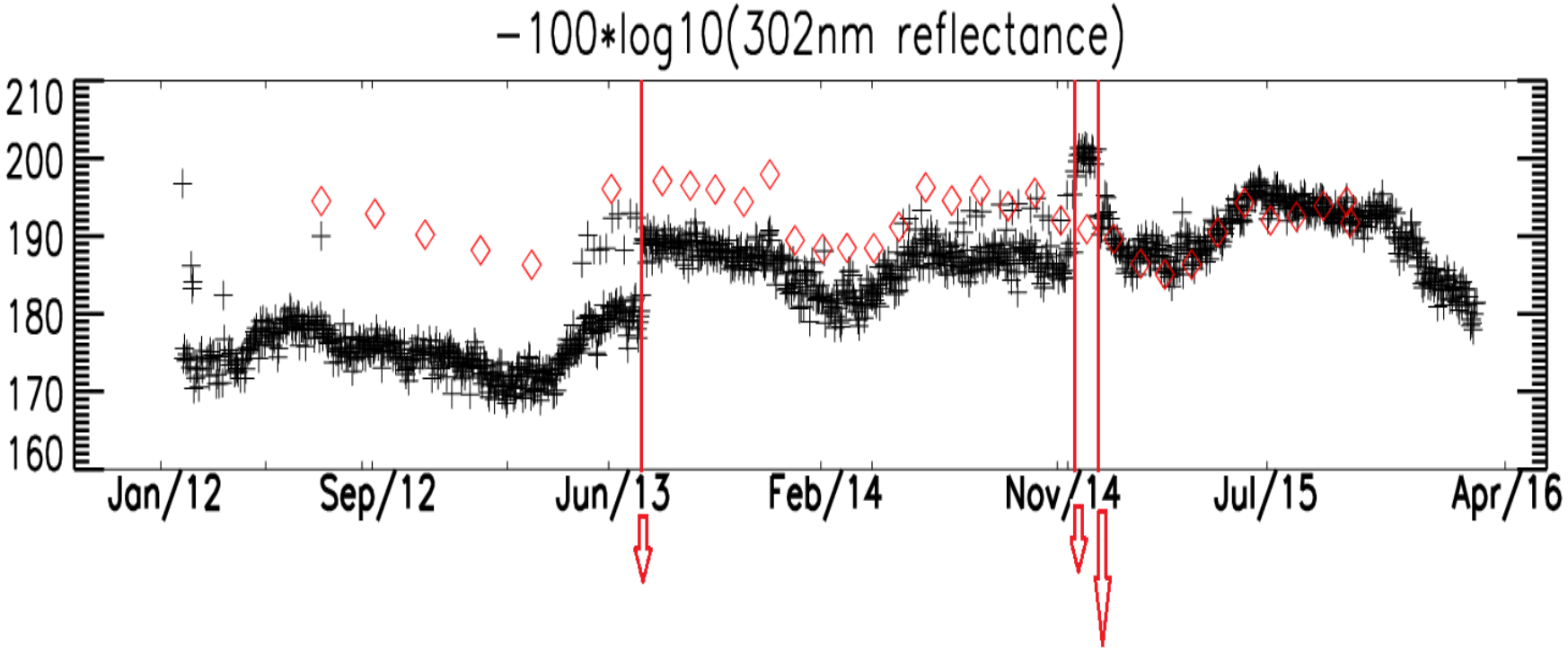
S-NPP OMPS Reprocessing

- Reprocessing was completed for January 2012 to April 2016.
- The purpose of the reprocessing is to create a consistent SDR set using the best set of input LUTs and a consistent algorithm.
- The IDPS OMPS algorithms have gone through several table and code updates since the beginning of the data collection:
  - Straylight algorithms and LUTS.
  - Regular Dark current updates
  - Improved calibration
  - Updated solar flux LUTS
  - Corrections of OMPS TC Wavelength orbital variations

- Initial analysis indicates we have corrected the major known problems.

SDR Reprocessing con't

- The OMPS EDR team at NOAA has reprocessed the total ozone and ozone profile datasets using the reprocessed OMPS SDR. Initial results look good for total ozone. The reprocessed ozone profile record is still undergoing analysis.
- The image shows jumps in the time series in the CLASS OMPS-TC SDR archive. The equatorially averaged radiance at one wavelength is plotted.



Straylight algorithm and LUT Updates

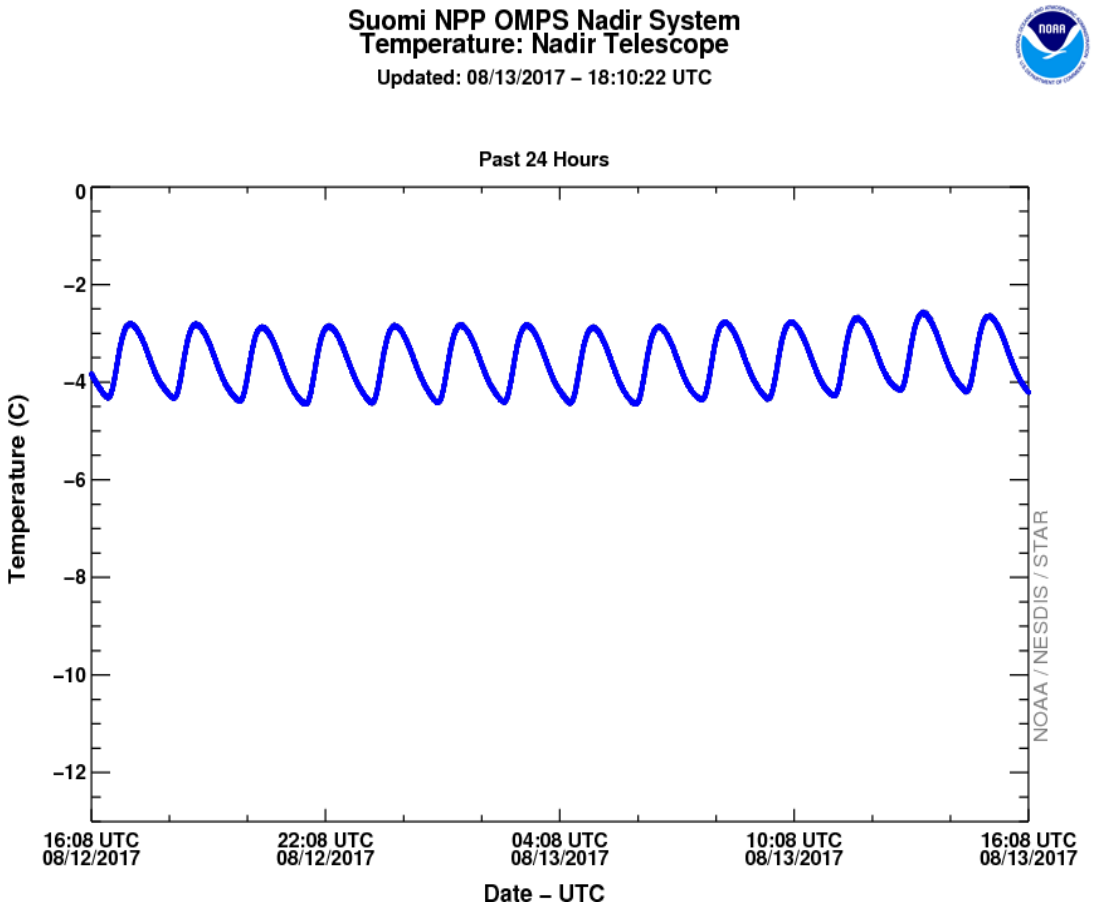
Long Term Monitoring with ICVS

NM: http://www.star.nesdis.noaa.gov/icvs/status_NPP_OMPS_NM.php
NP: http://www.star.nesdis.noaa.gov/icvs/status_NPP_OMPS_NP.php
LP: http://www.star.nesdis.noaa.gov/icvs/status_NPP_OMPS_LP.php

The NOAA/STAR ICVS provides long term monitoring of key parameters

- Instrument Health and
- Sensor Performance
- SDR Product Monitoring
- Data Quality Assessment
- Anomaly Detection
- Anomaly Notification

ICVS OMPS Monitoring Presentation in this session by Ding Liang



JPSS-1 Readiness

- Significant code and tables changes were made
  - decompression of instrument counts, the RDR format changed.
  - New FSW version(Flight Software Version)
  - Medium resolution Nadir Profile SDR, 5x5 per granule
  - Medium resolution Nadir Mapper 17km by 17km capability

Post Launch Plans

- SDR beta L + 68
- provisional L + 90
  LUTs be ready @ L+76 for provisional SDR.

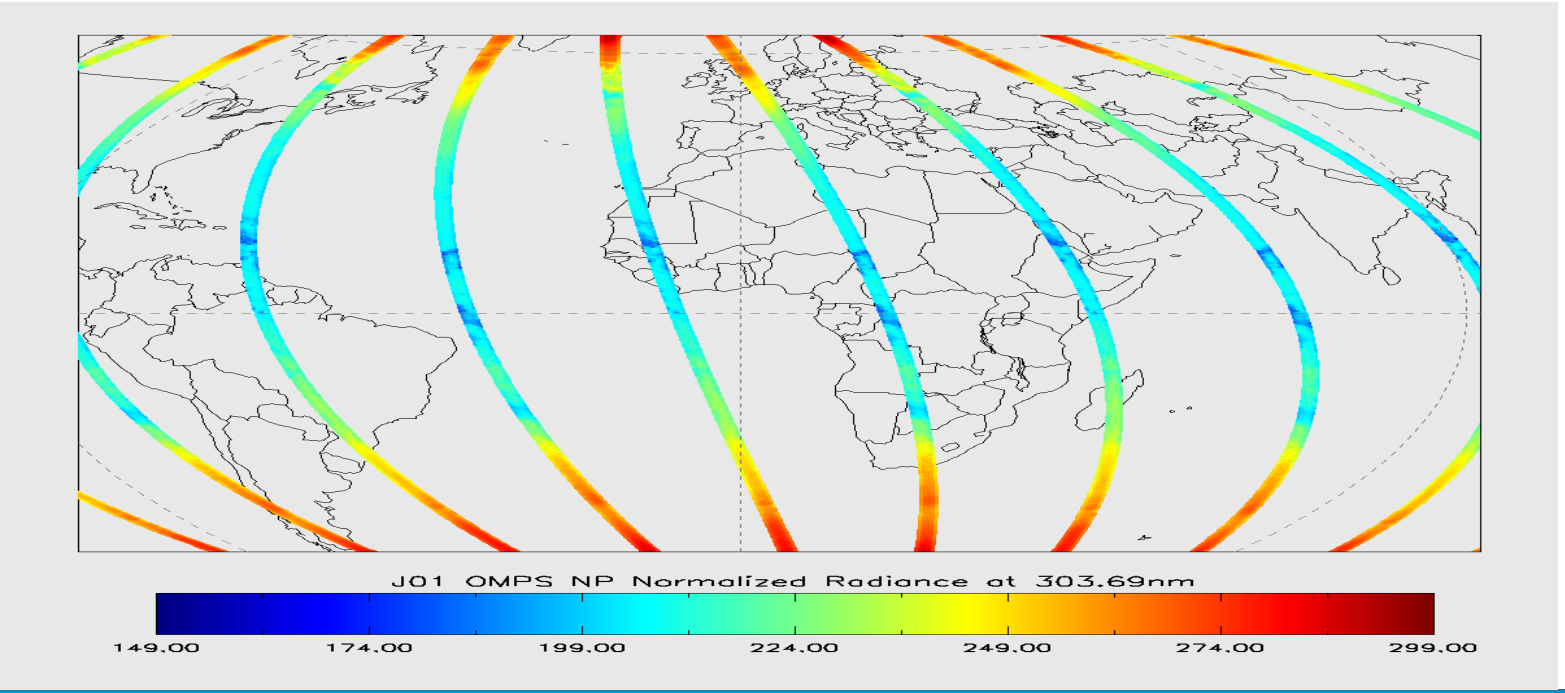
J1 OMPS nominal operation at 50 km ^2 ground pixel size from L+90 to L + 270 days.

OMPS-TC will take 17 km x 17 km EV as diagnostic measurements one day per week during the intensive cal/val period.

OMPS SDR team may start OMPS-TC 17 km x 17 km EV as nominal measurements after L+ 270 days (after successful demonstration and approval) .

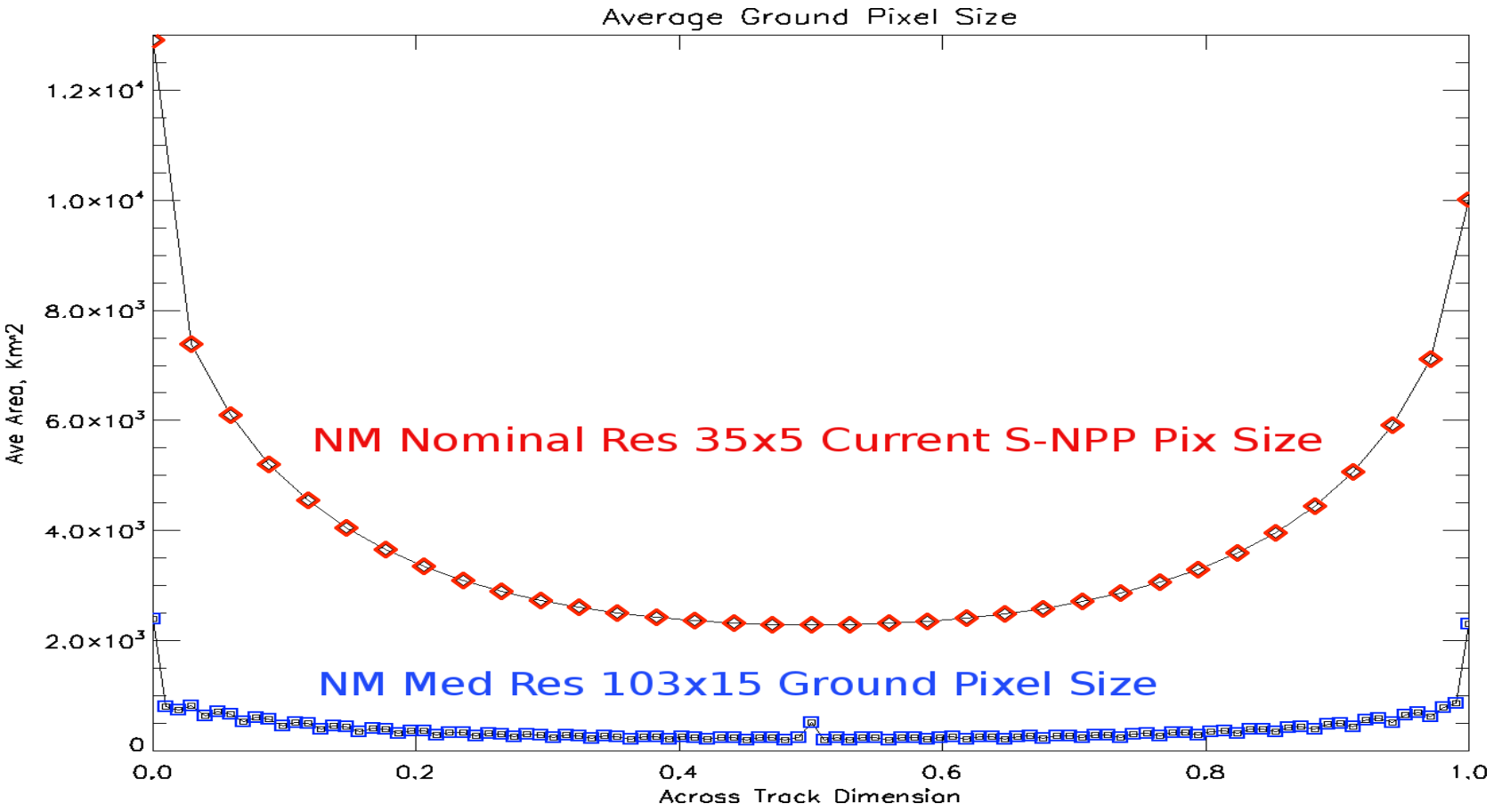
JPSS-1 Readiness

- Tested and delivered tables for five instrument configurations for the OMPS Nadir Mapper.
- The current at-launch configuration for JPSS-1 will take low, medium, and high measurement modes and aggregate the pixels to the nominal resolution mode of 50km by 50km ground pixel size *(known problems with aggregation)*
- End-to-End tests with the OMPS EDR team.
- The J01 OMPS-NP SDR now has a cross track dimension of five. EDR algorithm updates were made to handle the J01 OMPS-NP medium Resolution SDR.

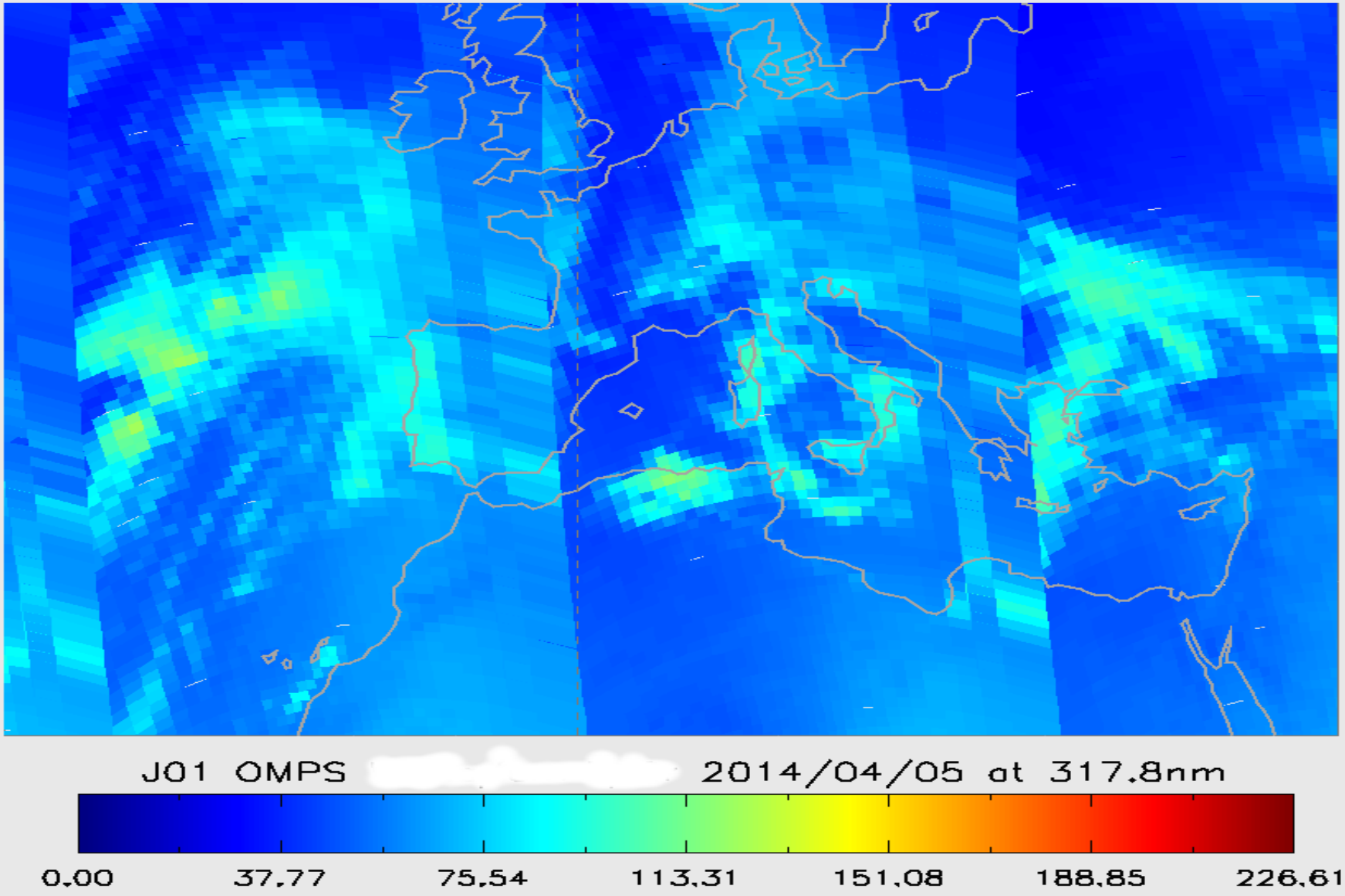


Future Improvements

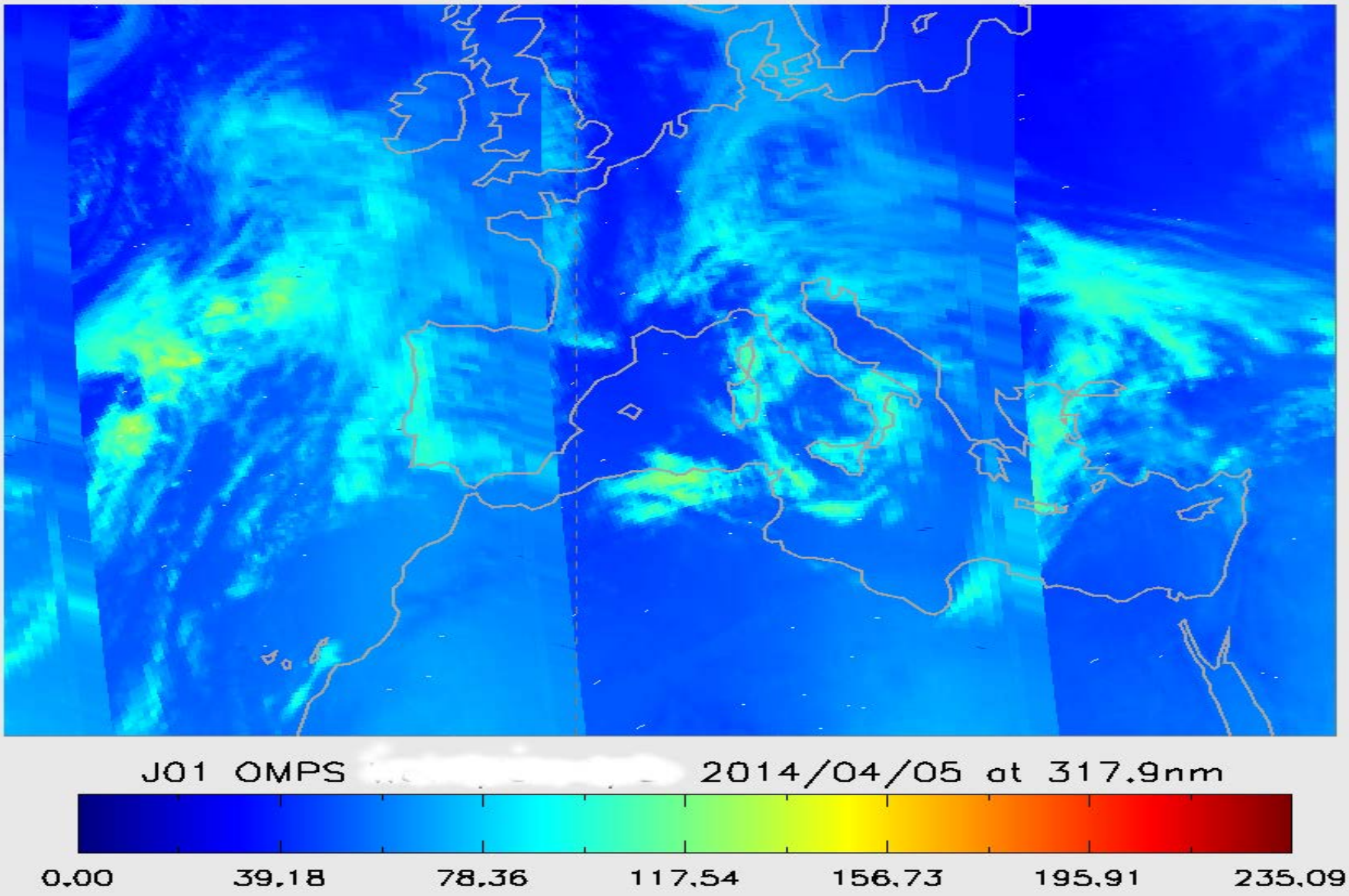
- The OMPS Limb Profiler will return for J2.
- Improved Nadir Mapper Resolution for J2, 17km by 17km ground pixel requirement at nadir.



Current OMPS-TC Spatial Res



OMPS-TC Spatial MedRes



Summary

- Successfully completed J1 SDR algorithm readiness review
- Delivered J1 launch ready Tables and LUTs
- JCT tests passed in SEIT Ops-like environment
- Performed in-house end-to-end tests of the J1 algorithm chain going from RDR to SDR to EDR
  - SNPP proxy datasets and Brass broad J1 data were used to test full range of spatial and spectral domain of J1 sensor beyond NPP sensor capabilities
  - J01 EDR will be run in NDE.

- S-NPP OMPS SDR were reprocessed

Path Forward

- J1 SDR
  - Correction of J01 NP wavelength variation using bi-weekly LUTs
  - Generate weekly dark current tables
  - Demonstrate medium resolution(17km by 17km) JPSS-1 OMPS-TC-SDR using diagnostic mode measurements taken one day per week. This will be run off-line at STAR using ADL.

- J2 and Beyond
  - OMPS Limb Profiler SDR algorithm preparation
  - J2 OMPS-TC has a 17km^2 medium resolution ground pixel size requirement.