OZONE

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Outline

- Executive Summary
- Product Performance
- Major Risks/Issues and Mitigation
- Milestones and Deliverables
- Future Plans/Improvements

Executive Summary

- Heritage/Enterprise Version 8 Algorithms to create Total Column Ozone and Nadir Ozone Profiles with improved horizontal resolution are ready for implementation at NDE and for reprocessing.
- An improved atmospheric SO2 algorithm will allow correction of ozone amounts for elevated SO2 levels.
- The Version 2 Limb Ozone Profile algorithm is ready for implementation at NDE.
- We are working with users, operations, and the OMPS SDR team to prepare for these new products and their improved horizontal resolution with J-01.

OMPS Total Ozone Product Requirements

- JPSS Level 1 Requirements Document (L1RD) Supplement for the OMPS Ozone Total Column Environmental Data Records (EDRs)

Table 5.2.11 - Ozone Total Column (O	
EDR Attribute	**Threshold**
Ozone TC Applicable Conditions: 1. Threshold requirements only apply under daytime conditions with Solar Zenith Angles (SZA) up to 80 degrees. 2. The EDR shall be delivered for all SZA.	
a. Horizontal Cell Size	50 x 50 km^2 @ nadir
b. Vertical Cell Size	0 - 60 km
c. Mapping Uncertainty, 1 Sigma	5 km at Nadir
d. Measurement Range	50 - 650 milli-atm-cm
e. Measurement Precision	
1. X < 0.25 atm-cm	6.0 milli-atm-cm
2. 0.25 < X < 0.45 atm-cm	7.7 milli-atm-cm
3. X > 0.45 atm-cm	2.8 milli-atm-cm + 1.1%
f. Measurement Accuracy	~2%
1. X < 0.25 atm-cm	9.5 milli-atm-cm
2. 0.25 < X < 0.45 atm-cm	13.0 milli-atm-cm
3. X > 0.45 atm-cm	16.0 milli-atm-cm
g. Refresh	At least 90% coverage of the globe every 24 hours (monthly average) ~3%

Verification of Performance:

a. 20-Pixel Aggregation and 7-S along track integration.
b. 318 nm channel BUV comes from the surface to top of atmosphere. Standard profiles in tables account for full range.
c. Confirmed by coastlines and comparison to 750x750 m^2 VIIRS.
d. Confirmed by standard profiles and four years of processing and ground-based matchup scatter.
e. Precision estimates from Nearest Neighbor analysis. Use of 1512 Latitude/Month/TOz profiles.
f. Accuracy is adjusted by soft calibration and checked by zonal mean and overpass statistics.
g. 105° cross-track swath provides full daily coverage.

OMPS Version 8 Ozone Profile EDR Requirements

Ozone Nadir Profile (OMPS-NP) (3)	
Attribute	**Threshold**
a. Horizontal Cell Size	250 x 250 km^2 (1)
b. Vertical Cell Size	3 km reporting
1. Below 30 hPa (~ < 25 km)	10 -20 km
2. 30 -1 hPa (~ 25 -50 km)	7 -10 km
3. Above 1 hPa (~ > 50 km)	10 -20 km
c. Mapping Uncertainty, 1 Sigma	< 25 km
d. Measurement Range 0-60 km	0.1-15.0 ppmv
e. Measurement Precision (2)	
1. Below 30 hPa (~ < 25 km)	Greater of 20 % or 0.1 ppmv
2. 30 -1 hPa (~ 25 -50 km)	5% -10%
3. Above 1 hPa (~ > 50 km)	Greater of 10% or 0.1 ppmv
f. Measurement Accuracy (2)	
1. Below 30 hPa (~ < 25 km)	Greater of 10 % or 0.1 ppmv
2. 30 -1 hPa (~ 25 -50 km)	5% -10%
3. Above 1 hPa (~ > 50 km)	Greater of 10 % or 0.1 ppmv
g. Refresh	At least 60% coverage of the globe every 7 days (monthly average) (2,3)

Notes: 1. SDRs will go to 50x50 km^2 for J-01. 2. The OMPS Nadir Profiler performance is expected to degrade in the area of the South Atlantic Anomaly (SAA) due to the impact of periodic charged particle effects in this region. 3. All OMPS measurements require sunlight, so there is no coverage in polar night areas.

Verification of Performance:

a. 93-Pixel cross-track aggregation and 37.5-S along track integration.
b. Version 8 Algorithms Averaging Kernels
c. Confirmed by to Nadir Mapper, Pixel size, and co-alignment.
d. Confirmed by four years of processing and ground-based matchup scatter.
e. Precision estimates from SNR and Version 8 measurement contribution functions, and along-track differences
f. Accuracy is adjusted by soft calibration and checked by zonal mean statistics, chasing orbits, and Version 8 a priori profiles
g. Suborbital track and precession of orbits.

JPSS-1 Readiness – Algorithms

- Major Accomplishments and Highlights Moving Towards J-01
  - V8Pro was implemented in IDPS Mx8.11
  - Delivered V8TOz single granule package with medium FOV capability to NDE
  - Delivered 15-granule moving-window version of the LFSO2 Code to NDE
  - Ready to deliver V8Pro single granule package with medium FOV capability to NDE
  - Working with NASA on early operations and Cal/Val Plan test timelines
- J1 Algorithm Summary
  - LFSO2/V8TOz for 17x17 km^2 FOV

The V8TOZ has been implemented on LINUX systems with NetCDF output. The LFSO2/V8TOz has been adapted to run on 15-granule sequences on the STAR LINUX system using the first-run V8TOz EDR as input. Both algorithms have been delivered with the capability to handle large and medium FOV SDR products, and they will be integrated into NDE following the October 2016 NDE Block 2.0 ORR.

  - V8Pro for medium FOV

The V8Pro has been implemented in IDPS. We have developed a new glue-ware aggregator to create 50x250 km^2 FOV EDR product from the full range of large and medium FOV SDR products. The algorithm will be delivered after completion of the code reviews, and it will be integrated into NDE following the October 2016 ORR.

JPSS-1 Readiness – Cal/Val

- J1 Cal/Val Overview
  - Pre-Launch Calibration/Validation Plans
    - Ozone Cal/Val Plan Completed January 2016
    - Demonstrating V8Pro and V8TOz soft calibration capabilities with S-NPP
    - Working to develop and test all analysis programs as described in the plan with new medium FOV data sets.
  - Post-Launch Calibration/Validation Plans
    - "Beta" ten days after activation and doors open (launch plus 60 days).
      - Geolocation, product range and reporting
    - "Provisional" L+120 days.
      - Precision and first iteration of soft calibration
    - "Validated 1" after ICV (L+210 days)
      - Accuracy and stability from six months of data
    - “Validated 3” After 1 year of measurements (L+410 days)
      - Accuracy and stability over one annual cycle

JPSS-1 Readiness – Issues & Applications

- Issues - Risks / Mitigation
  - Program guidance on platform for OMPS products – NDE Transition
    - Products in NetCDF4 (+ changes for downstream)
    - Details for product deliveries to Users (BUFR) , STAR and CLASS
    - New system for maintenance and table deliveries
  - Small FOV preparations and short granules / Using diagnostic test data sets, restrict to medium FOV RDRs, CCR Requesting upgrade for S-NPP OMPS to Flight Software 6.0 .
  - Uneven records (moving targets) / Develop better initial tables and reprocessing capabilities
    - Product validation analyses have to be repeated or adjusted as new algorithms and SDR resolution improvements and calibration corrections enter the system.
  - NP Degradation, wavelength scale, solar activity and bandpass / Working with SDR team to implement and demonstrate improvements for S-NPP OMPS.
  - Bandpass and Wavelength Scales for J-01 OMPS NP / revise with in-orbit solar measurement analysis
- Users' Readiness
  - We are upgrading the BUFR products to be created from the OMPS V8 algorithm products and parameters. V8 algorithm BUFR products are already in use.
  - We are working on soft calibration to homogenize the suite of ozone products from OMPS, SBUV/2, OMI and GOME.
  - We are working with users of aerosol, SO_2 and O_3 products to prepare them for the higher spatial resolution products.

Summary

- Heritage/Enterprise Version 8 algorithms are ready for implementation at NDE and provide the capability to process medium FOV J-01 data.
- The products will meet the program requirements.
- S-NPP OMPS Limb Profile Ozone products will also be made operationally at NDE.

FY17 OMPS EDR Milestones/Deliverables

Task Category	Task/Description	Start	Finish	Deliverable
Development (D)	Deferred algorithm improvements (EOFs, Solar, Wavelengths, Bandpasses]	Present	Q3	Code modification
Integration & Testing (I)	Final V8Pro, LFSO2, &V2LP algorithm deliveries to NDE	Present	Q1, Q2	Code logic and output changes
Calibration & Validation (C)	Final RT Tables for J-01 Reprocess S-NPP V8 EDRs Evaluation/validation of S-NPP V8 products including SO2 Prepare, demonstrate and exercise tools for J-01 Soft Calibration for J-01	Present	Q2 Q1,Q2 Q1,Q2 Q2, Q3 Q4	New Tables CDRs! Report and statistics on C/V C/V Plan RR and execution Adjustment LUT
Maintenance	Monitor performance and resolve anomalies	Ongoing	Ongoing	New DRs and CCRs as needed
LTM & Anomaly Resolution (L)	Continue and expand ICVS Monitoring Trending of ground-based comparisons	Ongoing Ongoing	Ongoing Q4	New ICVS content Report for S-NPP and J-01

Path Forward (FY-18 thru FY-21)
High Priority Ozone Tasks/Milestones

	S-NPP	JPSS-1	JPSS-2
FY18	**Sustainment, monitoring, maintenance Implement Cloud Optical Centroid, DOAS NO_2 and SO_2 Retrievals, and Limb Aerosol**	**Provide feedback to SDR Team Complete Validation of Ozone Profile, Total Column Ozone, Aerosol Index, and Total Column SO_2 per Cal/Val Plan**	**Review FM3 performance and evaluate impact of any waivers etc.**
FY19	**Sustainment, monitoring, maintenance, reprocessing**	**Complete coordination with users for applications Sustainment, monitoring, maintenance**	**J-02 product algorithm review including Limb Profiler**
FY20		**Sustainment, monitoring, maintenance**	**Deliveries for J-02 tables and code specifics**
FY21		**Sustainment, monitoring, maintenance, reprocessing**	**Prepare resources and analysis tools to execute Cal/Val Plan**

GSICS USERS' WORKSHOP

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Outline

- Executive Summary
- Workshop Goals
- Workshop Agenda

Executive Summary

- GISCS activities have matured to the point where they are providing the foundation for a true Global System of Infrared instrument measurements including Polar and Geostationary satellites.
- Methods for Visible, Microwave and Ultraviolet instruments are progressing and are addressing differences in the reference measurements, sensor technologies and Earth signatures in their different spectral regions.
- The ICVS is an important asset in the NOAA participation in GSICS activities.

Workshop Goals

- Applications of current GSICS products,
- GPRC resources (e.g., Calibration/Validation Systems, Long Term Monitoring, Instrument Landing Pages, and Monitoring notices, alerts and summaries),
- Interactions between data assimilation groups and measurement calibration, characterization and monitoring teams,
- Introduction to the NESDIS Integrated Calibration Validation System (ICVS) design and content www.star.nesdis.**noaa**.gov/**icvs**/
- Introduction to upcoming GSICS products and research areas (e.g., GEO Ring, GOES-R on-orbit calibration),
- Practical experience in the use of JPSS Mission and other instruments as references for Monitoring GEO/LEO instrument measurements in Near Real Time and Climate Data Record applications, and
- Calibration advances (e.g., Lunar, Deep Convective Cloud, Reference Migration, Best Practices).

Morning Agenda

Session 12: GSICS Users Workshop ESSIC Room 4201

0830 - 0835		Session Introduction	Chair - L. Flynn
0835 - 0845		Introduction to GSICS Workshop	Mitch Goldberg
0845 - 0900		GSICS Past Present and Future	Ken Holmlund
0900 - 0915		GSICS Research Working Group	Fred Wu for D. Kim/T. Hewison
0915 - 0930		GSICS Data Working Group	Masaya Takahashi
0930 - 0945		GCC GSICS Products and Deliverables	Larry Flynn
0945 - 1000		GSICS User Survey	Manik Bali
1000 - 1015		Break	
1015 - 1030		Well Calibrated JPSS Instruments as GSICS References	Fuzhong Weng
1030 - 1045		ICVS Design, content and structure	L. Brown
1045 - 1100		ICVS Calibration and science	N Sun
1100 - 1115		ICVS Alerts, events and monitoring	N Sun
1115 - 1120		MW Session Introduction	Chair - R. Ferraro
1120 - 1140		Investigating Shortcomings of Radiative Transfer Models at Microwave Frequencies	Wesley Berg
1140 - 1200		Stability and Interconsistency of Passive Microwave Water Vapor Products for Weather and Climate	J. Forsythe
1200 - 1220		What Happens to Radiances after They Leave Home: Precipitation	G. Huffman
1220 - 1240		Toward Long-Term Climate Change Monitoring in the JPSS Era	Cheng-Zhi Zou
1240 – 1245		Closing	Ralph Ferraro

Afternoon Agenda

Session 12: GSICS Users Workshop ESSIC Room 4201

1245 - 1330		Lunch	
1330 - 1445		IR Session	Chair - Fred Wu
1330 - 1345		Inter-Calibration with Hyperspectral Sounders	Fred Wu
1345 - 1350		Inter-Calibration of HIRS using IASI as Reference	Fred Wu on behalf of Tim Hewison
1350 - 1410		Inter-Calibration of Himawari-8 AHI Using CrIS as Reference	Masaya Takahashi
1410 - 1425		ISRO's GSICS Activities for Intercalibration of the INSAT-3D radiances	Pradeep Thapliyal
1425 - 1445		Calibration Requirements for SST	Andy Harris & Eileen Maturi
1445 - 1530		VIS Session	Chair - Dave Doelling
1445 - 1500		GSICS visible sub-group calibration activities	Dave Doelling
1500 - 1515		MODIS and VIIRS Reflective Solar Calibration Update	Jack Xiong
1515 - 1530		PATMOS-x Reflective Solar Calibration Status	Andy Heidinger
1530 - 1545		Poster Session 3 - NCWCP Atrium	
1545 - 1600		Preliminary SCIAMACHY Lunar observations as intercalibration source	Matthijs Krijger
1600 - 1615		The Moon and Earth Radiation Budget Experiment (MERBE)	Grant Matthews
1615 - 1630	--	Instrument landing pages, OSCAR	L. Flynn, M. Bali
1630 - 1645	--	UV Projects	L. Flynn
1645 - 1700	--	Discussions and Conclusions	