MEMORANDUM FOR:	The Record
FROM:	Quanhua (Mark) Liu and Nicholas Nalli, JPSS Soundings Team Leads
SUBJECT:	SNPP Infrared Ozone Profile Validated maturity status and public release
DATE:	10/13/2016

Validated maturity status declaration for IR Ozone Profile Environmental Data Record Product

Maturity Review Date:	**10/18/2016**
Effective Date:	**10/18/2016**
Operational System:	**NUCAPS Version 1.5**

The JPSS Algorithm Maturity Readiness Review Board approved the release of the NOAA Unique Combined Atmospheric Processing System (NUCAPS) Infrared Ozone Profile Environmental Data Record (EDR) product to the public with a Validated maturity level quality as of 10/18/2016 (effective date), based on JPSS Validation Maturity Review held on 10/18/2016 (link to review artifacts: http://www.star.nesdis.noaa.gov/jpss/AlgorithmMaturity.php).

1. Maturity stage definition:
   http://www.star.nesdis.noaa.gov/jpss/documents/Status/DataProductMaturityLevelDefinitions.pdf
2. Algorithm Description:
   - List of Products (Collection Short Name (CSN): 'NUCAPS-EDR')
     - Infrared Ozone Profile EDR

   - Product requirements/Exclusions (L1RDS)

Attribute	Threshold	Objective
O_3 Total Column, Refresh	24 hours	24 hours
O_3 Total Column, Horizontal Resolution	100 km	100 km
O_3 Total Column, mapping uncertainty (3σ)	25 km	25 km
O_3 Profile Precision, 4–260 hPa (6 statistic layers)	20%	10%
O_3 Profile Precision, 260 hPa to sfc (1 statistic layer)	20%	10%
O_3 Profile Accuracy, 4–260 hPa (6 statistic layers)	±10%	±5%
O_3 Profile Accuracy, 260 hPa to sfc (1 statistic layer)	±10%	±5%
O_3 Profile Uncertainty, 4–260 hPa (6 statistic layers)	25%	15%
O_3 Profile Uncertainty, 260 hPa to sfc (1 statistic layer)	25%	15%

- Quality flags (Table)

Values	Definition	Notes
0	accepted	
1	IR+MW final physical retrieval failed at least one quality check	
2	MW regression failed at least one quality check	removed
4	rejected by NOAA (IR regression) file	removed
8 → 9	rejected by internal MIT (MW) file	becomes 9
16 → 17	IR regression failed at least one quality check	becomes 17 ⇒ Quality_Flag = 1
24→25	MW and IR+MW both failed at least one quality check	becomes 25 ⇒ Quality_Flag = 1
−9999	missing	

- Product evaluation/validation
    - Validation of the v1.5 IR ozone profile EDR was performed using collocated ozonesondes representative of the global latitude belts and land/sea surface types.
    - Ozonesonde data used for "truth" included dedicated ozonesondes from NOAA-supported intensive campaigns (AEROSE and CalWater/ACAPEX; e.g., *Nalli et al.,* 2011), as well as sites of opportunity from the SHADOZ (e.g., *Thompson et al.* 2007) and WOUDC (e.g., DWD-GRUAN, & INPE, & KNMI, & NASA-WFF, & SMNA; http://www.woudc.org) networks.

- Product availability/reliability
    - NUCAPS IR Ozone Profile EDR data were produced since 09/01/2013, but data before 09/03/2014 (Validated maturity effective date for the atmospheric vertical temperature and moisture profile, AVTP and AVMP, respectively, EDRs) were of unknown reliability because the quality of the ozone profile EDR is ultimately dependent upon the quality of the AVTP/AVMP EDRs, which are retrieved first in the sequential NUCAPS retrieval algorithm.
    - Note that the Beta maturity was attained for the original IDPS "CrIMSS" algorithm AVTP/AVMP products in August 2012, but the NUCAPS algorithm superceded the "CrIMSS" algorithm as the operational CrIS/ATMS soundings algorithm in September 2013.

- Algorithm performance dependence
    - The NUCAPS IR Ozone Profile performance is dependent retrieval steps in the NUCAPS algorithm such as cloud-clearing and AVTP/AVMP retrievals being optimized.
    - The NUCAPS algorithm as a whole is dependent upon required sensor data record (SDR) inputs being validated and stable (i.e., CrIS SDRs).

- Known errors/issues/limitations
  - o The CrIS IR ozone channels provide very little sensitivity to ozone in the troposphere as evidenced by the retrieval averaging kernels.
  - o Therefore, it is expected that the tropospheric layer ozone retrieval relaxes to the *a priori* and thus should be used with caution.

3. Changes since last maturity stage
   - v1.5.1: Used a new rtaerr file: cris_rtaerr_v10b.asc
   - v1.5.2: Uses the earlier v1.5 rtaerr file, but with the ascending/descending flag added in. All versions from here forward have the ascending/descending flag.
4. Review board recommendations
   - The Team recommends algorithm Validated Maturity
5. Path Forward/Future Plan
   - Planned further improvements
     - o Implement CrIS full-resolution SARTA model (to be delivered by STC)
     - o Optimize CrIS full-resolution algorithm
     - o Develop and test "IR-only" algorithm
     - o Prepare for JPSS-1
   - Planned Cal/Val activities / milestones
     - o Apply averaging kernels, degrees-of-freedom, etc.
     - o Publish peer-reviewed publication on SNPP validation
     - o Prepare for J-1
       - ▪ Global Focus Day numerical model comparisons
       - ▪ Support intensive campaigns featuring dedicated ozonesondes
       - ▪ Acquire and collect global ozonesonde datasets, including dedicated ozonesondes if available
6. Additional Items to note

Additional information is available in the NUCAPS algorithm theoretical basis document (ATBD) and validation maturity review briefing, which can be accessed at:
   http://www.star.nesdis.noaa.gov/jpss/Docs.php

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