MEMORANDUM FOR: The JPSS Program Record
SUBMITTED BY: JPSS SFR Product Team Lead Huan Meng
CONCURRED BY: JPSS Algorithm Management Project Lead Arron Layns
JPSS STAR Program Manager Lihang Zhou
APPROVED BY: JPSS Program Scientist Mitch Goldberg

SUBJECT: NOAA-20 SFR Product Provisional Maturity Status
DATE: 05/16/2019

Provisional maturity status declaration for SFR Retrieval Product
Maturity Review Date: **05/16/2019**
Effective Date: **05/16/2019**

The NOAA-20 satellite was launched on November 18, 2017. NOAA-20 ATMS is a cross-track scanning radiometer with 22 channels at frequencies ranging from 23 to 183 GHz. The high frequencies are suitable for retrieval of snowfall rate (SFR).

The Snowfall Rate (SFR) science team has developed a NOAA-20 ATMS SFR algorithm and has been generating the product at near real-time since 2018. Extensive calibration and validation studies have been conducted to demonstrate the performance of the product. Based on the evaluation presented, the science team recommends the NOAA-20 SFR product to be considered to have Provisional maturity level quality as of 05/16/2019 (effective date).

1. **Maturity stage definition**:
   The Definition of Provisional maturity stage is available at the JPSS Algorithm Maturity Matrix webpage: http://www.star.nesdis.noaa.gov/jpss/AlgorithmMaturity.php

2. **Algorithm Description**:

   The NOAA-20 ATMS SFR product is water equivalent snowfall rate derived from ATMS measurements at a set of window and water vapor/temperature sounding channels. The algorithm is composed of two independent components: a statistical Snowfall Detection (SD) algorithm and a physically-based SFR algorithm. The SD algorithm optimally combines two statistical models trained using in-situ snowfall observations. The two models utilize satellite measurements and numerical weather prediction (NWP) model data, respectively. The SFR algorithm is based on a 1D variational (1D-Var) model that retrieves cloud properties from ATMS measurements. SFR is derived from the cloud properties and calculated ice particle terminal velocity. The SFR product is a two-dimensional array with the same field-of-view size as the ATMS water vapor sounding channels, i.e. 16-km at nadir.

   The SFR product is included in the Microwave Integrated Retrieval System (MiRS) data file. The MiRS Collection Short Name (CSN) is: NDE_L2_MIRS. The output file is generated in netCDF4

format.

Product requirements/Exclusions (L1RDS):
The ATMS SFR product requirements are documented in the Joint Polar Satellite System (JPSS) Level 1 Requirements Supplement (L1RDS). The current version of the L1RDS is available at http://www.jpss.noaa.gov/technical_documents.html. The NOAA-20 ATMS SFR product meets all the threshold criteria of JPSS Level 1 requirements.

Applicable Conditions:
  – Over global land
  – Limb-corrected 53.6 GHz brightness temperature is 240 K or above

Product evaluation/validation:
The NOAA-20 ATMS SFR validation study includes two separate sets of activities: one for SD and the other for SFR. The SD algorithm is validated against ground observations (Quality Controlled Local Climatology Data from NCEI). The SFR algorithm is validated using the NCEP Stage IV radar and gauge precipitation analyses. The validation results show good agreement between the NOAA-20 ATMS SFR and the validation 'truth' data with the performance statistics meeting the L1RDS requirements.

Product availability/reliability:
The NOAA-20 ATMS SFR is currently at the Integration and Testing stage prior to full production. The product is scheduled for operational production in NDE starting August 2019. Once the operational phase begins, the product will be available at NOAA CLASS as part of the MiRS Precipitation and Surface Products files:
https://www.avl.class.noaa.gov/saa/products/welcome

Algorithm performance dependence:
The performance of the NOAA-20 ATMS SFR product largely depends on the quality of the NOAA-20 ATMS TDR data. The TDR data have reached validated maturity.

Additional information is available in the ATMS SFR algorithm theoretical basis document (ATBD) and provisional maturity review briefing.

3. **Changes since last maturity stage**:
   - Performed radiometric bias correction
   - Trained a snowfall detection (SD) model
   - SD validation
   - SFR calibration
   - SFR validation

4. **Review board recommendations**:
   TBD

5. **Path Forward/Future Plan**:
   Perform algorithm enhancement, calibration and validation. Reach validated maturity status.

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