



Read-me for Data Users

MEMORANDUM FOR: The JPSS Program Record
SUBMITTED BY: JPSS Snowfall Rate (SFR) Team Lead, Huan Meng
CONCURRED BY: JPSS Algorithm Management Project Lead Lihang Zhou
JPSS STAR Program Manager Ingrid Guch
APPROVED BY: JPSS Program Scientist Satya Kalluri

SUBJECT: NOAA-21 SFR Provisional maturity status and public release
DATE: 03/07/2024

Provisional maturity status declaration for NOAA-21 Snowfall Rate

Maturity Review Date: 03/07/2024
Effective Date: 03/07/2024
Operational System: NCCF, SFR 2.0

The JPSS Algorithm Maturity Readiness Review Board approved the release of the NOAA-21 Snowfall Rate to the public with a Provisional maturity level quality as of 03/07/2024 (effective date), based on JPSS Validation Maturity Review held on 03/07/2024 ([link to review artifacts](#)).

- 1. Maturity stage definition** (reference to the AMM webpage for maturity definition: <http://www.star.nesdis.noaa.gov/jpss/AlgorithmMaturity.php>). Provisional maturity means that the product meets the following criteria:
 - Product performance has been demonstrated through analysis of a large, but still limited (i.e., not necessarily globally or seasonally representative) number of independent measurements obtained from selected locations, time periods, or field campaign efforts.
 - Product analyses are sufficient for qualitative, and limited quantitative, determination of product fitness-for-purpose.
 - Documentation of product performance, testing involving product fixes, identified product performance anomalies, including recommended remediation strategies, exists.
 - Product is recommended for potential operational use (user decision) and in scientific publications after consulting product status documents.

2. Algorithm Description:

List of Products (Collection Short Name (CSN))

ATMS Snowfall Rate (SFR)

Product requirements/Exclusions (DPS)

The SFR requirements are documented in the [Joint Polar Satellite System \(JPSS\) Ground Segment Data Product Specification \(GSegDPS\)](#). Specifically, there are three product requirements:

DPS-1756: The algorithm shall produce a SFR product that has a measurement precision of: 1.0 mm/hr.

DPS-1757: The algorithm shall produce a SFR product that has a measurement accuracy of: ± 0.3 mm/hr.

Quality flags (Table)

There is one quality flag (32 bit) in the SFR file that specifies two quality variables:

Quality flag bit	Meaning	Value
0	1DVAR Convergence	1: Non-convergent 0: Convergent
1	SFR threshold	1: SFR is below threshold, set to 0 0: SFR is above threshold, value unchanged

Product evaluation/validation

The NOAA-21 SFR provides water equivalent snowfall amount in unit time. It is derived from two algorithms: a machine learning (ML) model for snowfall detection (SD), and a ML enhanced 1DVAR-based algorithm for snowfall rate estimation. A comprehensive validation study has been conducted to evaluate both algorithms. The validation data source for SD is the NOAA/NCEI Integrated Surface Database. Only manual ground observations are used to ensure data quality. The validation datasets for snowfall rate estimation consists of NCEP Stage IV, a radar and gauge combined hourly precipitation product, and ECMWF reanalysis ERA5 snowfall rate. The validation results show that the NOAA-21 SFR meet all JPSS requirements.

Product availability/reliability

The NOAA-21 SFR EDR data has been produced operationally since July 7, 2023 as a Beta maturity product. The data is available within the MIRS data package available at NOAA CLASS: <https://www.avl.class.noaa.gov/saa/products/welcome>. The Provisional mature data will become available at CLASS as a standalone dataset in the future.

Algorithm performance dependence

The performance of the NOAA-21 SFR product largely depends on the quality of the NOAA-21 ATMS TDR data and the NOAA GFS model forecasts. The NOAA-21 TDR data have reached validated maturity. Additional information is available in the ATMS SFR algorithm theoretical basis document (ATBD) and Provisional maturity review briefing.

Known errors/issues/limitations

Due to the limited amount of the NOAA-21 snowfall data, the training datasets for the NOAA-21 SFR algorithms contain both NOAA-21 and NOAA-20 data. Additional NOAA-21 data will improve the quality of the SD and SFR algorithms in the future.

3. Changes since last maturity stage

The SFR science team trained a new NOAA-21 ML snowfall detection model using a dataset consisting of both NOAA-21 and NOAA-20 data. New ML enhancement models for NOAA-21 snowfall rate estimations have also been developed.

4. Review board recommendations

TBD

5. Path Forward/Future Plan

Collect additional NOAA-21 snowfall data and update the SD and SFR algorithms. Conduct inter-satellite calibration to ensure consistency across satellites.

6. Additional Items to note



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The SFR science team maintains a product [website](#) that displays SFR from a constellation of satellites including NOAA-21 in near real-time. NOAA-21 SFR is also being distributed to some NWS Weather Forecast Offices for operational applications.

Additional information is available in the SFR algorithm theoretical basis document (ATBD) and validation maturity review briefing, which can be accessed at:

<http://www.star.nesdis.noaa.gov/jpss/Docs.php>

Point of Contact:

Name: Huan Meng

Email: huan.meng@noaa.gov

Phone: 301-405-8799