



Read-me for Data Users

MEMORANDUM FOR: The JPSS Program Record
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SUBJECT: NOAA-21 Provisional maturity status for the VIIRS Polar Winds (VPW) Product

DATE: 01/25/2024

Validated maturity status declaration for VIIRS Polar Winds (VPW)

Maturity Review Date: 01/25/2024
Effective Date: 11/16/2023
Operational System: NCCF, VPW Version V3.2.0, Processing Version Tag v3r2

The JPSS Algorithm Maturity Readiness Review Board approved the release of the JPSS Product Enterprise VIIRS Polar Winds (VPW) with a Validated maturity level quality as of 11/16/2023, based on the JPSS VPW held on 01/25/2024.

• **Validated Maturity Stage Definition**

- Product performance has been demonstrated over a large and wide range of representative conditions (i.e., global, seasonal).
- Comprehensive documentation of product performance exists that includes all known product anomalies and their recommended remediation strategies for a full range of retrieval conditions and severity level.
- Product analyses are sufficient for full qualitative and quantitative determination of product fitness-for-purpose.
- Product is ready for operational use based on documented validation findings and user feedback.
- Product validation, quality assurance, and algorithm stewardship continue through the lifetime of the instrument.

• **Algorithm Description**

The VIIRS Polar Winds (VPW) are derived by tracking cloud features viewed by the VIIRS M15 (10.8um) channel in the overlap region of three consecutive NOAA-21 orbits. Wind speed, direction, and height are measured throughout the troposphere, poleward of approximately 70 degrees latitude, in cloudy areas only. The height of the derived winds is achieved by using VIIRS cloud height product associated with the VIIRS pixels used in the feature tracking step. The vertical and horizontal coverage of the VPW product is not uniform.

An extensive description of the VPW product may be found in the Enterprise VPW Algorithm Theoretical Basis Document (ATBD). The VPW ATBD can be accessed at the following link: <http://www.star.nesdis.noaa.gov/jpss/Docs.php>

The Collection Short Name for the VPW from N21 is:

JRR-VPW_v3r2_n21_sYYYYMMDDSSSSSSSS_eYYYYMMDDSSSSSSSS_cYYYYMMDDSSSSSSSS where YYYY is the year in 4 digits, MM the month, DD the day, and SS the seconds down to the sixth or seventh significant digit depending on whether the reference is to the start time of the granule (s), the end time of the granule (e), or the time it was created (c).

Product requirements published in the JPSS Ground Segment Data Product Specifications (Rev H) (February 22, 2023) are:

DPS	Requirement	Performance
DPS-104	The Polar Winds product shall provide polar wind vectors, at cloud tops, globally day and night, in cloudy areas, between the surface and the tropopause.	
DPS-806	The Polar Winds BUFR product shall provide geolocated polar wind vectors, converted from the Polar Winds product, in BUFR format.	
DPS-106	The Polar Winds product shall provide polar wind vectors with magnitudes from 3 to 100 meters/second and directions from 0 to 360 degrees.	
DPS-107	The Polar Winds product shall provide polar wind vectors with a measurement precision of 4.2 meters/sec, expressed as a mean vector difference.	
DPS-108	The Polar Winds product shall provide polar wind vectors with a measurement accuracy of 7.5 meters/sec, expressed as a mean vector difference.	
DPS-109	The Polar Winds product shall provide polar wind vectors with a horizontal resolution of 10 km.	

The key VPW product outputs are:

- Time of wind from the middle image in the image triplet
- Latitude (degrees north)
- Longitude (degrees east)
- Speed of wind vector (m/s)
- Direction of wind vector (degrees)
- Pressure assignment of tracer (hPa)
- Temperature associated with pressure assignment of tracer (K)

- Satellite Zenith Angle (degrees)
- Time interval between images (minutes)
- Product Quality Flag (0 = product passes all quality tests; > 0 product fails quality tests)
- Quality Indicator (QI) of derived wind (0-100, with 100 being the best)

Product evaluation/validation

- Visual comparisons with the NOAA-21 VPW products generated outside of NCCF
- Comparisons of VPW product with the following reference wind data:
 - Radiosonde wind observations
 - Commercial aircraft wind observations
 - NCEP GFS analysis winds
- Inter-sensor comparisons
 - Comparisons of the NOAA-21 VPW product to NOAA-20 and S-NPP VPW products

Product availability/reliability

- NOAA-21 VPW data v3r2 products have been consistently and reliably produced since 11/16/2023.

Algorithm performance dependence

- The VPW product performance is dependent on the following:
 - VIIRS SDR calibration and navigation
 - Clear Sky Mask Product
 - Plays a role in the VPW geographic coverage
 - Cloud Type/Phase Product
 - Drives cloud height retrieval
 - Cloud Height Products
 - Drives VPW height assignment

Known errors/issues/limitations

- The latest version of the enterprise winds algorithm (v3r2) uses a check to ensure that a valid cloud top pressure exists when determining the height of the derived wind. This check will be supplemented in the future with checks that interrogate the cloud retrieval quality flags provided with the cloud height products.
- The latest version of the enterprise cloud height algorithm tends to generate a lot of cloud top pressures at 986 hPa resulting in a peak in the number of VPWs whose height assignments are 986 hPa. The quality of these VPWs is fine based on comparisons to the wind reference data noted above.

- **Changes Since Last Maturity Stage**
 - None



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- **Review Board Recommendations**

- None

- **Path Forward/Future Plan**

- Transition updates to the enterprise VPW algorithm noted above in the next algorithm update cycle
- Transition updates to the enterprise VPW algorithm to add the capability to generate winds using the VIIRS short-wave IR (SWIR) M11 (2.25um) band.

- **Additional Items to Note**

- None

Additional information is available in the Enterprise VPW 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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