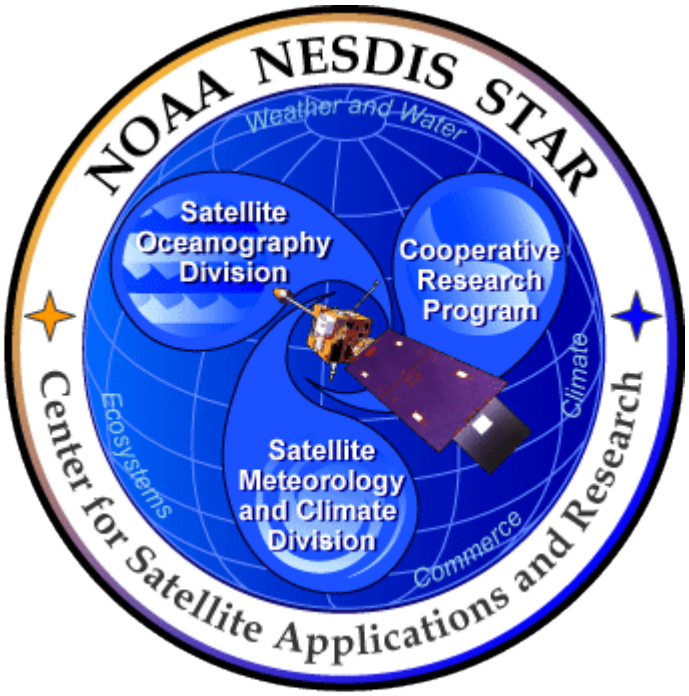

NOAA NESDIS
CENTER for SATELLITE APPLICATIONS and RESEARCH

The NOAA VIIRS Polar Winds Product System
External Users Manual

Version 1.0

TITLE: The NOAA VIIRS Polar Winds Product System EXTERNAL USERS MANUAL VERSION 1.0

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APPROVAL SIGNATURES:

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1. PRODUCTS

This is an external user's manual document describing the VIIRS Polar Winds products and output files. The VIIRS Polar Winds product system was developed at the Center for Satellite Applications and Research (STAR) and implemented into operations at the NOAA NPOESS Data Exploitation (NDE).

The intended users of the External Users Manual (EUM) are end users of the output products and files, and the product verification and validation (V&V) teams. The purpose of the EUM is to provide product users and product testers with information that will enable them to acquire the product, understand its features, and use the data. External users are defined as those users who do not have direct access to the processing system.

1.1. Product Overview

The NOAA VIIRS Polar Winds Product System (NVPWPS) is developed to generate the VIIRS Polar Winds (VPW) products. The system is designed to run within the NPOESS Data Exploitation (NDE) system delivered to the Office of Satellite and Product Operations (OSPO). The output products are intended for operational and scientific users.

1.1.1. Product Requirements

The requirements are to develop a production system to retrieve polar winds products using the Visible Infrared Imager Radiometer Suite (VIIRS) instrument on the Suomi National Polar-orbiting Partnership satellite (NPP, formerly the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project). NPP was launched 28 October 2011. The products will also be generated with the VIIRS instrument on future Joint Polar Satellite System (JPSS) satellites.

1.1.2. Product Team

The VIIRS Polar Winds Development product team consists of members from STAR. The roles and contact information for the different product team members are identified in Table 1-1.

Table 1-1 Product Team Members

Team Member	Organization	Role	Contact Information
Walter Wolf	STAR	STAR Project Lead	5830 University Research Court Riverdale, MD. 20740 Phone: 301-683-3594 Email: Walter.Wolf@noaa.gov
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			Suitland MD 20746 Phone: (301)817-3803 Email: Donna.McNamara@noaa.gov

1.1.3. Product Description

The NOAA VIIRS Polar Winds Product System (NVPWPS) generates polar winds products for both north polar and south polar regions. The system was designed to run within the NPOESS Data Exploitation (NDE) production environment. The output products are intended for operational and scientific users.

1.1.4. Product History

The polar winds product suite has expanded considerably in recent years. In addition to Terra and Aqua MODIS winds being produced separately, a mixed-satellite product was developed in order to improve the timeliness of the winds and to extend the coverage somewhat. To take advantage of the additional temporal coverage provided by the NOAA satellites, polar winds product from AVHRR on NOAA-15 through -19 and Metop-A continues. But since the launch of the Suomi National Polar-orbiting Partnership (Suomi NPP) on 28 October 2011, a new focus is on developing a method to generate winds from the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument on board the new satellite.

1.2. Product Characteristics

VIIRS is a 22-band imaging radiometer that, in terms of features, is a cross between MODIS and AVHRR, with some characteristics of the Operational Linescan System (OLS) on Defense Meteorological Satellite Program (DMSP) satellites. Several unique characteristics of VIIRS will impact theVIIRS polar winds products, which include

- a wider swath,
- high spatial resolution,
- constrained pixel growth: better resolution at edge of swath,
- a visible day-night band (DNB).

1.3. Product Access

All NVPWPS output data files will be made available by the NDE DHS on the NDE data distribution server at ESPC in a near real time manner. For access to this server, information about data files, and associated documentation, the NVPWPS PAL should be contacted (see Table 1-1).

The NESDIS' Policy on Access and Distribution of Environmental Data and Products is provided at: http://www.ospo.noaa.gov/Organization/About/access.html.

Users need to fill out the Data Access Request Form located on this site and submit to the PAL with a copy to nesdis.data.access@noaa.gov. This address provides the OSPO Data Access Team a copy of the correspondence. The process is defined in the following diagram. Once the request is approved by the OSPO management the data will be delivered by the Data Distribution System (DDSProd) currently distributing the ESPC data products and later by the Product Distribution and Access (PDA) system. The ESPC Data Distribution Manager, Donna McNamara (donna.mcnamara@noaa.gov) should be contacted for any data accessibility and data distribution problems.

Table 1-2 lists the VIIRS polar winds output file and its format. Tables 1-3 show the detailed content of the output file listed in Table 1-2.

Table 1-2 VIIRS Polar Winds Output File

File	Description	Format	Size/file
PAMV-VIIRS-CD-SH_v1r1_npp_s????????????????_e????????????_c????????????????.nc	This is the VIIRS Polar Winds product data for South Hemesphere	NetCDF4	6 MB/file
PAMV-VIIRS-CD-NH_v1r1_npp_s????????????????_e????????????_c????????????????.nc	This is the VIIRS Polar Winds product data for North Hemesphere	NetCDF4	6MB/file

Here is an example of the Polar-Winds Product naming convention:

PAMV-VIIRS-CD-NH_v1r1_npp_s201305020126490_e201305020448490_c201310071709460.nc

Where,
NH – North Hemesphere (SH – South Hemesphere)
v1r1 – version
s201305020126490 -- first (remapped) image pole-pass-over time (4digit year + 2digit month + 2digit day + 2digit hour + 2digit minute + 3digit second)

e201305020448490 -- third (remapped) image pole-pass time (same as above)
c201310071709460 – product create time (same as above)

Table 1-3 Polar Winds Output File

Variable	Type	Description	Dim	Units	Range
AMVChannel	Long	Channel Number	0	None	NA
Altitude	Float	Derived altitude of tracer from pressure	1	m	-300., 30000.
BestFitPresLvl	Float	Best Fit Pressure Level	0	hPa	0,1100
BoxSize	Long	Target box size being tracked	0	None	NA
BufferSize	Float	Total targets identified	0	None	NA
CldHgtMax_Layer1	Float	Cloud height max for atmospheric layer1	0	hPa	NA
CldHgtMax_Layer2	Float	Cloud height max for atmospheric layer2	0	hPa	NA
CldHgtMax_Layer3	Float	Cloud height max for atmospheric layer3	0	hPa	NA
CldHgtMean_Layer1	Float	Cloud height mean for atmospheric layer1	0	hPa	NA
CldHgtMean_Layer2	Float	Cloud height mean for atmospheric layer2	0	hPa	NA
CldHgtMean_Layer3	Float	Cloud height mean for atmospheric layer3	0	hPa	NA
CldHgtMin_Layer1	Float	Cloud height min for atmospheric layer1	0	hPa	NA
CldHgtMin_Layer2	Float	Cloud height min for atmospheric layer2	0	hPa	NA
CldHgtMin_Layer3	Float	Cloud height min for atmospheric layer3	0	hPa	NA
CldHgtStdDev_Layer1	Float	Standard deviation about mean height (hPa) assigned to good derived winds in atmospheric layer 1	0	hPa	NA
CldHgtStdDev_Layer2	Float	Standard deviation about mean height (hPa) assigned to good derived winds	0	hPa	NA

		in atmospheric layer 2			
CldHgtStdDev_Layer3	Float	Standard deviation about mean height (hPa) assigned to good derived winds in atmospheric layer 3	0	hPa	NA
CloudPhase	Long	Dominant cloud phase of target scene	1	NA	NA
CloudTyp	Long	Dominant cloud type of target scene	1	NA	NA
CombinedMedianHgtErr	Float	Representative height error (hPa)	1	hPa	NA
CombinedMedianTempErr	Float	Representative temperature error	1	Kelvin	NA
CorrCoeff	Float	Correlation coefficient of first vector	1	NA	NA
CorrCoeff2	Float	Correlation coefficient of second vector	1	NA	NA
ExpectedErr	Float	Expected Error	1	m.s-1	NA
Fcst_Dir	Float	Direction of forecast	1	Degree	NA
Fcst_Spd	Float	Speed of forecast	1	m.s-1	NA
Flag	Long	Internal Quality Flag	1	NA	0, 16
GoodWndClrCld	Float	% of good winds for Clear/Cloudy sky	0	NA	NA
InversionFlag	Long	Low-level inversion flag	1	NA	NA
LagSize	Long	Lag Size(in pixels)	0	NA	NA
LandFlag	Long	Land Mask	1	NA	NA
LatMatch	Float	Latitude of the match in the preceding image	1	Degrees _north	NA
LatMatch2	Float	Latitude of the match in the succeeding image	1	Degrees _north	NA
Latitude	Float	Wind Latitude	1	Degree_ north	-90., 90.
LonMatch	Float	Longitude of the match in the preceding image	1	Degrees _north	NA
LonMatch2	Float	Longitude of the match in the succeeding image	1	Degrees _north	NA

Longitude	Float	Wind Longitude	1	Degree_ north	-180., 180.
MaxCTP	Float	Maximum cloud-top pressure (hPa) in largest cluster	1	hPa	NA
MaxCTT	Float	Maximum cloud-top temperature (K) in largest cluster	1	Kelvin	NA
MaxClusterSize1	Long	Size of largest DBSCAN cluster (sample 1 – reverse vector)	1	NA	NA
MaxClusterSize2	Long	Size of largest DBSCAN cluster (sample 2 – forward vector)	1	NA	NA
MedianBT	Float	Representative BrtTemp of tracer	1	Kevin	NA
MedianPress	Float	Pressure assignment of tracer (mb)	1	hPa	0., 1100.
MinCTP	Float	Minimum cloud-top pressure (hPa) in largest cluster	1	hPa	NA
MinCTT	Float	Minimum cloud-top temperature (K) in largest cluster	1	Kelvin	NA
NestedTrackingFlag	Long	Nested tracking flag	0	NA	NA
NextImageDate	Long	Date(Year+Julian day) of subsequent image	1	NA	NA
NextImageTime	Long	Time(HHMM) of subsequent image	1	NA	NA
NumClusters1	Long	Number of distinct motion clusters from DBSCAN analysis (sample 1 –reverse vector)	1	NA	NA
NumClusters2	Long	Number of distinct motion clusters from DBSCAN analysis (sample 2 – forward vector)	1	NA	NA
NumGoodWnds_Layer1	Long	Number of good winds for atmospheric layer1 (100 – 399.9 mb)	0	NA	NA
NumGoodWnds_Layer2	Long	Number of good	0	NA	NA

		winds for atmospheric layer2 (400 – 699.9 mb)			
NumGoodWnds_Layer3	Long	Number of good winds for atmospheric layer3 (700 – 1000 mb)	0	NA	NA
NumOfAtmosLayers	Long	Number of atmospheric layers	0	NA	NA
NumOfChn	Long	Number of Channels	0	NA	NA
NumQAVals	Long	Number of QA Flag Values	0	NA	NA
NumTargets_Total	Long	Total targets identified	0	NA	NA
PctOfAvg1	Float	Standard deviation of sample 1 divided by magnitude of average displacement	1	NA	NA
PctOfAvg2	Float	Standard deviation of sample 2 divided by magnitude of average displacement	1	NA	NA
PointIndex	Long	Cold sample counter in brightness temperature histogram	1	NA	NA
PriorImageDate	Long	Date(Year + Julian day) of prior image	1	NA	NA
PriorImageTime	Long	Time (HHMM) of prior image	1	NA	NA
QA_Value_0	Float	% of QA flag value of 0: good wind; passes all QC checks	0	NA	NA
QA_Value_1	Float	% of QA flag value of 1: Maximum gradient below acceptable threshod	0	NA	NA
QA_Value_2	Float	% of QA flag value of 2: Target located on earth edge	0	NA	NA
QA_Value_3	Float	% of QA flag value of 3: Cloud amount failures (less than 10% cloud cover for cloud track winds or	0	NA	NA

		greater than 0% cloud cover for water vapor clear sky winds)			
QA_Value_4	Float	% of QA flag value of 4: Median pressure not found	0	NA	NA
QA_Value_5	Float	% of QA flag value of 5: Bad or missing brightness temperature in target scene	0	NA	NA
QA_Value_6	Float	% of QA flag value of 6: More than 1 cloud layer present	0	NA	NA
QA_Value_7	Float	% of QA flag value of 7: Target scene too coherent (not enough structure for reliable tracking)	0	NA	NA
QA_Value_8	Float	% of QA flag value of 8: Tracking correlation below 0.6 (not used for nested tracking)	0	NA	NA
QA_Value_9	Float	% of QA flag value of 9: u-component acceleration greater than 5 m/s (for winds generated from visible channel) or 10 m/s (for winds generated from any other channel)	0	NA	NA
QA_Value_10	Float	% of QA flag value of 10: v-component acceleration greater than 5 m/s (for winds generated from visible channel) or 10 m/s (for winds generated from any other channel)	0	NA	NA
QA_Value_11	Float	% of QA flag value of 11: u- and v-component accelerations greater than 5 m/s	0	NA	NA

		(for winds generated from visible channel) or 10 m/s (for winds generated from any other channel)			
QA_Value_12	Float	% of QA flag value of 12: Derived wind slower than 3 m/s	0	NA	NA
QA_Value_13	Float	% of QA flag value of 13: Target scene too close to day/night terminator (visible and SWIR only)	0	NA	NA
QA_Value_14	Float	% of QA flag value of 14: Median pressure used for height assignment outside acceptable pressure range (channel dependent)	0	NA	NA
QA_Value_15	Float	% of QA flag value of 15: Match found on boundary of search region	0	NA	NA
QA_Value_16	Float	% of QA flag value of 16: Gross difference from forecast wind (channel dependent)	0	NA	NA
QA_Value_17	Float	% of QA flag value of 17: Median pressure of largest cluster for first image pair is too different from median pressure of largest cluster for second image pair only valid for nested tracking	0	NA	NA
QA_Value_18	Float	% of QA flag value of 18: Search region extends beyond domain of data buffer	0	NA	NA
QA_Value_19	Float	% of QA flag value of 19: Expected	0	NA	NA

		Error (EE) too high			
QA_Value_20	Float	% of QA flag value of 20: Missing data in search box	0	NA	NA
QA_Value_21	Float	% of QA flag value of 21: No winds are available for the clustering algorithm	0	NA	NA
QA_Value_22	Float	% of QA flag value of 22: No clusters were found	0	NA	NA
QI	Long	Quality Indicator (QI) of derived wind (0-100, with 100 being the best)	1	NA	1, 100
QIDirFlag	Long	QI test – Direction Consistency Flag	1	NA	NA
QIFcstFlag	Long	QI test – Forecast Consistency Flag	1	NA	NA
QILocConsistencyFlg	Long	QI test – Buddy Consistency (Cloest neighbor) Flag	1	NA	NA
QISpdFlag	Long	QI test – Speed Consistency Flag	1	NA	NA
QIVecFlag	Long	QI test – Vector Consistency Flag	1	NA	NA
SatID	Long	Satellite ID	0	NA	NA
SatZen	Float	Satellite zenith angle	1	degree	NA
StdDevMVD1	Float	Standard deviation of largest 5x5 cluster (sample 1 –reverse vector)	1	NA	NA
StdDevMVD2	Float	Standard deviation of largest 5x5 cluster (sample 2 – forward vector)	1	NA	NA
Target_Type	Long	Target type (0-clear; 1=cloudy)	0	NA	NA
TempGrad	Float	NWP vertical temperature gradient (+/- 200 hPa about pressure assignment of tracer)	1	Kelvin	NA
Time	Long	Date/time of measurement	1	secs since 1970-01-01	NA

				00:00:00	
TimeInterval	Long	Minutes between images	0	NA	NA
UComponent1	Float	u-component of first (reverse time) vector	1	m.s-1	NA
UComponent2	Float	u-component of second (forward time) vector	1	m.s-1	NA
VComponent1	Float	v-component of first (reverse time) vector	1	m.s-1	NA
VComponent2	Float	v-component of second (forward time) vector	1	m.s-1	NA
VariancePress	Float	Standard deviation of cloud top pressure values in target scene (hPa)	1	hPa	NA
Wind_Dir	Float	Direction of average wind vector (degree)	1	Degree 0., 360.	
Wind_Speed	Float	Speed of average wind vector (m/s)	1	Degrees _east	0., 155.
Wind_Speed_Shear	Float	NWP vertical wind shear (+/- 200 hPa about pressure assignment of tracer)	1	m.s-1	NA
WndSpdMax	Float	Max of target wind speed	0	m.s-1	NA
WndSpdMean	Float	Mean of target wind speed	0	m/s	NA
WndSpdMin	Float	Min of target wind speed	0	m.s-1	NA
WndSpdStdDev	Float	StdDev of target wind speed	0	m.s-1	NA
WndSpdStdDev	Float	StdDev of target wind speed	0	m.s-1	NA
WndSpdStdDev_Layer1	Float	Standard deviation about mean wind speed (m/s) assigned to good derived winds in atmospheric layer 1	0	m.s-1	NA
WndSpdStdDev_Layer2	Float	Standard deviation about mean wind speed (m/s) assigned to good derived winds in atmospheric layer 2	0	m.s-1	NA

WndSpdStdDev_Layer3	Float	Standard deviation about mean wind speed (m/s) assigned to good derived winds in atmospheric layer 3	0	m.s-1	NA

State the procedures that should be followed for obtaining near real time (NRT) and archived product data files. This information may be in the developer's Operations Concept Document (OCD). Refer to the OCD in the developer's project artifact repository, if available. *(Document Object 46, PAL)*

2. ALGORITHM

2.1. Algorithm Overview

The VIIRS Polar Winds products are generated using the AMV (Atmospheric Motion Vectors)/DMW (Derived Motion Winds) algorithm. The AMV algorithm runs inside a system of supporting software. This is the AIT-Framework system or the GOES-R Algorithm Working Group (AWG) Product Processing System Framework. The Framework has been developed to be plug-and-play system for GOES-R scientific algorithms enabling the development and testing of the Level 2 GOES-R products within a single system. The system has been created to run products and store them in memory to be used as inputs for other products: i.e. product precedence. Common ancillary data has been used by the algorithms and the ancillary data is also stored in memory and treated as precedence for the products. Within the Framework system, the AMV algorithm has flexible interface design that allows the different types of instruments/satellite data set. Therefore the AMV algorithm is the same for GOES Winds and Polar Winds.

The Derived Motion Winds Algorithm (DMWA) to be applied to VIIRS observations was originally developed for the future GOES-R ABI instrument (Bresky et al, 2013, Daniels et al, 2012). There are a number of basic steps involved in the process of generating Derived Motion Winds (DMW) from VIIRS:

- Obtain a set of at least three consecutive precisely calibrated, navigated and co-registered orbital images in a selected spectral channel.
- Locate and select a set of suitable targets in the middle image domain.
- For each image pair in the image triplet, use a correlation algorithm to derive the motion most representative for the target scene.

For detailed information about the DMV algorithm, see the DMV Algorithm Theoretical Basis Document (NESDIS/STAR, 2014)

2.1.1 Pre-Processing Steps

For NVWPS, there are two steps in order to generate a product of Polar Winds: The pre-processing step and main-processing step. The pre-processing step prepares the polar stereographic map projection file (remapped file) that will be used as the input to the main-processing step which generates winds products.

During Preprocessing steps, NVPWPS software first reads in the system PCF file, determines which remapped file(s) need to be generated. Next NWPWPS software converts the HDF5 format VIIRS data to NetCDF format, then generates/writes out Framework output of SDR, Cloud Mask, Phase and Height by calling the Framework program. The last preprocessing step is to generate the remapped file. For detailed information about the preprocessing steps, please refer NVPWPS System Maintenance Manual.

2.2. Input Data Files

This section describes the input data files required by the NVPWPS system, including the satellite data, the ancillary data required by the AIT-framework to generate Clouds and Polar Winds products, as well as the algorithm specified coefficient files,etc . All of these files are defined in the system PCF files through the File-Handle-Name (the left side of the equal sign in the PCF file).

The NVPWPS requires AIT-framework configuration files(CFG) and process control files(PCF) in text format.

An AIT-framework CFG file is required to run the AIT-framework program and in the CFG file, a number of AIT-framework PCF files are specified. The data is passed to the AIT-framework program through the Framework-CFG and Framework-PCF files by specifying the data files in these Framework-CFG and PCF.

2.2.1. Satellite Data Files

To generate a product of Polar Winds, three Polar Stereographic map projection files (PS data files or remapped files) in NetCDF format are required. Each of the PS data files are remapped from multiple granules over the polar region. Usually, 14-18 granules cover the north polar or south polar region.

For each granule, 18 input satellite data files are required to run NVPWPS system. They are VIIRS Science Data Records (SDR) Moderate Resolution Band 01 -16 SVM01-16, Terrain Corrected Geolocation data GMCTO. These data files are the VIIRS input to the NVPWPS system. All of these files are in HDF5 format and are generated by the IDPS system at NDE. The details of the File-Handle-Name in the system's PCF and the corresponding satellite data files are listed in NVPWPS System Maintenance Manual.

2.3. Ancillary Data Files Required by AIT-framework

The ancillary files are in NetCDF format, except for the CRTM coefficient files, which are in binary format.

2.3.1. Land Mask

The land mask is derived from the NASA EOS project supplied static dataset as well as World Vector Shoreline data and DTED DEM data provided by NIMA (then DMA) and bathymetric data provided by the oceanographic community.
The original global binary file, version 3, produced in 2003 by Robert Wolfe, was converted to NetCDF and HDF for usage in the framework. Resolution: The land/ocean mask is stored in a 1 km geographic (geodetic) projection.
Filename: lw_geo_2001001_v03m.nc
Origin: Created by SSEC/CIMSS based on NASA MODIS collection 5
Size: 890 MB.
Static/Dynamic: Static
Values:

0 = Shallow ocean
1 = Land (Nothing else but land)
2 = Ocean coastlines and lake shorelines
3 = Shallow inland water
4 = Ephemeral water

5 = Deep inland water
6 = Moderate or continental ocean
7 = Deep ocean

2.3.2. Coast Mask

The coast mask is created from the land/water mask and differentiates coast at resolutions ranging from 1 – 10 km. It is produced by searching for heterogeneity in concentric boxes 3x3 (1 km) up to 21x21 (10 km) of pixels centered on any given pixel.
Resolution: The coast mask is stored in a 1 km geographic (geodetic) equal area projection.
Filename: coast_mask_1km.nc
Origin: Created by SSEC/CIMSS based upon NASA MODIS collection 5.
Size: 890 MB.
Static/Dynamic: Static
Values: A value of 1 means that the pixel 1km away is a water/land transition or is a water/land transition. 0 is considered the fill value of the coast mask.

2.3.3. Surface Elevation Mask

The digital surface elevation is Global Land One-km Base Elevation (GLOBE) Project 1km database global file converted into a file format readable by the framework.
Resolution**:** The surface elevation is stored as meters in a Plate Carrée projection at 30 arc-second (1km) resolution.
Filename: GLOBE_1km_digelev.nc
Origin: NGDC
Size: 1843.2 MB
Static/Dynamic: Static

2.3.4. Surface Emissivity SEEBOR

The surface IR emissivity for ABI bands from UW-Madison baseline fit database. This is a global database of monthly (001-031, 032-059, etc.) IR land surface emissivity derived from the Moderate Resolution Imaging Spectroradiometer (MODIS) operational land surface emissivity product (MOD11). Emissivity is available globally at ten wavelengths (3.6, 4.3, 5.0, 5.8, 7.6, 8.3, 9.3, 10.8, 12.1, and 14.3 μm). Monthly emissivities have been integrated

into the ABI spectral response functions to match the ABI bands. The SEEBOR emissivity training set was interpolated over the spectral response function for a given channel at each data point. These are then output to a static file for usage in the framework. For the production of the test dataset, the ABI SRFs, provided by the Imagery AWG, were used to produce the static emissivity dataset.
Resolution: 0.05 degree (5km) spatial resolution
Filename: global_emiss_intABI_YYYYDDD.nc where**,** YYYYDDD = year plus Julian day
Origin: UW Baseline Fit, Seeman and Borbas (2006).
Size: 693 MB x 12
Static/Dynamic: Dynamic
Values: The emissivities are fractional values scaled with a scale factor of 0.001 and have fill value of -9999. Generally, the data points that are the fill value are ocean or water pixels.

Surface emissivity at 5km resolution (climatologically monthly), required by AIT Framework is listed in Table 2-1.

Table 2-1 Surface Emissivity Data

File Name	Description	Size (MB)
global_emiss_intABI_2005001.nc	SEEBOR data for January	693
global_emiss_intABI_2005032.nc	SEEBOR data for February	693
global_emiss_intABI_2005060.nc	SEEBOR data for March	693
global_emiss_intABI_2005091.nc	SEEBOR data for April	693
global_emiss_intABI_2005121.nc	SEEBOR data for May	693
global_emiss_intABI_2005152.nc	SEEBOR data for June	693
global_emiss_intABI_2005182.nc	SEEBOR data for July	693
global_emiss_intABI_2005213.nc	SEEBOR data for August	693
global_emiss_intABI_2005244.nc	SEEBOR data for September	693
global_emiss_intABI_2005274.nc	SEEBOR data for October	693
global_emiss_intABI_2005305.nc	SEEBOR data for November	693
global_emiss_intABI_2005335.nc	SEEBOR data for December	693

2.3.5. Surface Type Mask

A global land cover classification collection created by The University of Maryland Department of Geography. Imagery from the AVHRR satellites acquired between 1981 and

1994 was used to distinguish fourteen land cover classes and was updated in 2001. The original binary file is available at:
Resolution**:** This product is available at 1 km resolution in a 1 km geographic (geodetic) equal area projection.
The data are arranged with the upper left hand corner having a latitude/longitude of 90.0, -180.0 and lower right corner with a latitude/longitude of 90S, 180.0.
Filename: gl-latlong-1km-landcover.nc
Origin: University of Maryland
Size: 890 MB
Static/Dynamic: Static
Values:

0 = Water
1 = Evergreen Needleleaf Forest
2 = Evergreen Broadleaf Forest
3 = Deciduous Needleleaf Forest
4 = Deciduous Broadleaf Forest
5 = Mixed Forests
6 = Woodland
7 = Wooded Grassland
8 = Closed Shrubland
9 = Open Shrubland
10 = Grasslands
11 = Cropland
12 = Bare Ground
13 = Urban and Built-Up

2.3.6. CRTM Coefficient for VIIRS SDR

CRTM coefficient files for VIIRS data, required by AIT Framework, are shown in Table 2-2.

Table 2-2 CRTM Coefficient Data

File Name	Description	Size (KB)
AerosolCoeff.bin	Aerosol Coeff data for CRTM	5766260

CloudCoeff.bin	Cloud Coeff data for CRTM	1654180
EmisCoeff.bin	Emissivity Coeff data for CRTM	1888256
viirs-m_npp.SpcCoeff.bin	Space Coeff data for NPP VIIRS-M	472
viirs-m_npp.TauCoeff.bin	Tau Coeff data for NPP VIIRS-M	105704

2.3.7. Lat/Lon Data for Polar Stereographic Map Projection Data File reader

These two files contain the geolocation of the PS projection map grids of 3305X3305 over the south polar region and north polar region. The lat/lon data files are required by the remapping/gridding processing from granule to PS projection map. File information is listed in Table 2-3.

Table 2-3 Lat/Lon Data for PS Files

File Name	Description	Size (MB)
myNpseh_Lats.Lons.3305x3305x1.nc	Lat/Lon data for North PS	84
mySpseh_Lats.Lons.3305x3305x1.nc	Lat/Lon data for South PS	84

2.3.8. Ancillary Data for VIIRS SDR Reader

This file contains NPP VIIRS 16 M-band channel information, Planck coefficients and spectral ranges. It is used by the framework SDR Data Readers.

File Name: npp_viirs_ancil.nc
Size: 2572 KB

Ancillary data that contains information such as channel mapping. It is used by the Polar Sterographic map projection data reader and required by AIT framework:

File Name: npp_viirs_ancil.nc
Size: 2312 KB

2.3.9. Ancillary Data for Polar Winds

It is the winds coefficient data for the AMV algorithm:

File name: AMV_coeff.nc
Size: 496KB

2.3.10. GFS GRIB2 Forecast Files

These are GFS 6-hour global forecast data files at 0.5 degree resolution in GRIB2 format from NCEP.

File Name: *gfs.t${Hour}z.pgrbf${Forecast}.YYYYMMDD*
Size: 51~52 MB

2.3.11. OISST Daily Data

It is the Reynolds OISST daily analysis at 0.25 degree resolution from NCDC

File Name: avhrr-only-v2.YYYYMMDD_preliminary.nc
Size: 8.0 MB

3. PERFORMANCE

3.1. Product Testing

3.1.1. Test Data

Description of all NVPWPS test data (input, output, and intermediate) used in unit and system tests is provided in the NVPWPS Algorithm Readiness Review and Test Readiness Document (NESDIS/STAR, 2014). These are available by contacting the NVPWPS Product Area Lead (PAL) at OSPO.

3.1.2. Test Plans

Description of all NVPWPS test plans used in unit and system tests is provided in the NVPWPS Algorithm Readiness Review and Test Readiness Document (NESDIS/STAR, 2014). These are available by contacting the NVPWPS Product Area Lead (PAL) at OSPO.

3.2. Product Accuracy

3.2.1. Test Results

Description of all NVPWPS test results from the unit and system tests is provided in the NVPWPS Algorithm Readiness Review and Test Readiness Document (NESDIS/STAR 2014). These are available by contacting the NVPWPS Product Area Lead (PAL) at OSPO.

3.2.2. Product Accuracy

NPP/VIIRS wind product has been validated against radiosonde wind observations, aircraft wind observations, and GFS analysis winds. The accuracy and precision of the VIIRS winds fall well within the accuracy and precision specifications. The detailed validations are available at Algorithm Readiness Review by contacting the NVPWPS Product Area Lead (PAL) at OSPO.

3.3. Product Quality

Quality flags are expected to be zero, which means no error.

Each failure is associated with a unique “flag” value that is saved in the DMW output file. These values are shown in Table 3-1.

Table 3-1: Derived Motion Winds Failure Codes.

Derived Motion Wind Quality Control Codes	
QC_Flag	**Definition**
0	Good wind
1	Maximum gradient below acceptable threshold
2	Target located on earth edge
3	Cloud amount failure (less than 10% cloud cover for cloud track winds or greater than 0% cloud cover for water vapor clear-sky winds)
4	Median pressure failure
5	Bad or missing brightness temperature in target scene
6	Multiple cloud layers present
7	Target scene too coherent (not enough structure for reliable tracking)
8	Tracking correlation below 0.6 (not used for nested tracking)
9	u-component acceleration greater than 10 m/s (5 m/s for visible)
10	v-component acceleration greater than 10 m/s (5 m/s for visible)
11	u- and v- component accelerations greater than 10 m/s (5 m/s for visible)
12	Derived wind slower than 3 m/s
13	Target scene too close to day/night terminator (visible and SWIR only)
14	Median pressure used for height assignment outside acceptable pressure range (channel dependent)
15	Match found on boundary of search region
16	Gross difference from forecast wind (channel dependent)
17	Median pressure (used for height assignment) of largest cluster for first image pair is too different from median pressure of largest cluster for second image pair – only valid for nested tracking
18	Search region extends beyond domain of data buffer
19	Expected Error (EE) too high
20	Missing data in search region
21	No winds are available for the clustering algorithm

22	No clusters were found
Catastrophic Failures	
Invalid time interval	
Temporal data not available	
Line segment swath too small (must contain at least the same number of lines as target box size, usually 15 lines)	
Search region must be larger than target scene	

No external product tools are supplied. External users can choose their own tools to display and analyze these output files.

4. PRODUCT STATUS

4.1. Operations Documentation

NESDIS/STAR (2014), Algorithm Theoretical Basis Document (ATBD) for the VISible Infrared Imaging Radiometer Suite (VIIRS) Polar Winds Product, Version 1.0.

NESDIS/STAR (2014), NVPWPS System Maintenance Manual, Version 1.0.

NESDIS/STAR (2014), NOAA-Unique VIIRS Polar Winds Product System Algorithm Readiness Review (ARR)

NESDIS/STAR (2013), The NUCAPS External Users Manual, Version 1.0.

NESDIS/STAR (2014), NVPWPS Test Readiness Document (TRD)

4.2. Maintenance History

END OF DOCUMENT