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**Center for Satellite Applications and Research (STAR)**



# **AVHRR Vegetation Health Product (AVHRR-VHP)**

## **User Guide**

**Version 1.4**

**Dec 21, 2013**



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**Prepared by I. M. Systems Group, Inc.  
Mr. Wei Guo ([Wei.Guo@noaa.gov](mailto:Wei.Guo@noaa.gov))**

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## 1. Introduction

This document describes the data format of AVHRR derived Vegetation Health Indices Product (below, referred as AVHRR-VHP or VHP). It is the improved version of previous GVI-x data set.

AVHRR-VHP products are generated by program `avhrr_gvi.exe` and `vh.exe` (C++ program developed by [Wei.Guo@noaa.gov](mailto:Wei.Guo@noaa.gov)). The input of this software package is AVHRR GAC data, outputs are VH products in NetCDF format. For convenience, 16km sampled data files are also available in HDF format. The file structure is almost the same.

There are 3 weekly files will be released to users:  
 ND file: (\*ND.nc) raw NDVI and Brightness Temperature of channel 4 (BT4). SDS names: NDVI and BT4  
 SM file: noise reduced (smoothed) NDVI and BT4 data. SDS names: SMN and SMT.  
 VH file: vegetation health indices. (SDS names: VCI, TCI and VHI)

Table 1 variables of AVHRR VHP products

Data type	content
NVI	NDVI,
BT4	Brightness Temperature,
SMN	Smoothed NDVI,
SMT	Smoothed Brightness Temperature,
VCI	Vegetation Condition Index,
TCI	Temperature Condition Index
VHI	Vegetation Health Index

The AVHRR-VHP products are self-explained NetCDF files. Please refer the attributes of the file and SDS for detail.

## 2. File name convention

**Example:** `VHP.G04.C07.NP.P2013018.ND.nc`  
**Format:** `VHP.Grr.Ccc.xx.Pyyyywww.pp.nc`  
 where,

GVIX	Prefix of the file name;
rr	Resolution in km
xx	Satellite ID, example: NC - NOAA 7 NF - NOAA 9 NH - NOAA 11 NJ - NOAA 14 NL - NOAA 16 NN - NOAA 18

	NP - NOAA 19
cc	two-digits, number of days per composite period; 07: for weekly (i.e. 7 days) composite
yyyy	four-digits, year number of the processed period;
www	Three-digits, period number;
pp	Product file type: ND: raw NDVI and BT4 SM: smoothed (noise removed) data, including SMN and SMT VH: vegetation health indices including VCI, TCI and VHI

### 3. File Attributes

VHP file contains the following file attributes (table 2). They provide general information about the product.

Table 2 File attributes of VHP ND file

Properties - VHP.G04.C07.NP.P2013017.ND.hdf

Number of attributes = 22

Name	Value	Type	Array Size
PRODUCT_NAME	Vegetation Health	8-bit charact...	17
VERSION	VH (vh.exe, version 1.3, March 21 2012)	8-bit charact...	38
SATELLITE	NP	8-bit charact...	2
INSTRUMENT	AVHRR	8-bit charact...	5
DATE_BEGIN	113	8-bit charact...	3
DATE_END	119	8-bit charact...	3
TIME_BEGIN	00:00 UTC (use day time data only)	8-bit charact...	34
TIME_END	23:59 UTC (use day time data only)	8-bit charact...	34
ANCILLARY_FILES	FILE_CONFIGURE\vh.config_NP2FILE_PR...	8-bit charact...	466
CITATION_TO_DOCUMENTS	User Guide of Vegetation Health(VH) syste...	8-bit charact...	71
CONTACT	NOAA/NESDIS/STAR/EMB	8-bit charact...	20
CONFIGURE_FILE_CONTENT	[Options for vh.exe]DIR_Ancillary= ...	8-bit charact...	1605
PROJECTION	Plate_Carree	8-bit charact...	12
YEAR	2013	32-bit integer	1
PERIOD_OF_YEAR	17	32-bit integer	1
DAYS_PER_PERIOD	7	32-bit integer	1
END_LATITUDE_RANGE	-55.152	32-bit floatin...	1
START_LONGITUDE_RANGE	-180.0	32-bit floatin...	1
START_LATITUDE_RANGE	75.024	32-bit floatin...	1
END_LONGITUDE_RANGE	180.0	32-bit floatin...	1
INPUT_FILES	1	32-bit integer	1
INPUT_FILENAMES	data/AVHRR_VHP/4km/weekly/VHP.G04.C...	8-bit charact...	63

PRODUCT\_NAME

### 4. Scientific dataset

The variables in the VHP file are saved as scaled 16-bits integers. The scaling parameters and equations are attached to the scientific

dataset (SD) as attributes.

Table 3 SDS attributes of VHP NDVI.

Name	Value	Type	Array Size
long_name	NDVI	8-bit character	4
coordsys	cartesian	8-bit character	9
units	NONE	8-bit character	4
range	-0.1, 1.0	32-bit floatin...	2
_FillValue	-999	16-bit integer	1
scale_factor	0.0010	32-bit floatin...	1
add_offset	0.0	32-bit floatin...	1
Remark	Value= scale_factor * (ScaledInteger - add_offset)	8-bit character	50

Data arrays are in geographic projection (grid with equal latitude and longitude interval). The size of data array can be found by calling NETCDF function or using interactive tools such as HDFview. The array is in row major order. The first point of array is at the north-west corner of the grid. Then it goes eastward and then southward.

For 4km VHP product, the arrays are with size 10000x3616, Covers latitude [-55.152 to 75.024], longitude [-180.0, 180.0] (outside border of the spatial area of VHP product).

The size of grid pixel:

$$dLon= dLat = (360.0/10000)$$

For any pixel [i,j] in the array, the position of pixel's center is calculated as:

$$\begin{aligned} \text{Latitude} &= (75.024 - (j+0.5) * dLat) \quad (j: \text{counts from } 0 \text{ to } 3615) \\ \text{longitude} &= (-180.0 + (i+0.5)* dLon) \quad (i: \text{counts from } 0 \text{ to } 9999) \end{aligned}$$

The spatial coverage of data array are described by the file attributes of NETCDF file, example:

```
START_LATITUDE_RANGE = 75.024
START_LONGITUDE_RANGE = -180.0
END_LATITUDE_RANGE = -55.152
END_LONGITUDE_RANGE = 180.0
```

In the new version (data of 2014), these attributes' names were changed as below (example):

```
geospatial_lat_max = 75.024
```

```
geospatial_lat_min = -55.152  
geospatial_lat_units = degrees_north  
geospatial_lon_max = 180.0  
geospatial_lon_min = -180.0  
geospatial_lon_units = degrees_east
```

(End)