NPP/ VIIRS Active Fires Level 2 product description

The NPP Active Fires products are produced by a detection method similar to that used by MODIS. The input to the Active Fires production is Level 1B moderate- resolution reflective band M7 and emissive bands M13 and M15. The fire algorithm first calculates band M13 and band M15 brightness temperature (BT) statistics for a group of background pixels adjacent to each potential fire pixel. These statistics are used to set thresholds for several contextual fire detection tests. There is also an absolute fire detection test based on a pre- set M13 BT threshold. If the results of the absolute and relative fire detection tests meet certain criteria, the pixel is labeled as fire. The designation of a pixel as fire from the results of the BT threshold tests may be overridden under sun glint conditions or if too few pixels were used to calculate the background statistics.

There are multiple fire products. The IDPS operational fire product, NPP_AVAF_L2 (AS 3000 and 3001), contains only a list of pixels where fire was detected. If fire is present within a given granule, the NPP_AVAF_L2 product will contain latitude and longitude, row and column indices, and quality flags for each fire pixel. If no fire is present within the granule, these data fields will not be included in the NPP_AVAF_L2 file. Other Level 2 fire products (NPP_VAFIP_L2 in AS 3001 and 3002, NPP_VAFIRE_L2D in AS 3001) contain two- dimensional fire masks and associated quality information.

There are two versions of the Active Fires algorithm being used to generate NPP fire products. The first is the algorithm that is operating at IDPS, which is used to generate NPP_AVAF_L2 and NPP_VAFIP_L2. This version of the fire algorithm is based on MODIS C4 fire detection methods. The second is the NASA/ NOAA Science Team algorithm based on the MODIS C6 Fire algorithm, which is used to generate NPP_VAFIRE_L2D. NPP_VAFIRE_L2D contains several pieces of information for each fire pixel: pixel coordinates, latitude and longitude, pixel M7 reflectance, background M7 reflectance, pixel M13 and M15 BT, background M13 and M15 BT, mean background BT difference, background M13, M15, and BT difference mean absolute deviation, fire radiative power, number of adjacent cloud pixels, number of adjacent water pixels, background window size, number of valid background pixels, detection confidence, land pixel flag, background M7 reflectance, and reflectance mean absolute deviation.

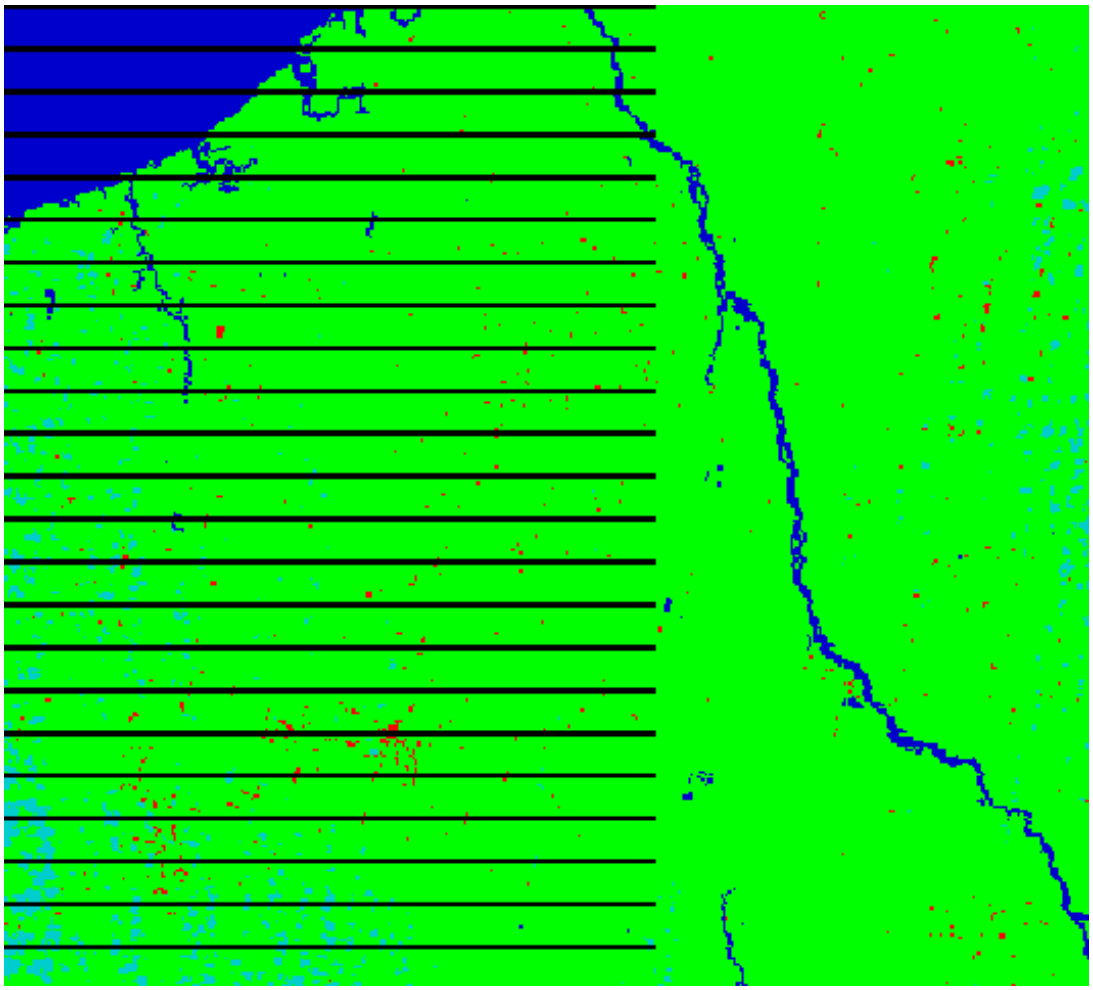

Figure 1: Example of Level 2 fire data. Fires are shown in red. Black areas are bowtie deletion pixels. (Subset of NPP_VAFIP_L2.A2013286.1130.P1_03001.2013286213506.hdf)

All Level 2G and Level 3 DDRs are composited from NPP_VAFIP_L2, so contain data generated by the IDPS algorithm. The tables and diagram below show the characteristics and interdependencies of Level 2, Level 2G, and Level 3 fire products.

Table 1: Summary of fire products produced at the Land PEATE

Product	Type/ format	Resolution	Found in Archive Sets	Notes
NPP_AVAF_L2	Level 2, 1-D vector of fire pixels	750m	3000/IDPS, 3001/LPEATE, 3002/LPA	Several data fields not present if no fires in granule; IDPS OPS algorithm
NPP_VAFIP_L2	Level 2, 2-D fire mask swath pixel array	750m	3001/LPEATE, 3002/LPA	Same data as NPP_AVAF_L2; IDPS OPS algorithm
NPP_VAFIRE_L2D	Level 2, 2-D fire mask swath pixel array	750m	3001/LPEATE	Science Team algorithm (based on MODIS C6)
NPP_DVAF1KD_L2GD	Level 2G grid/ tile (multiple data layers)	1km	3001/LPEATE, 3002/LPA	Daily, daytime only. Generated from NPP_VAFIP_L2.
NPP_DVAF1KN_L2GD	Level 2G grid/ tile (multiple data layers)	1km	3001/LPEATE, 3002/LPA	Daily, nighttime only. Generated from NPP_VAFIP_L2.
NPP_DAF1KM_L3D	Level 3 grid/ tile	1km	3001/LPEATE, 3002/LPA	Daily. Generated from NPP_DVAF1KD_L2GD and NPP_DVAF1KN_L2GD
NPP_D8AF1KM_L3D	Level 3 grid/ tile	1km	3001/LPEATE, 3002/LPA	8- day composite Generated from NPP_DVAF1KD_L2GD and NPP_DVAF1KN_L2GD

Table 2: NPP fire products and MODIS equivalents (MOD for Terra and MYD for Aqua)

Description	**NPP product**	**MODIS equivalent**
Level 2 Active Fire pixel list (one-dimensional) from IDPS algorithm	NPP_AVAF_L2	None
Level 2 Active Fire mask (two-dimensional) from IDPS algorithm	NPP_VAFIP_L2	MOD14/ MYD14 (C4)
Level 2 Active Fire mask (two-dimensional) from Science Team algorithm	NPP_VAFIRE_L2D	MOD14/ MYD14 (C6)
Level 2G Active Fire mask, day	NPP_DVAF1KD_L2GD	MOD14GD/ MYD14GD
Level 2G Active Fire mask, night	NPP_DVAF1KN_L2GD	MOD14GN/ MYD14GN
Level 3 daily Active Fire mask	NPP_DAF1KM_L3D	MOD14A1/ MYD14A1 (but only 1 day of data in each data file)
Level 3 8- day composite Active Fire mask	NPP_D8AF1KM_L3D	MOD14A2/ MYD14A2

Figure 2: Interdependencies of NPP/ VIIRS fire products

NPP_AVAF_L2 PRODUCT FILE SPECIFICATION

Dimensions:

Along_Track
Along_Scan
Number_of_active_fires

Variables:

float Latitude(Number_of_active_fires)

float Longitude(Number_of_active_fires)

long RowIndex(Number_of_active_fires)

long ColIndex(Number_of_active_fires)

byte QF1_VIIRSAFARP(Number_of_active_fires)

byte QF2_VIIRSAFARP(Number_of_active_fires)

byte QF3_VIIRSAFARP(Number_of_active_fires)

byte QF4_VIIRSAFARP(Number_of_active_fires)

NPP_VAFIP_L2 PRODUCT FILE SPECIFICATION

Dimensions:

Along_Track:VIIRS_750M_FIRE
Along_Scan:VIIRS_750M_FIRE
Bands:VIIRS_750M_FIRE

Variables:

byte fireMask(Along_Track:VIIRS_750M_FIRE, Along_Scan:VIIRS_750M_FIRE)

0 = missing input data
1 = not processed (obsolete)
2 = not processed (obsolete)
3 = water
4 = cloud
5 = non-fire
6 = unknown
7 = fire (low confidence)
8 = fire (nominal confidence)
9 = fire (high confidence)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte fireMask_QCFlags(Bands:VIIRS_750M_FIRE, Along_Track:VIIRS_750M_FIRE, Along_Scan:VIIRS_750M_FIRE)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

NPP_VAFIRE_L2D PRODUCT FILE SPECIFICATION

Dimensions:

number_of_scan_lines
pixels_per_scan_line
number_of_active_fires
cmg_cells_day
cmg_values
cmg_cells_night

Variables:

byte fire mask(number_of_scan_lines, pixels_per_scan_line)
fire mask legend:
0 missing input data
1 not processed (obsolete)
2 not processed (obsolete)
3 non-fire water
4 cloud
5 non-fire land\n
6 unknown\n
9 fire (high confidence)

long algorithm QA(number_of_scan_lines, pixels_per_scan_line)
units = "bit field"

short FP_line(number_of_active_fires)
long_name = "granule line of fire pixel"

short FP_sample(number_of_active_fires)
long_name = "granule sample of fire pixel"

float FP_latitude(number_of_active_fires)
long_name = "latitude of fire pixel"
units = "degrees"

float FP_longitude(number_of_active_fires)
long_name = "longitude of fire pixel"
units = "degrees"

float FP_R7(number_of_active_fires)
long_name = "M7 reflectance of fire pixel"

float FP_T13(number_of_active_fires)
long_name = "M13 brightness temperature of fire pixel"
units = "kelvins"

float FP_T15(number_of_active_fires)
long_name = "M15 brightness temperature of fire pixel"
units = "kelvins"

float FP_MeanT13(number_of_active_fires)
long_name = "M13 brightness temperature of background"
units = "kelvins"

float FP_MeanT15(number_of_active_fires)
long_name = "M15 brightness temperature of background"
units = "kelvins"

float FP_MeanDT(number_of_active_fires)
long_name = "mean background brightness temperature difference"
units = "kelvins"

float FP_MAD_T13(number_of_active_fires)
long_name = "background M13 brightness temperature mean absolute deviation"
:units = "kelvins"

float FP_MAD_T15(number_of_active_fires)
long_name = "background M15 brightness temperature mean absolute deviation"
units = "kelvins"

float FP_MAD_DT(number_of_active_fires) ;
long_name = "background brightness temperature difference mean absolute deviation"
units = "kelvins"

float FP_power(number_of_active_fires)
long_name = "fire radiative power"
units = "MW"

byte FP_AdjCloud(number_of_active_fires)
long_name = "number of adjacent cloud pixels"

byte FP_AdjWater(number_of_active_fires)
long_name = "number of adjacent water pixels"

byte FP_WinSize(number_of_active_fires)
long_name = "background window size"

short FP_NumValid(number_of_active_fires)
long_name = "number of valid background pixels"

byte FP_confidence(number_of_active_fires)
long_name = "detection confidence"
units = "%"

byte FP_land(number_of_active_fires)
long_name = "land pixel flag"

float FP_MeanR7(number_of_active_fires)

long_name = "background M7 reflectance"

float FP_MAD_R7(number_of_active_fires)
long_name = "background M7 reflectance mean absolute deviation"

short CMG_day(cmg_cells_day, cmg_values)
CMG_day:long_name = "Climate Modeling Grid information"

short CMG_night(cmg_cells_night, cmg_values)
long_name = "Climate Modeling Grid information"