

Visual Information Solutions

#### **Ingest and Analysis of NPP-VIIRs Data from the NOAA CLASS System:** Radiometric Calibration, Bow Tie Correction and Derived Dataset support in the ENVI

**COTS Software** 

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# Agenda

- NPP-VIIRS Business Case
- Data support (SDRs/EDRs)
- Calibration
- Swath-to-Grid Geo-correction (BowTie)

OMPS

CERES





## NPP VIIRS – Why is this data important?

- > Data from NPP VIIRS is used heavily by customers in Environmental Monitoring
  - > Agriculture, Forestry, Natural Hazards, Disaster Response, Climate, Weather, etc.
- > Data from NPP VIIRS is also being used for certain applications in D & I and international markets
- > NPP VIIRS bridges the gap between MODIS and JPSS
- > Data from NPP VIIRS is available to the general public for <u>free</u> on the NOAA CLASS distribution website:



## **Over-Arching Goal**

The ENVI software makes VIIRS data accessible and usable to anyone who can operate a modern software user interface

This support opens up VIIRS data to a wide user group supporting broad Earth observation applications in commerce, insurance, agriculture, and disaster response





# **ENVI Supported SDRs and EDRs**

>Imagery data (Sensor Data Records (SDRs), for all 22 bands is supported which is equivalent to Level 1B data in previous missions

>Imagery data for a select set of bands will be provided as **Environmental Data Records** (EDRs), which is equivalent to Level 2 data in previous missions

>A wide variety of EDR data products will be produced, including but not limited to:

#### >Active Fires Product (AVAFO\*.h5):

# >Environmental Data Records (EDRs) with

Quality, Latitude, and Longitude rasters:

>Aerosol Optical Thickness (aerosol optical depth, Angstrom exponent)

>Ice Surface Temperature

>Land Surface Temperature

>Ocean Color Chlorophyll

>Sea Ice Characterization (ice age, ice age weight)

>Sea Surface Temperature

>Snow Cover Depth Binary Map

Snow Fraction

EXELIS

>Surface Type (surface type, vegetation fraction)

- >Suspended Matter
- >Vegetation Index

>EDRs without Latitude and Longitude rasters:

- >Cloud Base Height
- >Cloud Cover Layers
- >Cloud Effective Particle Size
- >Cloud Optical Thickness
- >Cloud Top Height
- >Cloud Top Pressure
- >Cloud Top Temperature

# ENVI Supports a wide range of products Day-Night Band (DNB)



...and after storm damage, Mid-Atlantic and Midwest derecho, June 2012



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### Land Surface Temperature Derived EDR





### Surface Types Derived EDR



### **Optical and Thermal Bands**





## Calibration

>Calibration applied upon opening

>Calibration options are context dependant

>Depending on image opened, Images are processed to radiance, reflectance, brightness temperature, or albedo

>Calibration parameters are applied to each granule (if they are different)

>Images are then displayed with the granules together as full image without granule separation lines

Select NPP VIIRS Parameters	
	NPP VIIRS File Information
File	C:\data\envi_demos\npp\Image Bands\GIGTO-VI1BO-VI2B(
Туре	EDR
Image Date	2013-03-01
Select Produce: Radiance Radiance Coad RaveIm Reflectance/Thermal Geocorrect and Mitigate bowue Effect	
Projection Type: Geographic WGS-84	
Interpolation Method: Distance Weighted 🔻	
Output Directory:	
C:\data\envi_demos\npp\	
Display Geocorrected Image	
0	OK Cancel

### **Bowtie Correction**



### **Bowtie Correction**

Step 1: Determine Pixel size, Tie Points, and extents of image Step 2: Using the GLT, map data values to a regular geographic grid



Step 3: Interpolation—Weighted Distance or NN





```
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IDL - C:\data\envi_demos\npp\nppbatch.pro - IDL
File Edit Source Project Macros Run Window Help
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 Open New File New Project Save
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                           Cut
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                   🕅 nppbatch.pro 🔀
æ
      pro Nppbatch
ß
       ; Launch the application
뮲
       nv = ENVI(/HEADLESS)
(×)=
       ; Open an NPP VIIRS file with GLT map info and lat/lon rasters
       inputFile = FilePath('GIMGO-SVI01-SVI02-SVI03-SVI04-SVI05 npp d20120611 t1939047 e1944451 b03.
                                 Root Dir='\\fridge\envi data\', Subdir=['npp', 'NOAA CLASS, 'VIIRS 375m-F
       oInputRasters = nv.OpenRaster(inputFile)
       ; Determine output file location
       outputURI = nv.GetTemporaryFilename('.dat')
       ; Get the task from catalog
       oTask = ENVITask('ReprojectGLT')
       ; Set parameters
       inputImage = oInputRasters[1] ;NPP VIIRS reflectance raster
       lat = oInputRasters[4] ;latitude GLT
       < [
   🕅 IDL Console 🖾 👘 Command History  Problems
                                                      Current Directory: C:\Users\awarner\AppData\Local\Temp
                                                                                                      - 🗁 🚮 🔩
   IDL Version 8.3, Microsoft Windows (Win32 x86 64 m64). (c) 2013, Exelis Visual Information
   Solutions, Inc.
   Trial version expires on 31-dec-2014.
   Licensed for personal use by VISEvaluation Purposes Only only.
   All other use is strictly prohibited.
   % Restored file: ENVI.
```



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#### Future work

Exelis VIS also added a generic HDF5 reader in ENVI 5.1, this allows most scientific image formats to be opened in a friendly user interface

Plans for a temporal analysis tool to look at NPP-VIIRs data over time

Cloud masking algorithm

Speed improvements for Bowtie effect mitigation

