Distribution of NPP/VIIRS data through the NOAA Archives

NASA Ocean Color Research Team Meeting
23 April 2012, Seattle, Washington

Presenter: Axel Graumann,
NOAA/NESDIS/NCDC

Additional contributors: Viva Banzon, Jonathan Blythe, Deirdre Byrne, Kenneth Casey, Paul DiGiacomo, Mitchell Goldberg, Kent Hughes, Edward Kearns, Mike Soracco, Tom Schott, Rick Stumpf, Ron Vogel, Menghua Wang, Cara Wilson, Banghua Yan

Overview of NPP, JPSS & VIIRS

- Suomi National Polar-Orbiting Partnership (NPP) Mission, launched 28 October 2011
- Bridge to the Joint Polar Satellite System (JPSS)
- “The JPSS Program is a collaborative effort between NOAA and NASA with NOAA having overall responsibility, and NASA acting as NOAA’s acquisition agent and system integrator.” (JPSS Management Control Plan)
- The VIIRS (Visible Infrared Imager Radiometer Suite) sensor on NPP, future JPSS-1 provides ocean color and SST
- Global coverage and resolution - 750m (M bands)/375m (I bands)
- Official NPP Mission data is archived and distributed by the NOAA National Data Centers
- Big question: When are data available? When declared “beta” (see slide 6)

VIIRS Spectral Bands for Ocean Color

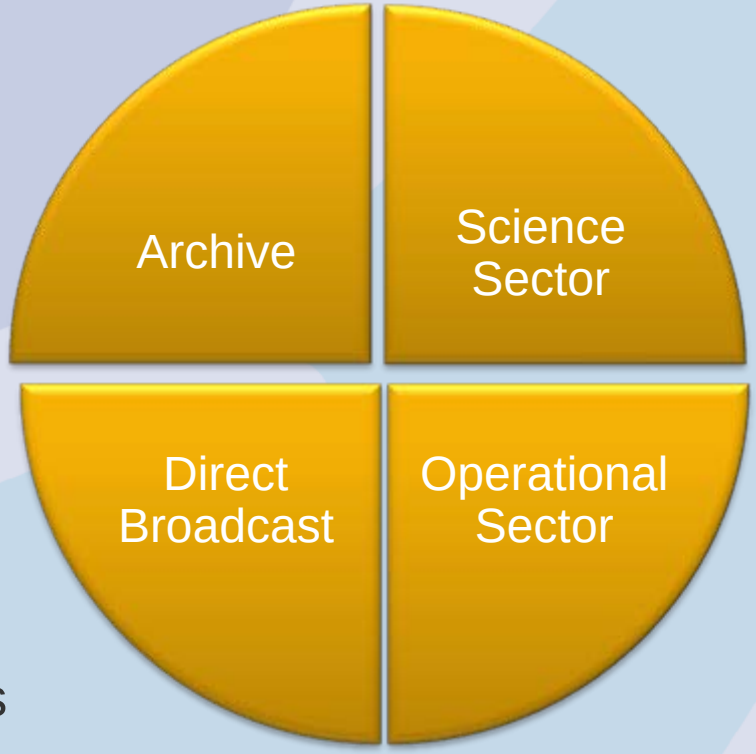
VIIRS on Suomi NPP
has Ocean and SWIR spectral bands similar to **MODIS**

VIIRS		MODIS		SeaWiFS
Ocean Bands (nm)	Other Bands (nm)	Ocean Bands (nm)	Other Bands (nm)	Ocean Band (nm)
412 (M1)	640 (I1)	412	645	412
445 (M2)	865 (I2)	443	859	443
488 (M3)	1610 (I3)	488	469	490
—		531	555	510
555 (M4)	*SWIR Bands*	551	*SWIR Bands*	555
672 (M5)	1240 (M8)	667	1240	670
746 (M6)	1610 (M10)	748	1640	765
865 (M7)	2250 (M11)	869	2130	865

Spatial resolution for VIIRS M-band: 750 m, I-band: 375 m

NOAA NPP/VIIRS Data Access Sectors

- **Archive Sector**
  Long-term repository of NPP mission data
- **Science Sector**
  Data/product development; transition to operations; mission-level reprocessing and generation of science quality data
- **Operational Sector**
  Generation and provision of near-real time regional and global operational data
  (NESDIS.Data.Access@noaa.gov)
- **Direct Broadcast Sector**
  Provision of real time data on regional basis



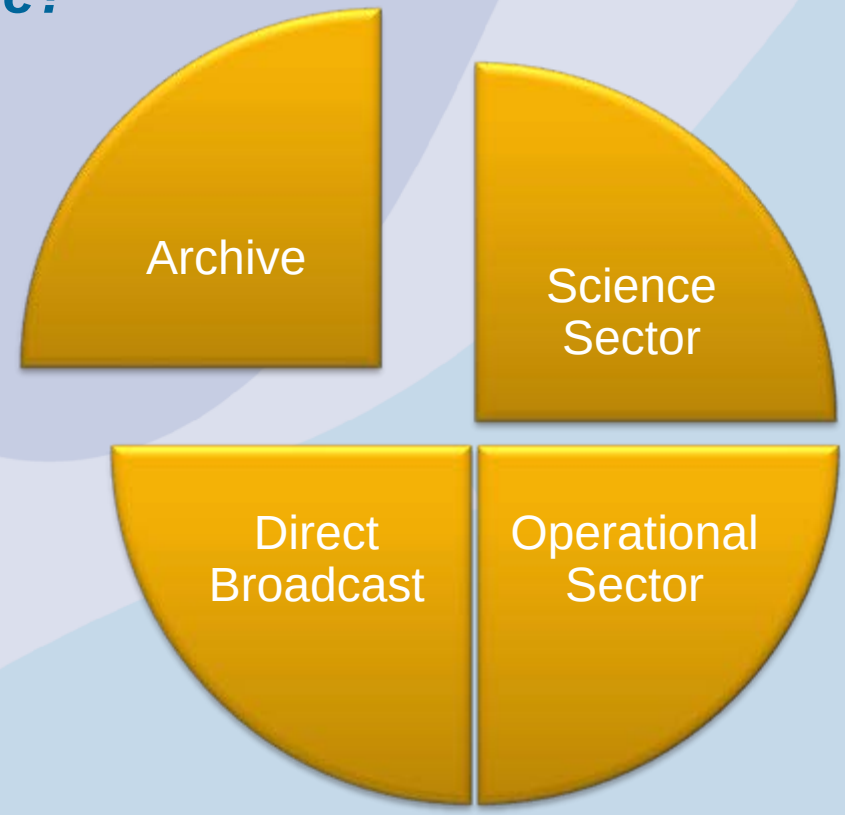
NOAA NPP/VIIRS Archive Sector

Where does NPP mission data live?

The NOAA National Data Centers share an IT – infrastructure called the Comprehensive Large Array-Data Stewardship System ***(CLASS)***

CLASS serves as the official repository of NPP mission data, including VIIRS

On-line search, order, and distribution of all archived VIIRS mission data is available through CLASS: **www.class.noaa.gov**



See our poster for information on the other sectors which provide various other data/ products with varying latencies, formats, etc.

NPP VIIRS/Ocean Color Products Overview

What NPP VIIRS mission data is available?

Official NPP VIIRS Ocean Color Data Products		Availability
Level 0	Raw Data Record (RDR)	April/May 2012
Level 1B	Sensor Data Record (SDR)	April/May 2012
Level 2	Environmental Data Record (EDR)*	~October 2012 (ocean color)

VIIRS Ocean Color EDRs: Normalized water-leaving radiances at VIIRS M1 to M5 bands & Chlorophyll-a. Other EDRs: Absorption & Backscattering coefficients at VIIRS M1-M5 bands.

How is the NPP mission data generated?

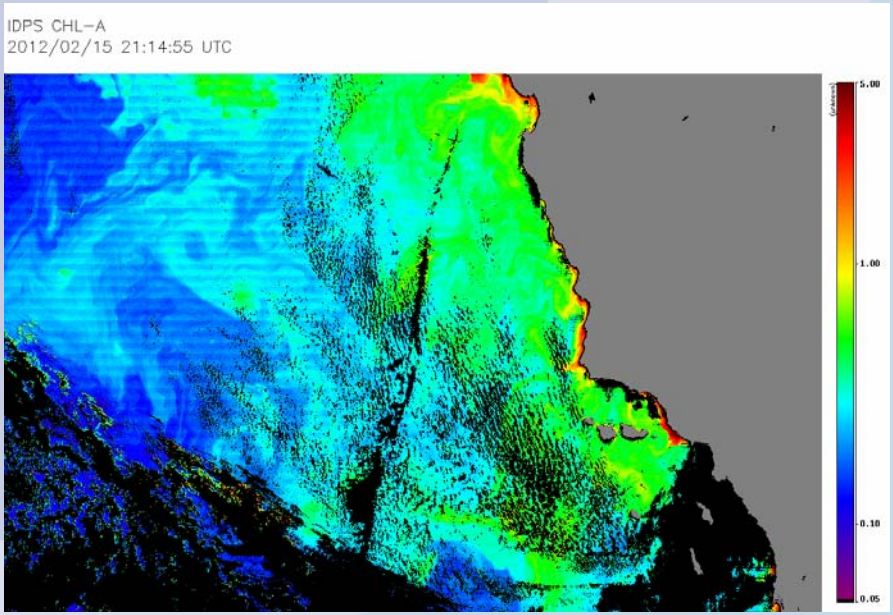
The official NPP mission RDRs, SDRs, and EDRs are presently generated via the JPSS Interface Data Processing Segment (**IDPS**)

What other VIIRS data and information is (will be) available?

- Also available in CLASS are ancillary and auxiliary supporting data.
- Global Level 3 data will be available through NOAA CoastWatch (coastwatch.noaa.gov/) and archived in CLASS (~spring 2013)
- Additional EDRs will be available over time based on demand & resources.

NOAA VIIRS Data in the NOAA Archive

- Official NPP project data files (from IDPS) are in HDF5 format
- Under VIIRS there are about 65 products (datatypes)
  - 3 levels of operational data (RDRs, SDRs, and EDRs)
  - SDR and EDR channels (bands) in separate files
  - RDR Science Data includes all bands in one file
  - Additional files include ancillary data, auxiliary data, release packages (software, documentation, etc.)
- Later products will be in NetCDF, CoastWatch HDF, etc.

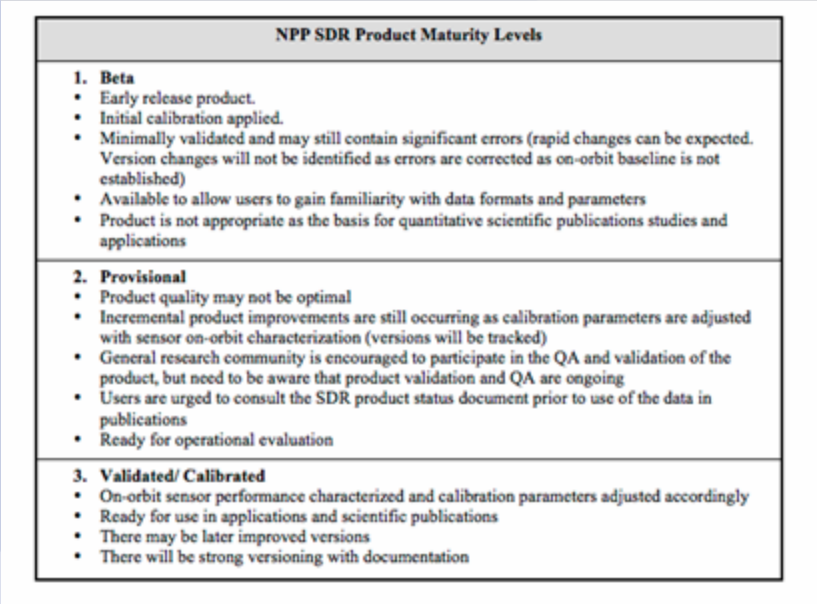


VIIRS Chlorophyll-a (IDPS)
February 15, 2012

Data Product Maturity Definitions

NPP SDR Product Maturity Levels:

1)Beta
2)Provisional
3)Validated/Calibrated

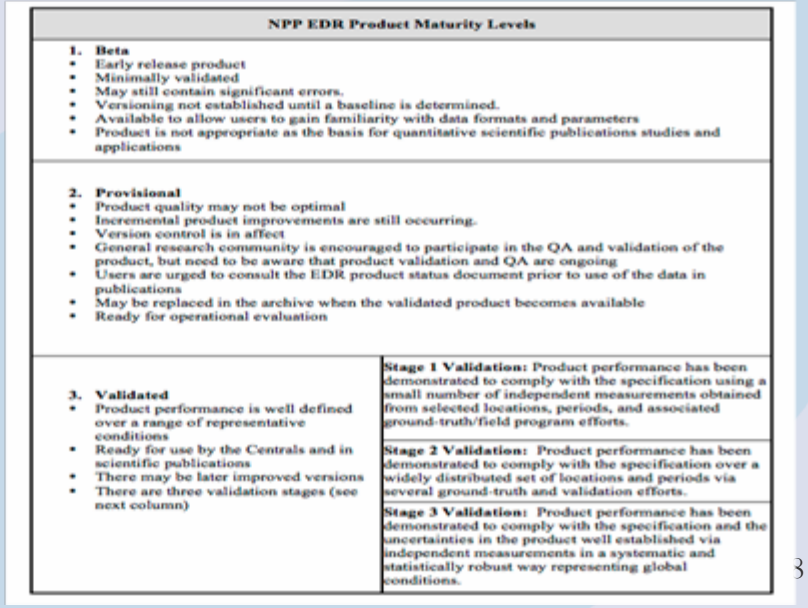


NPP SDR Product Maturity Levels

1. **Beta**
   - Early release product.
   - Initial calibration applied.
   - Minimally validated and may still contain significant errors (rapid changes can be expected. Version changes will not be identified as errors are corrected as on-orbit baseline is not established)
   - Available to allow users to gain familiarity with data formats and parameters
   - Product is not appropriate as the basis for quantitative scientific publications studies and applications
2. **Provisional**
   - Product quality may not be optimal
   - Incremental product improvements are still occurring as calibration parameters are adjusted with sensor on-orbit characterization (versions will be tracked)
   - General research community is encouraged to participate in the QA and validation of the product, but need to be aware that product validation and QA are ongoing
   - Users are urged to consult the SDR product status document prior to use of the data in publications
   - Ready for operational evaluation
3. **Validated/ Calibrated**
   - On-orbit sensor performance characterized and calibration parameters adjusted accordingly
   - Ready for use in applications and scientific publications
   - There may be later improved versions
   - There will be strong versioning with documentation

NPP EDR Product Maturity Levels:

1)Beta
2)Provisional
3)Validated (3 stages)



NPP EDR Product Maturity Levels

1. **Beta**
   - Early release product
   - Minimally validated
   - May still contain significant errors.
   - Versioning not established until a baseline is determined.
   - Available to allow users to gain familiarity with data formats and parameters
   - Product is not appropriate as the basis for quantitative scientific publications studies and applications
2. **Provisional**
   - Product quality may not be optimal
   - Incremental product improvements are still occurring.
   - Version control is in affect
   - General research community is encouraged to participate in the QA and validation of the product, but need to be aware that product validation and QA are ongoing
   - Users are urged to consult the EDR product status document prior to use of the data in publications
   - May be replaced in the archive when the validated product becomes available
   - Ready for operational evaluation
3. **Validated**
   - Product performance is well defined over a range of representative conditions
   - Ready for use by the Centrals and in scientific publications
   - There may be later improved versions
   - There are three validation stages (see next column)

Stage 1 Validation: Product performance has been demonstrated to comply with the specification using a small number of independent measurements obtained from selected locations, periods, and associated ground-truth/field program efforts.

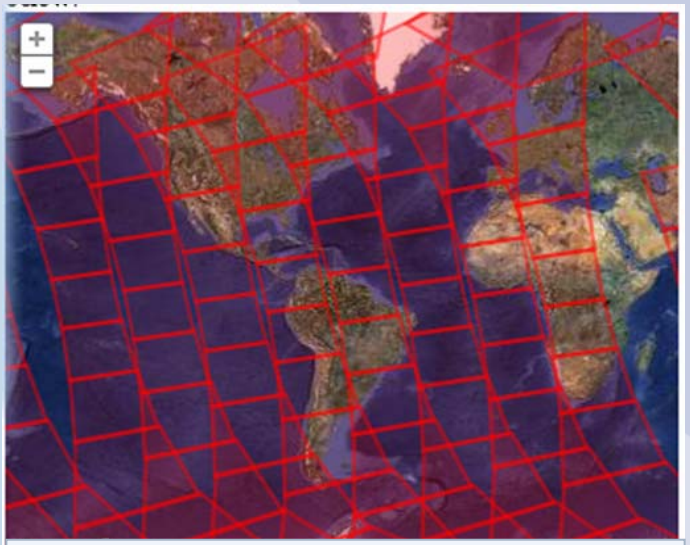
Stage 2 Validation: Product performance has been demonstrated to comply with the specification over a widely distributed set of locations and periods via several ground-truth and validation efforts.

Stage 3 Validation: Product performance has been demonstrated to comply with the specification and the uncertainties in the product well established via independent measurements in a systematic and statistically robust way representing global conditions.

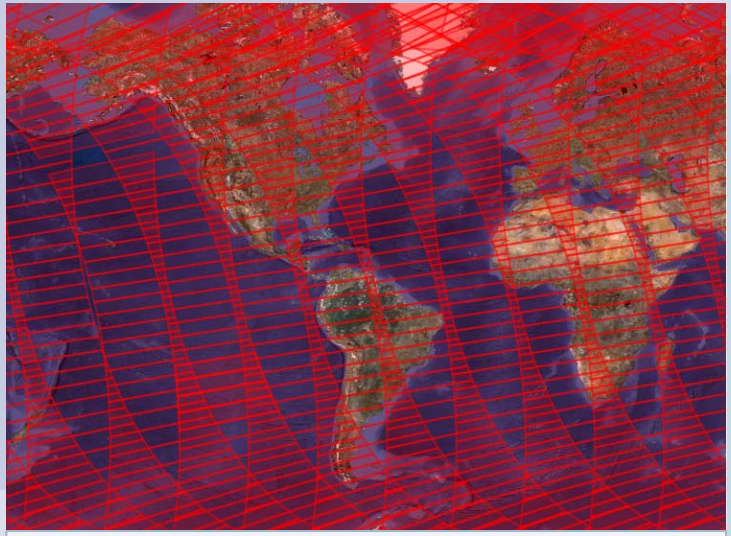
Example NPP VIIRS Daily File Number and Volume by Product (datatype)

Descriptive Name	Files	Volume
VIIRS Moderate Resolution Band 01 SDR	254	6 GBs
VIIRS Moderate Resolution Band 02 SDR	254	6 GBs
VIIRS Moderate Resolution Band 03 SDR	254	9 GBs
VIIRS Moderate Resolution Band 04 SDR	254	9 GBs
VIIRS Moderate Resolution Band 05 SDR	254	9. GBs
VIIRS Moderate Resolution Band 06 SDR	254	6 GBs
VIIRS Moderate Resolution Band 07 SDR	254	17 GBs
VIIRS Moderate Bands SDR Geolocation	254	79 GBs
VIIRS Sea Surface Temperature EDR	254	19 GBs
VIIRS Ocean Color/Chlorophyll EDR	254	93 GBs
VIIRS Science RDR	254	57 GBs

Granule comparison between MODIS and VIIRS



Coverage of MODIS Granules
Granule length: 5 min



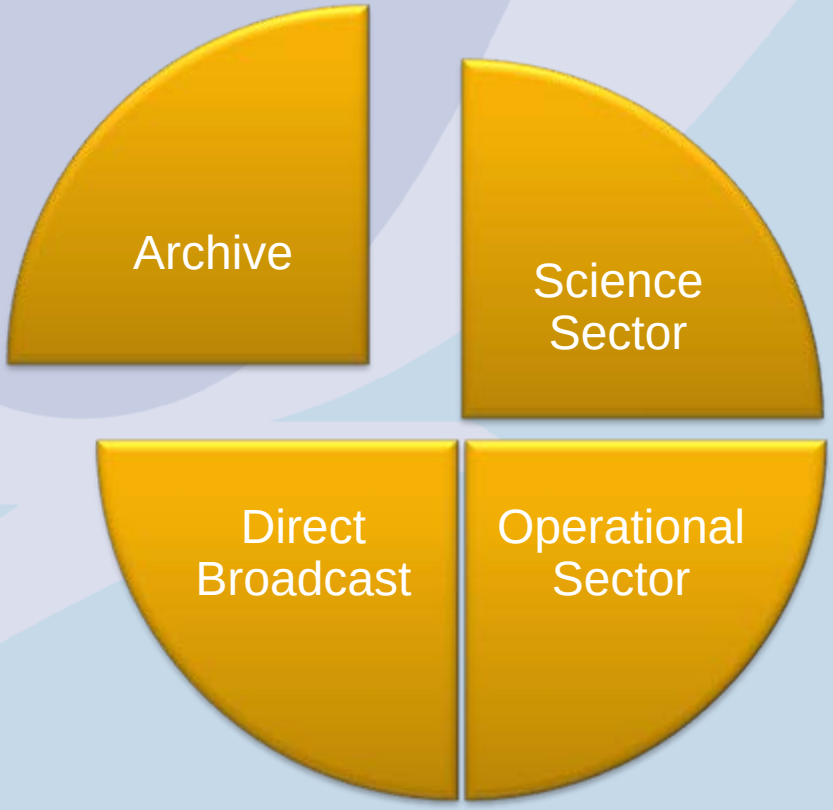
Coverage of VIIRS Granules
Granule length: 85.7 sec

- VIIRS archived data are grouped into aggregates
- One aggregate equals **four** granules
- Aggregate length is 5.7 min (342.8 sec)
- Bottom line: VIIRS files are larger than MODIS files!
- 72 granules per orbit or 18 aggregates per orbit

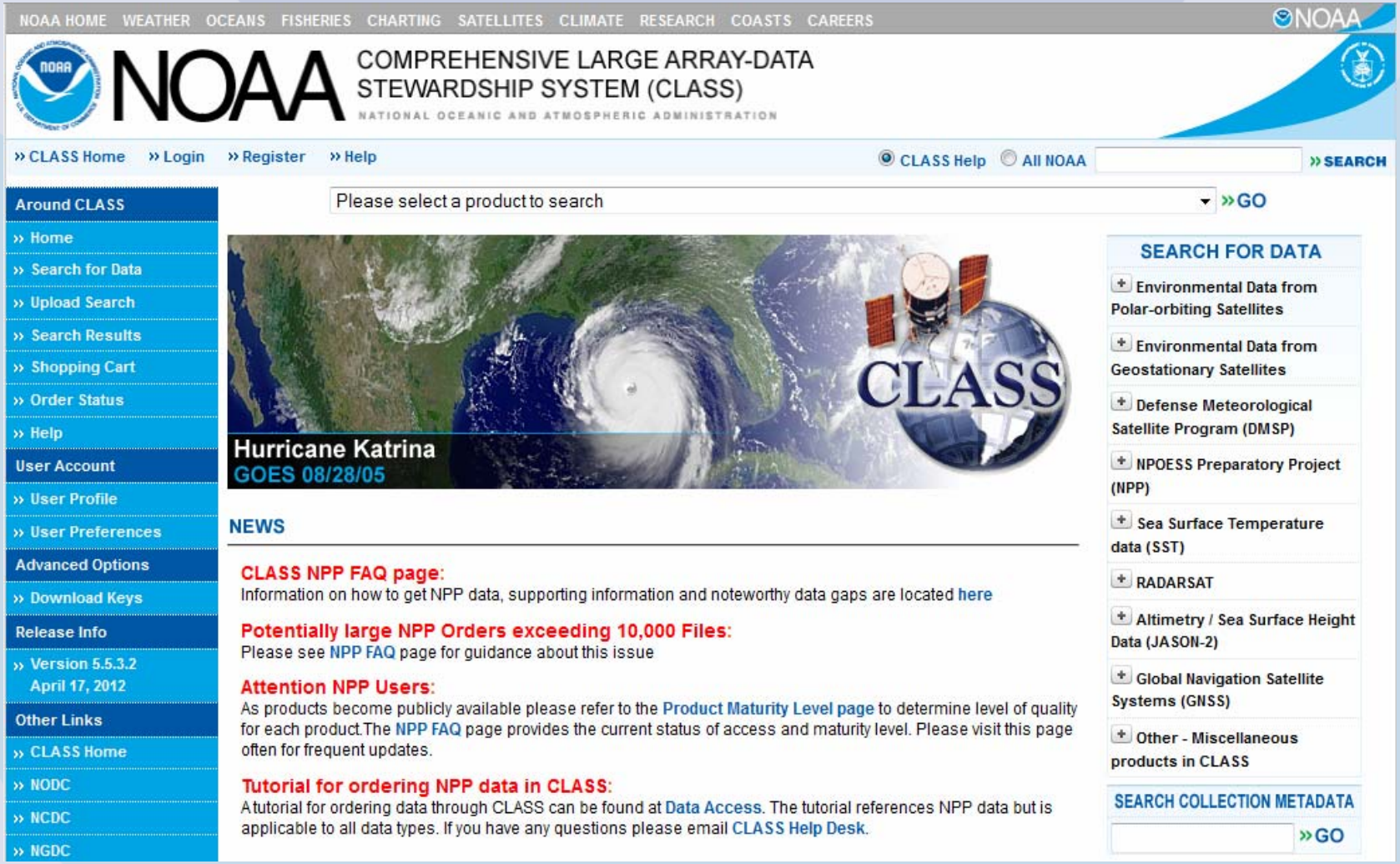
NOAA VIIRS Ocean Color Data Access

Some general notes on the design and capabilities of **CLASS**:

- The NOAA CLASS data storage system is not designed for real-time operations.
- At least six hours elapse before data are ingested into CLASS from the NPP IDPS. (Other sectors support real-time)
- Users must create an account to be able to access the data.
- Different levels of services: Ad hoc, large and subscription
- Direct download is currently not supported



CLASS Home Page



www.class.noaa.gov

NOAA VIIRS Ocean Color Data Access

How do I order from CLASS?

- **Step 1:** Register for a user id account at **www.class.noaa.gov** – minimal information: your name, e-mail address, a password
- **Step 2:** Select from the drop down product menu and highlight **NPP VIIRS**
- **Step 3:** From the the search interface find data of interest. Select geographic region, enter start/end dates and times, and select one or more data types (different products or spectral bands).
- **Step 4:** Determine if you need greater access or a subscription

CLASS order types:	Anticipated Order Delivery	File Limit	Must contact the Help Desk
Ad hoc orders	Usually within 24 hours	Up to 100 files	No
Large orders (bulk)	up to one week	up to 3000	Yes
Subscription (standing orders)	12 hours	No limit	Yes

Note: Always provide your user ID when contacting the CLASS helpdesk

NOAA VIIRS Ocean Color Data Access: Assistance and support

For technical questions regarding how to use CLASS:

- ✓ **class.help@noaa.gov**
- ✓ **axel.graumann@noaa.gov**

Notes on using CLASS:

- ✓ **NPP Access tutorial** (see link at **www.class.noaa.gov** in the News section: (http://www.class.ncdc.noaa.gov/notification/pdfs/CLASS_Tutorial_NPPDataAccess_20110909.pdf)

- ✓ Check the NPP FAQ page for operational start dates, data gaps, product maturity levels, etc. (http://www.class.ncdc.noaa.gov/notification/faq_npp.htm)

- ✓ Visit as at the poster session if you like a hands-on review of CLASS

So now you've acquired some VIIRS data …

JPSS Software Processing Packages

- Algorithm Development Library (**ADL**) (see poster by Jiang et al.)

  (https://jpss-adl-wiki.ssec.wisc.edu/mediawiki)

  - Provides the science community with a simple method for testing and proving algorithms to be used in Interface Data Processing Segment (IDPS)
  - ADL includes all source codes, lookup tables, and test data
  - Users can run ADL in their own Linux systems

There are other VIIRS data processing systems used by various groups (e.g., NOAA-MSL12, NASA-l2gen, NRL-APS).

What's coming up?

- CoastWatch will produce & distribute global Level 3 products (daily, weekly and monthly), initially at reduced resolution (~spring 2013), eventually at full resolution.
- Dedicated NOAA ocean color website w/VIIRS information, FAQ, data links et al.