

# Distribution of NPP/VIIRS Ocean Color Data

International Ocean Color Science Meeting  
Darmstadt, Germany, 6-8 May 2013

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On behalf of NOAA ocean color and archive teams

# 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 etc provides ocean color and SST
- Global coverage; resolution - 750m (M bands)/375m (I bands)
- Official NPP Mission data is archived and distributed by the NOAA National Data Centers

# 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)	<i>SWIR Bands</i>	551	<i>SWIR Bands</i>	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**

# VIIRS Ocean Color Data Access Summary

- A detailed presentation on NPP/VIIRS data access by A. Graumann et al. is available at the 2012 NASA Ocean Color Research Team Meeting Website: [http://oceancolor.gsfc.nasa.gov/MEETINGS/OCRT\\_Apr2012/](http://oceancolor.gsfc.nasa.gov/MEETINGS/OCRT_Apr2012/)
- NOAA's Comprehensive Large Array-data Stewardship System (CLASS) serves as the official repository of NPP mission data, including VIIRS. On-line search, order, and distribution of all archived VIIRS mission data (along with tutorials) is available through CLASS: [www.class.noaa.gov](http://www.class.noaa.gov)
- VIIRS RDR (Level 0) and SDR (Level 1B) data from the JPSS *Interface Data Processing Segment (IDPS)* available via CLASS since last year
- VIIRS Ocean Color EDR (Level 2) data from the IDPS have just been declared as "Beta" status (see next), and are available via CLASS.
- Daily global merged VIIRS ocean color (1 & 4 km) data available on a rolling basis from NOAA CoastWatch by Summer 2013 (THREDDS Server).
- *Reprocessing of IDPS ocean color data expected to occur by early 2014*

# NOAA NPP/VIIRS Data Access Sectors

- **Archive Sector**

Long-term repository of NPP mission data

- **Science Sector**

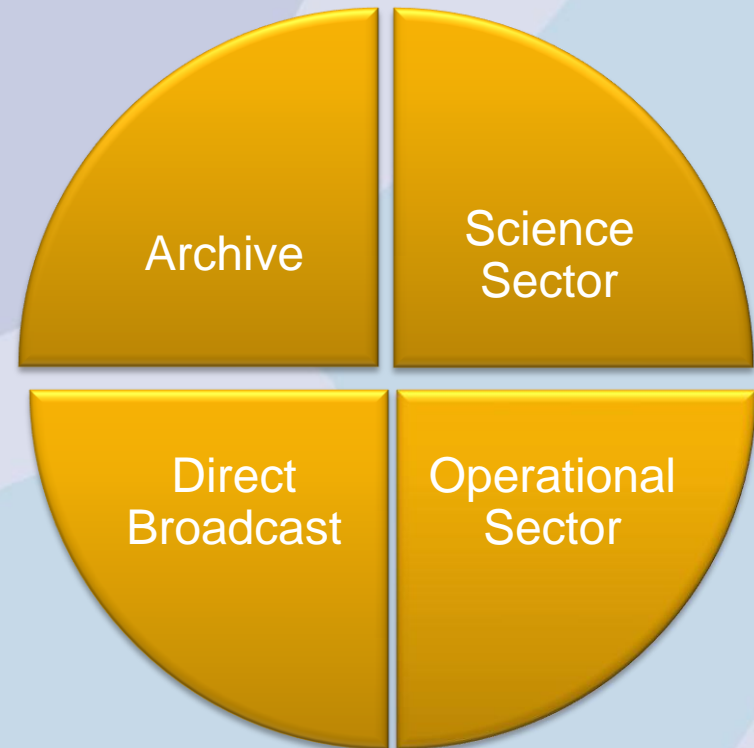
Data/product development; transition to operations; mission-level reprocessing and generation of science quality data

- **Operational Sector**

Generation and provision of near-real time regional and global operational data in support of user applications

- **Direct Broadcast Sector**

Provision of real time data on regional basis



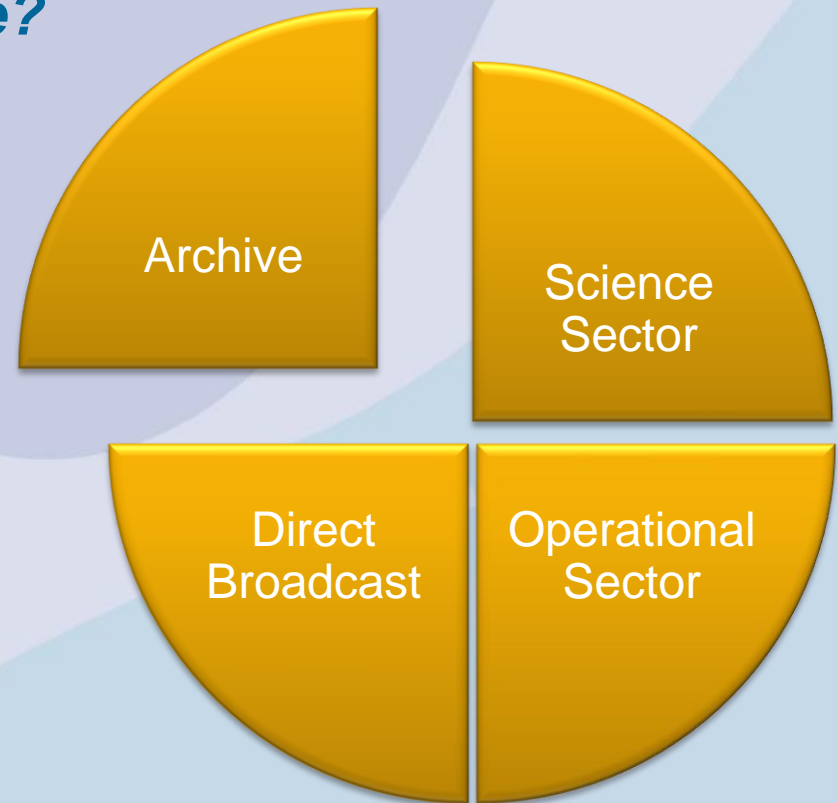
# NOAA NPP/VIIRS Data Access Sectors

## *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 data is available through CLASS: [www.class.noaa.gov](http://www.class.noaa.gov)





# 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)	Now in Archive
Level 1B	Sensor Data Record (SDR)	Now in Archive
Level 2	Environmental Data Record (EDR)*	Now in Archive

**\*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/](http://coastwatch.noaa.gov/)) and archived in CLASS (~Summer 2013)
- Additional EDRs will be available over time based on demand & resources.

# Data Product Maturity Definitions

## NPP SDR Product Maturity Levels:

- 1) Beta
- 2) Provisional
- 3) Validated/Calibrated

NPP SDR Product Maturity Levels	
1. <b>Beta</b>	<ul style="list-style-type: none"> <li>• Early release product.</li> <li>• Initial calibration applied.</li> <li>• 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)</li> <li>• Available to allow users to gain familiarity with data formats and parameters</li> <li>• Product is not appropriate as the basis for quantitative scientific publications studies and applications</li> </ul>
2. <b>Provisional</b>	<ul style="list-style-type: none"> <li>• Product quality may not be optimal</li> <li>• Incremental product improvements are still occurring as calibration parameters are adjusted with sensor on-orbit characterization (versions will be tracked)</li> <li>• 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</li> <li>• Users are urged to consult the SDR product status document prior to use of the data in publications</li> <li>• Ready for operational evaluation</li> </ul>
3. <b>Validated/ Calibrated</b>	<ul style="list-style-type: none"> <li>• On-orbit sensor performance characterized and calibration parameters adjusted accordingly</li> <li>• Ready for use in applications and scientific publications</li> <li>• There may be later improved versions</li> <li>• There will be strong versioning with documentation</li> </ul>

## NPP EDR Product Maturity Levels:

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

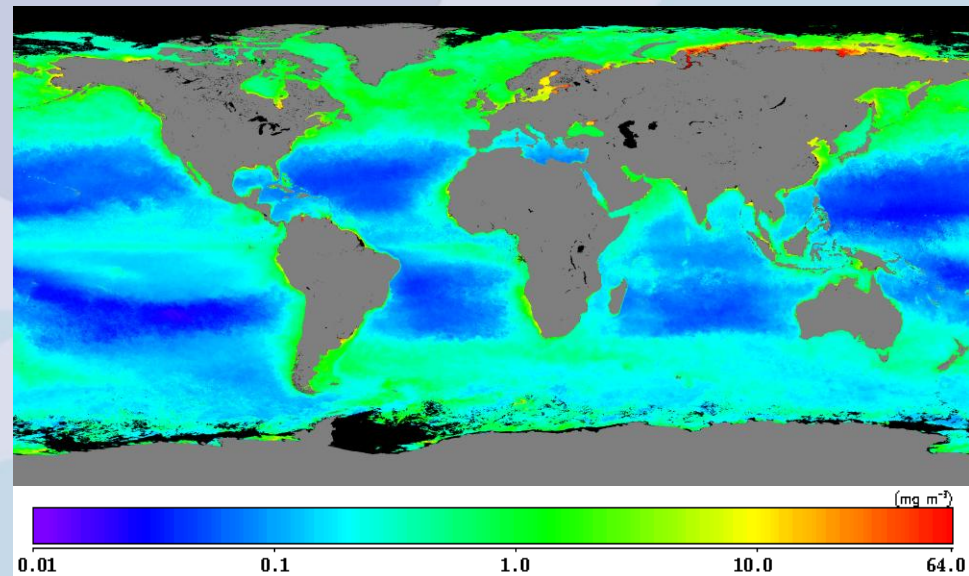
NPP EDR Product Maturity Levels			
1. <b>Beta</b>	<ul style="list-style-type: none"> <li>• Early release product</li> <li>• Minimally validated</li> <li>• May still contain significant errors.</li> <li>• Versioning not established until a baseline is determined.</li> <li>• Available to allow users to gain familiarity with data formats and parameters</li> <li>• Product is not appropriate as the basis for quantitative scientific publications studies and applications</li> </ul>		
2. <b>Provisional</b>	<ul style="list-style-type: none"> <li>• Product quality may not be optimal</li> <li>• Incremental product improvements are still occurring.</li> <li>• Version control is in affect</li> <li>• 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</li> <li>• Users are urged to consult the EDR product status document prior to use of the data in publications</li> <li>• May be replaced in the archive when the validated product becomes available</li> <li>• Ready for operational evaluation</li> </ul>		
3. <b>Validated</b>	<table border="1"> <tr> <td> <ul style="list-style-type: none"> <li>• Product performance is well defined over a range of representative conditions</li> <li>• Ready for use by the Centrals and in scientific publications</li> <li>• There may be later improved versions</li> <li>• There are three validation stages (see next column)</li> </ul> </td><td> <p><b>Stage 1 Validation:</b> 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.</p> <p><b>Stage 2 Validation:</b> 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.</p> <p><b>Stage 3 Validation:</b> 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.</p> </td></tr> </table>	<ul style="list-style-type: none"> <li>• Product performance is well defined over a range of representative conditions</li> <li>• Ready for use by the Centrals and in scientific publications</li> <li>• There may be later improved versions</li> <li>• There are three validation stages (see next column)</li> </ul>	<p><b>Stage 1 Validation:</b> 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.</p> <p><b>Stage 2 Validation:</b> 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.</p> <p><b>Stage 3 Validation:</b> 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.</p>
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# NOAA VIIRS Ocean Color Data in the NOAA Archive

- Official NPP project data files (from IDPS) are in HDF5 format
- For 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.)
- Other products will be in NetCDF, CoastWatch HDF, etc.

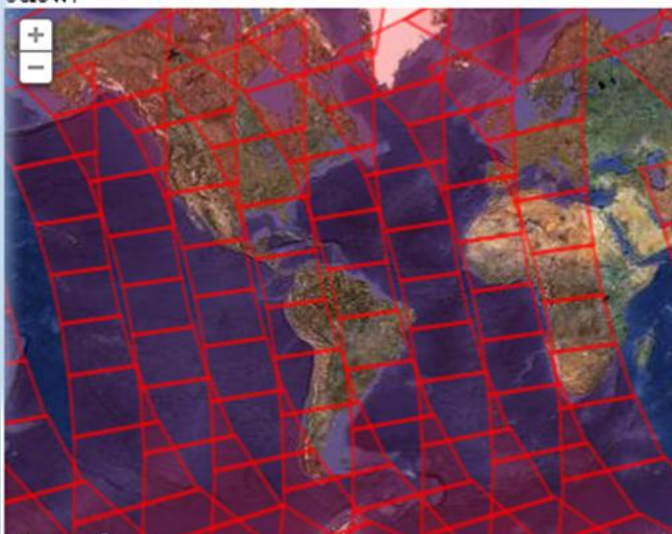
## VIIRS Climatology Chl-a Distributions (Data Included: Feb.—Nov., 2012)



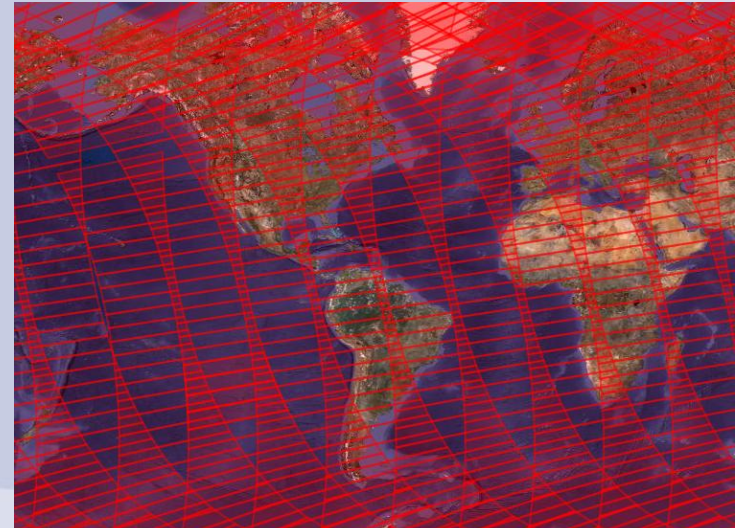
# Example NPP VIIRS Daily Volume by Product (datatype)

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	78.6 GBs
VIIRS Sea Surface Temperature EDR	254	19.0 GBs
VIIRS Ocean Color/Chlorophyll EDR	254	93.1 GBs
VIIRS Science RDR	254	56.7 GBs

# Granule comparison between MODIS and VIIRS



Coverage of MODIS Granules  
Granule length: 5 min



Coverage of VIIRS Granules  
Granule length: 85.7 sec

- A VIIRS aggregate equals **four** granules
- Aggregate length is 5.7 min (342.8 sec)
- VIIRS files are larger than MODIS files
- 72 granules per orbit or 18 aggregates per orbit





# VIIRS L2 Granule Selector

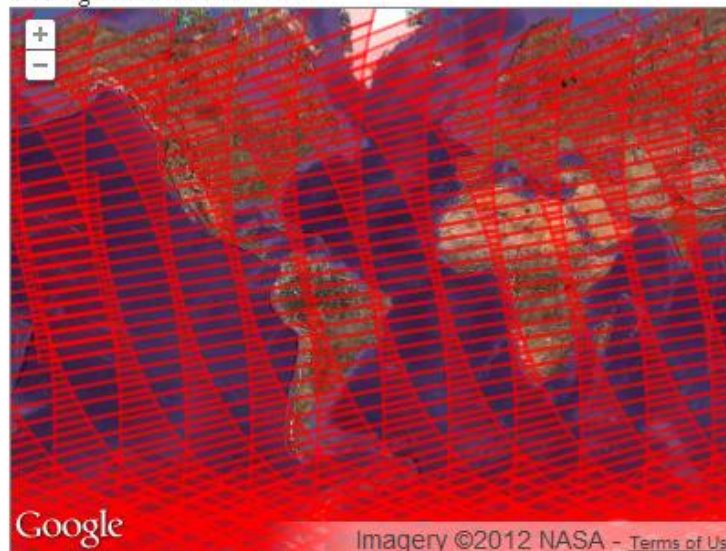
[Home](#)

VIIRS daytime granules are available in near real-time and retrospective days. Using the map interface, select the granule of interest for a true color thumbnail and links to the HDF dataset. Mapped granule bounds are approximate.

◀ December, 2012 ▶

Mon	Tue	Wed	Thu	Fri	Sat	Sun
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

VIIRS granules for 12-01-2012



NOAA CoastWatch VIIRS Data

VIIRS Granule Date: 2012-12-01 Time: 1850

Coordinates (Lat, Lon):

Upper Left: 20.623500, -100.452003

Upper Right: 25.084700, -70.915497

Lower Right: 20.042801, -70.213402

Lower Left: 15.724300, -98.802399

Download Data:

[L2 True Color Data \(CW HDF\)](#)

[L2 True Color Image \(PNG\)](#)

[L2 Data \(HDF5\)](#)



NOAA Satellites and Information

National Environmental Satellite, Data, and Information Service



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[National Oceanic & Atmospheric Administration](#)

[Center for Satellite Applications and Research](#)

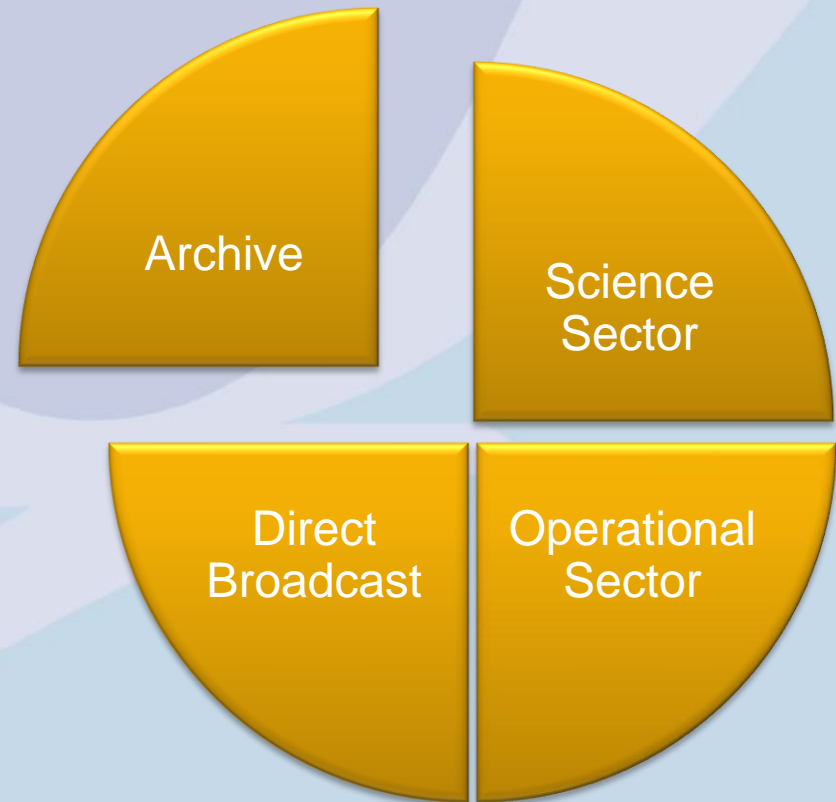
[Satellite Oceanography & Climatology Division](#)

Web site owner: [Satellite Oceanography & Climatology Division](#)

# 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





# NOAA

## COMPREHENSIVE LARGE ARRAY-DATA STEWARDSHIP SYSTEM (CLASS)

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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### User Account

[» User Profile](#)[» User Preferences](#)

### Advanced Options

[» Download Keys](#)

### Release Info

[» Version 5.5.3.2](#)

April 17, 2012

### Other Links

[» CLASS Home](#)[» NODC](#)[» NCDC](#)[» NGDC](#)

Please select a product to search

[» GO](#)

**Hurricane Katrina**  
**GOES 08/28/05**

### NEWS

#### CLASS NPP FAQ page:

Information on how to get NPP data, supporting information and noteworthy data gaps are located [here](#)

#### Potentially large NPP Orders exceeding 10,000 Files:

Please see [NPP FAQ](#) page for guidance about this issue

#### Attention NPP Users:

As products become publicly available please refer to the [Product Maturity Level page](#) to determine level of quality for each product. The [NPP FAQ](#) page provides the current status of access and maturity level. Please visit this page often for frequent updates.

#### Tutorial for ordering NPP data in CLASS:

A tutorial for ordering data through CLASS can be found at [Data Access](#). The tutorial references NPP data but is applicable to all data types. If you have any questions please email [CLASS Help Desk](#).

### SEARCH FOR DATA

[+ Environmental Data from  
Polar-orbiting Satellites](#)[+ Environmental Data from  
Geostationary Satellites](#)[+ Defense Meteorological  
Satellite Program \(DMSP\)](#)[+ NPOESS Preparatory Project  
\(NPP\)](#)[+ Sea Surface Temperature  
data \(SST\)](#)[+ RADARSAT](#)[+ Altimetry / Sea Surface Height  
Data \(JASON-2\)](#)[+ Global Navigation Satellite  
Systems \(GNSS\)](#)[+ Other - Miscellaneous  
products in CLASS](#)

### SEARCH COLLECTION METADATA

[» GO](#)

www.class.noaa.gov



# NOAA VIIRS Ocean Color Data Access

## *How do I retrieve/order from CLASS?*

- **Step 1:** Register for a user id account at [www.class.noaa.gov](http://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](mailto:class.help@noaa.gov)
- ✓ [axel.graumann@noaa.gov](mailto:axel.graumann@noaa.gov)

Notes on using CLASS:

- ✓ **NPP Access tutorial** (see link at [www.class.noaa.gov](http://www.class.noaa.gov) in the News section:  
( [http://www.class.ncdc.noaa.gov/notification/pdfs/CLASS\\_Tutorial\\_NPPDataAccess\\_20110909.pdf](http://www.class.ncdc.noaa.gov/notification/pdfs/CLASS_Tutorial_NPPDataAccess_20110909.pdf))
- ✓ Check the NPP FAQ page for operational start dates and outages:  
([http://www.class.ncdc.noaa.gov/notification/faq\\_npp.htm](http://www.class.ncdc.noaa.gov/notification/faq_npp.htm))
- ✓ Ability to check the status of your order from the CLASS home page  
(especially if large order)
- ✓ Search criteria can be saved and reused
- ✓ User preferences for data delivery can be pre-set