Veronica P. Lance* and Paul M. DiGiacomo and the NOAA CoastWatch/OceanWatch Team

*Global Science & Technology, Inc.

2016 STAR/JPSS Annual Science Meeting
College Park, MD, 14-18 August 2017
NOAA CoastWatch/OceanWatch Team

Paul DiGiacomo – Program Manager

<table>
<thead>
<tr>
<th>Full Time “CW Central” Technical Team</th>
<th>With Support From</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heng Gu</td>
<td>Veronica Lance</td>
</tr>
<tr>
<td>Phil Keegstra</td>
<td>Emily Smail</td>
</tr>
<tr>
<td>Sathya Ramachandran</td>
<td>Sheekela Baker-Yeboah</td>
</tr>
<tr>
<td>Michael Soracco</td>
<td>Ryan Wattam</td>
</tr>
</tbody>
</table>

And PolarWatch and 5 Regional Nodes

8/24/2017  2017 STAR/JPSS Annual Science Meeting, College Park, MD, 14-18 August 2017
Role of NOAA CoastWatch/OceanWatch

NOAA CoastWatch/OceanWatch

- Cross-NOAA program and data framework
- Interface between development, users of all levels and applications
- Measurement (vice) mission-based approach to multi-sensor satellite data
- Processing and customization of pre-and/or post-operational products; “value-added” for CoastWatch users
- NRT & science quality time-series data service
- Global and user regions of interest
- Quality monitoring
- Multiple pathways to data discovery
- Intermediate repository
- Help desk, project assistance, public outreach
- Best effort, 8/5 support

NESDIS/STAR (Oceans/SOCD)

- Science research
- Algorithm/product development
- Cal/Val
- Quality assessment and monitoring
- Reanalysis, reprocessing
- Satellite application development & support

NESDIS/OSPO

- Routine, robust, operational production and distribution, especially to NOAA users
- Dedicated support (8x5 or 24x7 depending upon specific product)

NESDIS/NCEI

- Data stewardship
- Determine archive-worthiness; identify storage requirements
- Ensure robust metadata
- Data archive; long term storage
- Discovery of and access to archived data
- Support for users

8/24/2017

2017 STAR/JPSS Annual Science Meeting,
College Park, MD, 14-18 August 2017
Suomi NPP VIIRS OC Data Products

- Near Real Time (Days 1-14)
  - Global
  - Regional

- Science Quality (Day 15 – 2 Jan 2012*)
  - Global
  - Regional

* Data from early mission (since launch Nov. 2011 to 2 Jan 2012) are available only upon special request and will be provided with a quality warning.

Also: Now Operational at OSPO
## NRT & Science Quality Data

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Near-Real Time</th>
<th>Delayed-Mode/Science-Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latency:</td>
<td>Best effort, as soon as possible (~12-24h)</td>
<td>Best effort, on a 2-week delay</td>
</tr>
<tr>
<td>Processing System:</td>
<td>MSL12 (v1.01; will transition to v1.2x)</td>
<td>MSL12 (v1.2x)</td>
</tr>
<tr>
<td>SDR:</td>
<td>IDPS Operational SDR</td>
<td>OC-improved SDR</td>
</tr>
<tr>
<td>Ancillary Data:</td>
<td>Global Forecast System (GFS) Model</td>
<td>Science quality (assimilated; GDAS) from NCEP</td>
</tr>
<tr>
<td>Spatial Coverage:</td>
<td>May be gaps due to various issues</td>
<td>Complete global coverage</td>
</tr>
<tr>
<td>Processed by:</td>
<td>OSPO (operational)</td>
<td>NOAA/STAR</td>
</tr>
<tr>
<td>Distributed by:</td>
<td>CoastWatch, OSPO</td>
<td>CoastWatch, NCEI</td>
</tr>
<tr>
<td>Archive Plans:</td>
<td>Yes, from OSPO to NCEI</td>
<td>Yes, from CoastWatch to NCEI</td>
</tr>
<tr>
<td>Full Mission Reprocessing:</td>
<td>No</td>
<td>Yes, every ~2-3 years or as needed</td>
</tr>
</tbody>
</table>
Example “Snapshot”

Science-Quality Data replaces 15-day old NRT data

IDPS SDR GFS Model

OC SDR GDAS

Reprocessed V1 Forward Stream V1

NRT

Science Quality

Launch 2 Jan 2012 1 May 2016 2 Weeks Ago Today

*Early mission data are not publically distributed due to quality issues. They can be specially requested but will come with a quality warning.

8/24/2017 2017 STAR/JPSS Annual Science Meeting, College Park, MD, 14-18 August 2017
L2 & L3 Global Products

- **Standard:**
  - Chlorophyll-a
  - $K_d(490)$
  - $K_d$(PAR)
  - $nL_w$ 5 M-Bands
    - 412
    - 445
    - 488
    - 555
    - 672
  - $nL_w$ (638) I-Band
  - QA Score

- **Experimental:**
  - L2_flags
  - Latitude
  - Longitude

  Future inclusion as released by MECB
L2 & L3 Sector and Regional Products

- **Standard:**
  - Chlorophyll-a
  - $K_d(490)$
  - $K_d$(PAR)
  - $nL_w$ 5 M-Bands
    - 412
    - 445
    - 488
    - 555
    - 672
  - $nL_w(638)$ I-Band
  - QA Score

- **Experimental:**
  - L2_flags
  - Latitude
  - Longitude
  - Edgemask
  - IOPs
  - PAR
  - *Future inclusion as released by MECB*

- **User Driven (“Customized” routine production; considered upon request):**
  - HAB anomaly product
  - $R_{rs}$
  - Special projections
  - Etc.

8/24/2017

2017 STAR/JPSS Annual Science Meeting, College Park, MD, 14-18 August 2017
L3 Global 750m Sectors

UZ  VZ  WZ  XZ  YZ  ZZ

UY  VY  WY  XY  YY  ZY

UX  VX  WX  XX  YX  ZX

UW  VW  WU  XW  YW  ZW
## CW Distribution of NRT

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Processing Level</th>
<th>Nominal Spatial Resolution</th>
<th>Chl-a</th>
<th>nLws</th>
<th>KdPAR</th>
<th>Kd490</th>
<th>Rrs (672)</th>
<th>Chlorophyll Fronts</th>
<th>True Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily granule global swath</td>
<td>L2</td>
<td>750 m</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Daily merged mapped CW regions***</td>
<td>L3</td>
<td>750 m</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Daily merged global single file</td>
<td>L3</td>
<td>4 km</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily merged global sectorized***</td>
<td>L3</td>
<td>750 m</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-day merged global single file</td>
<td>L3</td>
<td>4 km</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-day merged global sectorized***</td>
<td>L3</td>
<td>750 m</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>True monthly merged global single file</td>
<td>L3</td>
<td>4 km</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>True monthly merged global sectorized***</td>
<td>L3</td>
<td>750 m</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61 day merged for CW regions***</td>
<td>L3</td>
<td>750 m</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Anomaly for CW regions***</td>
<td>L3</td>
<td>750 m</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Daily granule Mediterranean</td>
<td>L1b, L2</td>
<td>750 m</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily merged mapped Mediterranean</td>
<td>L3</td>
<td>750 m</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily merged mapped Australia</td>
<td>L3</td>
<td>750 m</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CW Distribution of Science Quality

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Processing Level</th>
<th>Nominal Spatial Resolution</th>
<th>Chl-a</th>
<th>nLws</th>
<th>(K_a\text{(PAR)})</th>
<th>(K_a\text{(490)})</th>
<th>QA Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily granule global swath @750 m</td>
<td>L2</td>
<td>750 m</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Daily merged global sectorized *</td>
<td>L3</td>
<td>750 m</td>
<td>in progress at CW</td>
<td>in progress at CW</td>
<td>in progress at CW</td>
<td>in progress at CW</td>
<td>X</td>
</tr>
<tr>
<td>7-day merged global sectorized *</td>
<td>L3</td>
<td>750 m</td>
<td>in progress at CW</td>
<td>in progress at CW</td>
<td>in progress at CW</td>
<td>in progress at CW</td>
<td>X</td>
</tr>
<tr>
<td>True monthly merged global sectorized *</td>
<td>L3</td>
<td>750 m</td>
<td>in progress at CW</td>
<td>in progress at CW</td>
<td>in progress at CW</td>
<td>in progress at CW</td>
<td>X</td>
</tr>
<tr>
<td>Daily merged global single file</td>
<td>L3</td>
<td>4 km</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>7-day merged global single file</td>
<td>L3</td>
<td>4 km</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Monthly merged global single file</td>
<td>L3</td>
<td>4 km</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Data Formats

- Global and Sector:
  - NetCDF v4CF
  - GeoTIFF & PNG

- Tailored and CONUS Regional:
  - NetCDF v4 CF
  - GeoTIFF & PNG
  - HDF (v4 with CoastWatch metadata; to be phased out)
Pictured is daily NRT Chlorophyll-a [mg m^{-3}];
NRT Regional

- “CONUS” 750m regions: Hawaii, West Coast, Great Lakes, Northeast, Southeast, Gulf of Mexico, Caribbean

Daily Merge for Caribbean Region

Granule
International Partners (1)

- EUMETSAT
  - Processing and staging of L2 750m Mediterranean datasets
  - EUMETcast (Copernicus Service) broadcasts VIIRS data to EU

Shown: L3 Daily merge, mapped, $k_d\text{PAR } [m^{-1}]$
International Partners (2)

- **CSIRO**
  
  - Processing and staging of L3 Australia 750m datasets

Daily Merge, mapped, $k_d\text{PAR} \text{[m}^{-1}]$
Website Revamp v.1.2 in Progress

NOAA CoastWatch • OceanWatch

Satellite data products for understanding and managing our oceans and coasts
NOAA CoastWatch • OceanWatch
Ocean Color - Science Quality - VIIRS SNPP

Data are available through the following servers:

Service | Resource Locator
--- | ---
HTTPS | https://coastwatch.noaa.gov/cw_html/cw_granule_selector.html
THREDDS | https://www.star.nesdis.noaa.gov/thredds/socd/coastwatch/catalog_MEGB_viirs_lom_global.html
The Near Real Time Search tool gives the user the ability of selecting OceanWatch data products based on their region of interest, the products associated with that region, the individual sensor used to obtain this data, and a time period of interest obtained either by category or by selecting criteria in the Search Criteria panel on the left.
L2 Granule Selector

NOAA CoastWatch • OceanWatch
Level-1 / Level-2 Ocean Data

The NOAA CoastWatch granule selector enables a user to select a Level-1 or Level-2 dataset by selecting a date and clicking on the granule that covers the user's area of interest. For VIIRS near real-time data is available for the last 15 days and science quality data is available from 2012 up to near real-time coverage. Clicking a granule will open an information window containing a link to the preview image and/or data file. If multiple files are desired, each file can be 38 to 550 MB. Clicking on the download icon (●) will add the selected granule to a list that can be downloaded and used to retrieve files using local software.

https://coastwatch.noaa.gov/cwn/cw_granule_selector.html
L2 Spatial Search Tool

NOAA CoastWatch • OceanWatch
Level-2 VIIRS Ocean Color Science Quality

Note: Science quality, ocean color data from VIIRS is delayed by 15 days. The L2 datasets contain 5 NLW bands, chlorophyll-a, KdPAR, and Kd490. Use the FTP List button to generate a list of URLs for batch downloads. Data exists from 02JAN2012 to 31JUN2017.

https://coastwatch.noaa.gov/cw_html/cw_polygon_search.html#searchbox
Data Stewardship and Long-Term Archive by NCEI

- NOAA CoastWatch/OceanWatch is delivering MSL12 full mission science quality data (L2 and L3) for data stewardship and long-term archiving by NCEI.
- Data will be stored at CLASS but easily accessible via CoastWatch and through NCEI spinning disk.
- Spinning disk access page in progress, *waiting on me to edit the content description.*
Sentinel-3A OLCI

- A Cooperative Arrangement between the United States and the European Commission and technical arrangements between NOAA and EUMETSAT (and NOAA and ESA for S1 and S2) are all complete.
- NOAA is primary outlet in US for Sentinel 3 marine data.
- EUMETSAT data transfer via terrestrial multicast to NOAA/STAR is now routine. L1 and L2 marine data products are now available through CW.
- NOAA CoastWatch/OceanWatch provides near real-time access to global OLCI (L1b and L2 full and reduced resolution)
- SLSTR data products from EUMETSAT and SRAL data are coming into STAR and will be redistributed through CoastWatch.
- OLCI data complements existing JPSS sensors:
  - 300m spatial resolution
  - Spectral bands meeting NOAA NOS HAB requirements
  - Morning vs. afternoon orbits
  - Relieves single point-of-failure for HAB forecasting
Sentinel-3A OLCI
Summary (1)

Both NRT and Science Quality VIIRS-SNPP Ocean Color data are available through NOAA CoastWatch/OceanWatch.

Science Quality
L2 global, granules:
FTP:
THREDDS:
https://www.star.nesdis.noaa.gov/thredds/catalog/swathNPPVIIRSSCIENCEL2WW00/catalog.html
Or, you can interactively select and download data (or get your file list for automated commands) using the Granule Selector Tool here:
https://coastwatch.noaa.gov/cwn/cw_granule_selector.html
L3 global 4 km mapped:
FTP:
Both NRT and Science Quality VIIRS-SNPP Ocean Color data are available through NOAA CoastWatch/OceanWatch.

Near Real Time
THREDDS OC NRT main page:

https://www.star.nesdis.noaa.gov/thredds/socd/coastwatch/catalog_coastwatch_viirs_global.html

Includes: L2 global granules (swath); L3 global 4km mapped, daily, weekly, monthly merged

Or, you can interactively select and download data (or get your file list for automated commands) using the Granule Selector Tool here:

https://coastwatch.noaa.gov/cwn/cw_granule_selector.html
Thank You

Web Site:  CoastWatch.NOAA.gov

Help Desk:  Coastwatch.info@NOAA.gov

Me:  VeronicaLance@NOAA.gov