STAR JPSS Oceans

JPSS Ocean EDRs:
Users, Applications and Science

Paul M. DiGiacomo and Veronica P. Lance

With contributions from:
CRW - Mark Eakin, Erick Geiger,
OAR/ARL - Daniel Tong,
NWS/EMC - Avichal Mehra, Eric Bayler,
NMFS/SEFSC - Cara Wilson,
STAR/SST - Sasha Ignatov, Eileen Maturi
STAR/OC – Menghua Wang
NOAA CoastWatch/OceanWatch - Michael Soracco
UK Met Office - Simon Good

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

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Outline

- Users & Applications – NOS, NMFS, NWS, OAR and NESDIS, and Outside of NOAA and International
- Highlights from VIIRS SST and Ocean Color EDRs
- Reprocessing (Oceans) at STAR
- Non-NOAA (Oceans) data at STAR
- “Moderate Assurance” (for Oceans) at STAR

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Highlights from a few user groups

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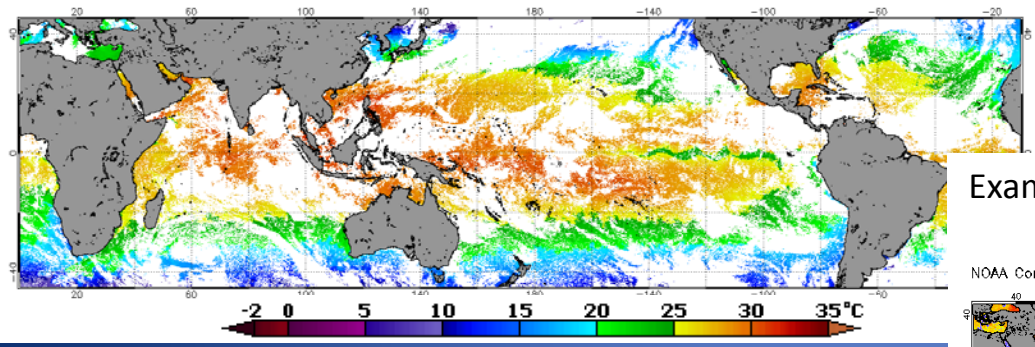
VIIRS SST User: NOAA Coral Reef Watch

Collated 0.02 degree resolution daily global VIIRS SST from June 6, 2016. Missing VIIRS data due to clouds are white.

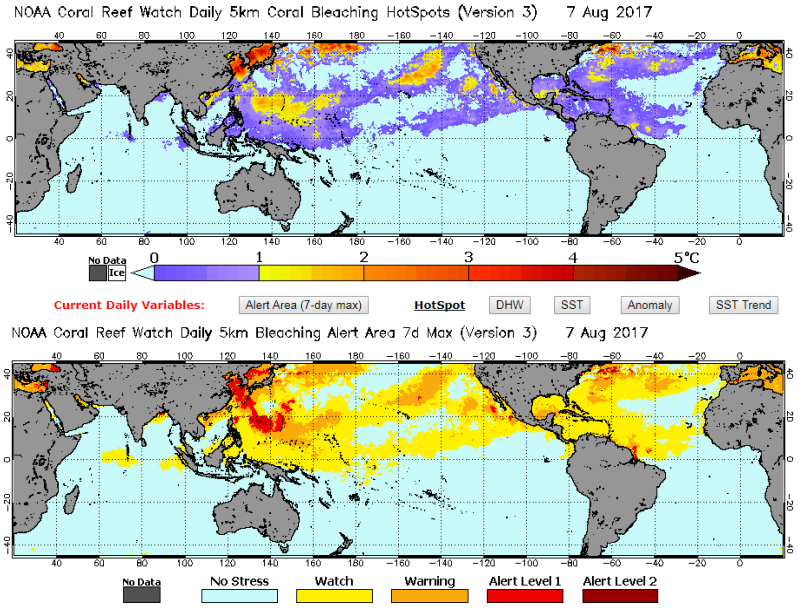


Coral Reef Watch developed a 0.02° (~2 km) global Sea Surface Temperature (SST) product from VIIRS ACSPO and recommends VIIRS ACSPO SST be included (along with Himawari and GOES geostationary SST) in a global, geo-polar blended 0.02° product for producing high quality bleaching alerts needed by regional coral reef managers across the globe

JPSS-PGRR sponsored project

- *Hernandez et al. plenary today, 1:45 pm*
- *2 in Ocean Color Breakout Wed., Sturm, 4:15 and Geiger, 4:30 pm*
- *SST Breakout Eakin, Thurs. 1:40 pm*

Examples of current daily CRW 5 km resolution Hot Spot and Bleaching Alert products



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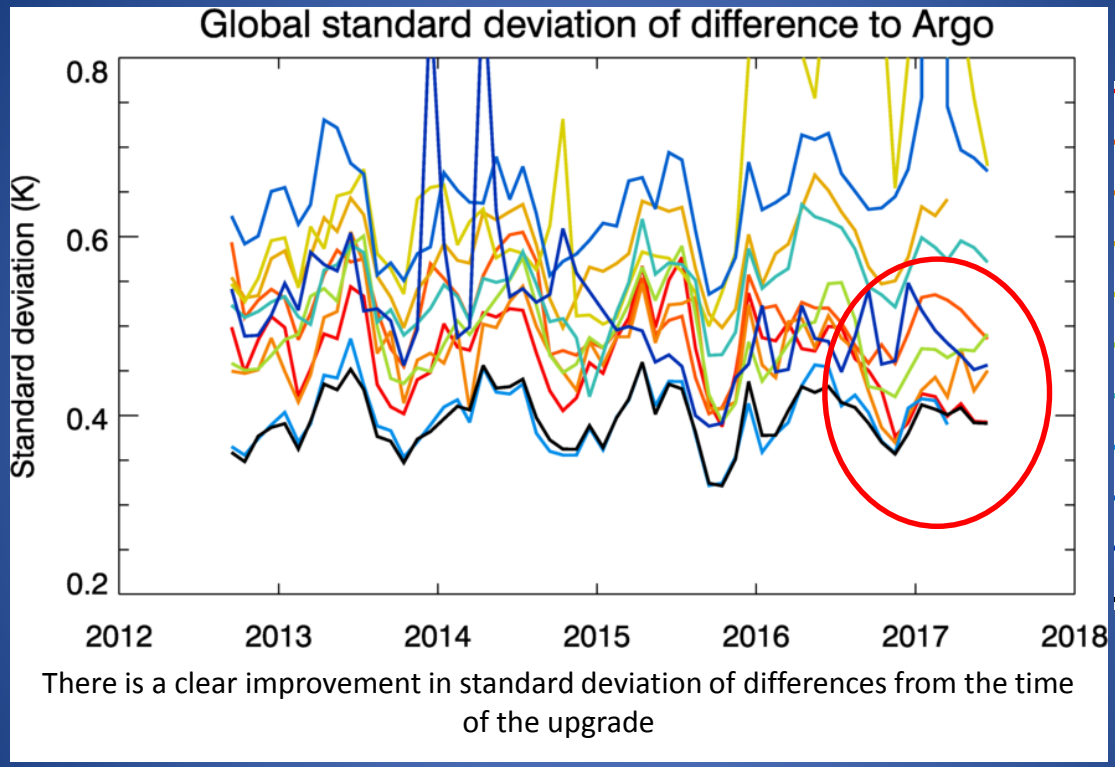
VIIRS SST Users: UK Met Office

- *Plenary slides from UK Met's Simon Good will be presented this afternoon at 1:30 pm*



There is a clear improvement in standard deviation of differences from the time of the upgrade

UK Met office sees clear improvements after incorporating ACSPO VIIRS SST into OSTIA

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VIIRS Ocean Color

User: NWS

NWS/NCEP/EMC is evaluating VIIRS Ocean Color for inclusion into NOAA's operational ocean models (HYCOM, MOM4).

- *Avichal Mehra will present in Ocean Color Breakout Wed., 4 pm*

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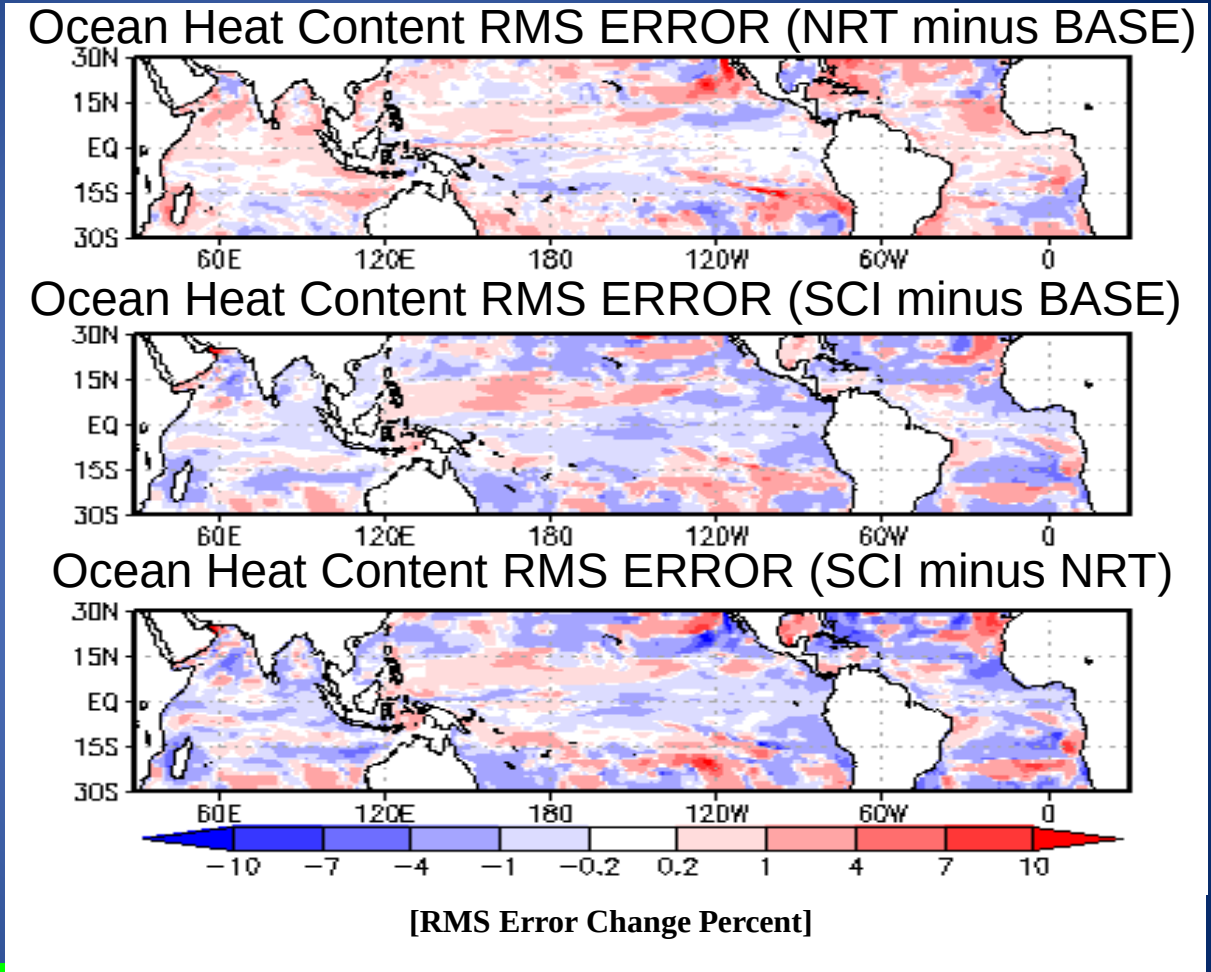

NESDIS Science-quality Chlorophyll-a significantly outperforms NRT and BASE (Operational Configuration). GODAS analyses used as ground truth

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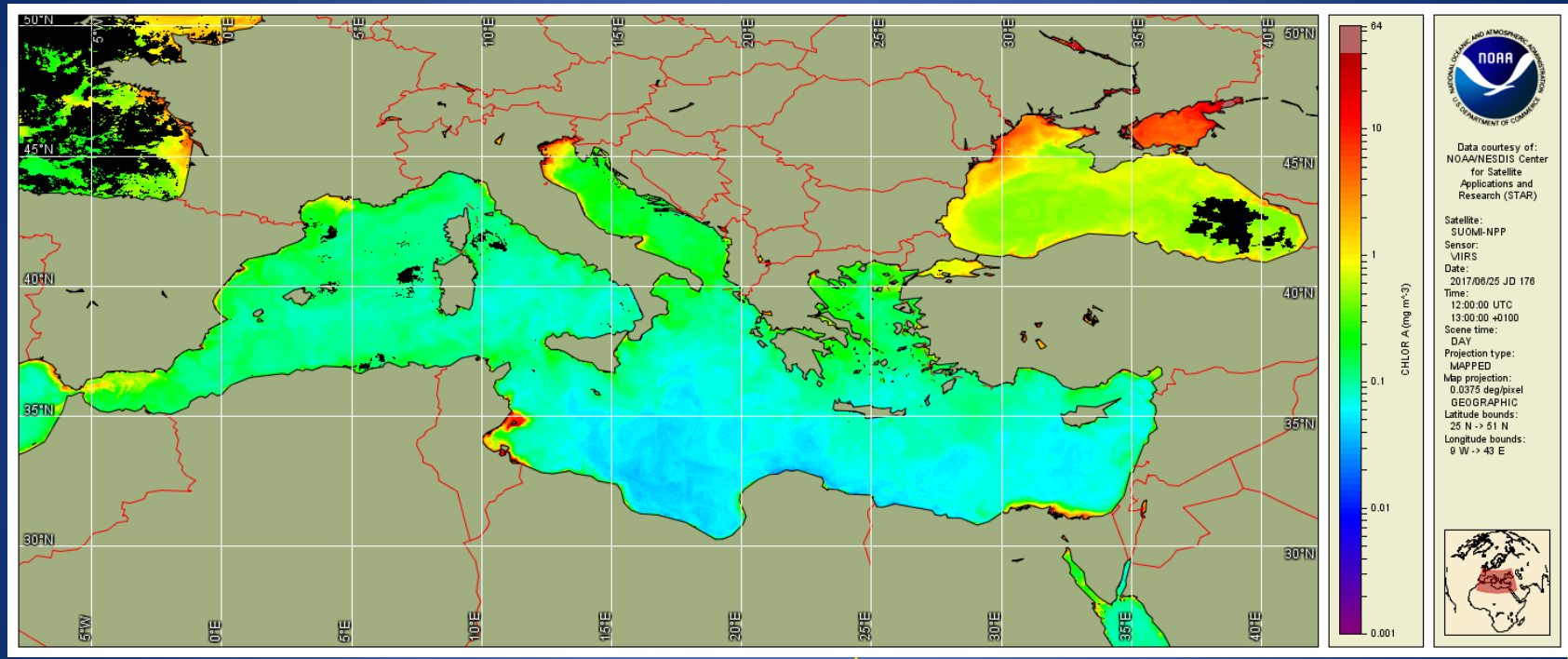
VIIRS Ocean Color User: EUMETSAT



Chlorophyll for the Mediterranean for EUMETSAT

- *Bojan Bojkov plenary – you saw it here – 9:30 am*
- *Bojkov will present in Ocean Color Breakout Wed., 3:45 pm*

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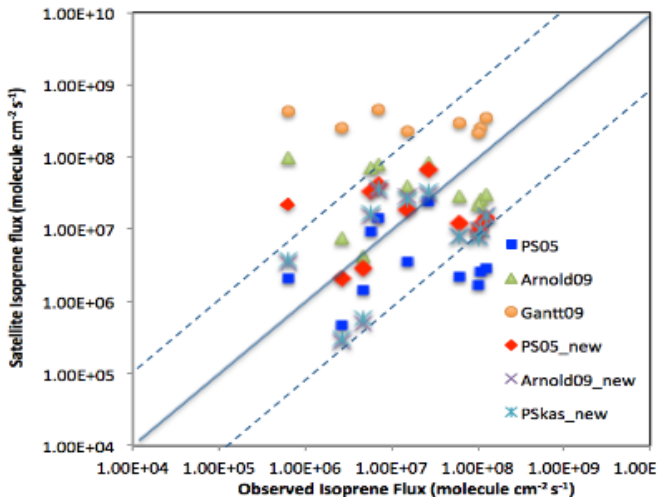
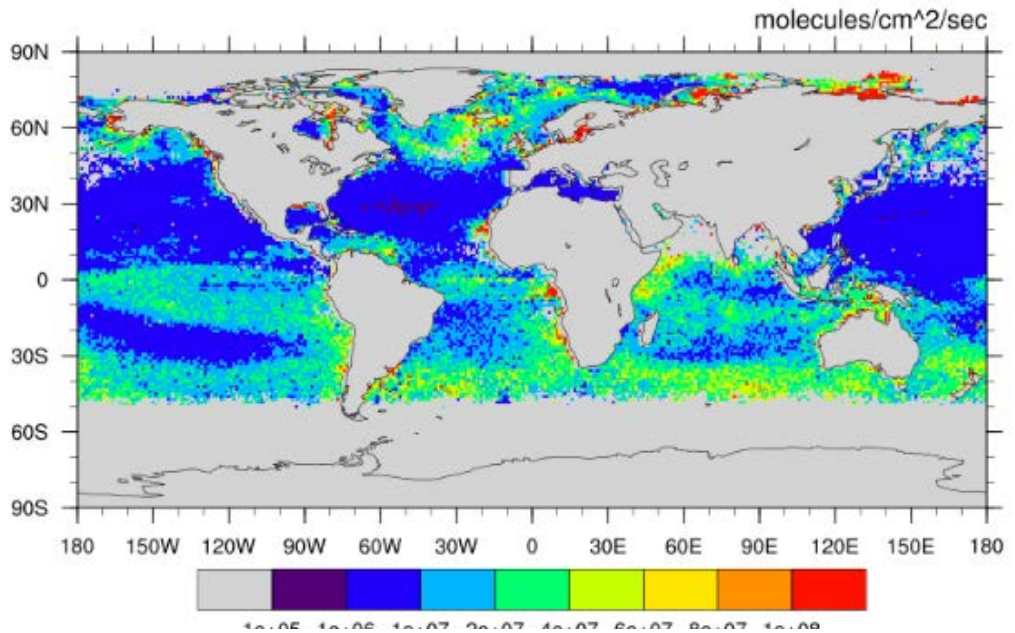
VIIRS Ocean Color User: OAR



Comparisons of VIIRS isoprene flux to historical field observations.



Monthly mean global isoprene emission rate distribution for July 2014.

The **NOAA Air Resources Laboratory** (OAR) improved the algorithm that derives the global distribution of marine isoprene which is then incorporated into emission models for the National Air Quality Forecasting Capability (NAQFC).

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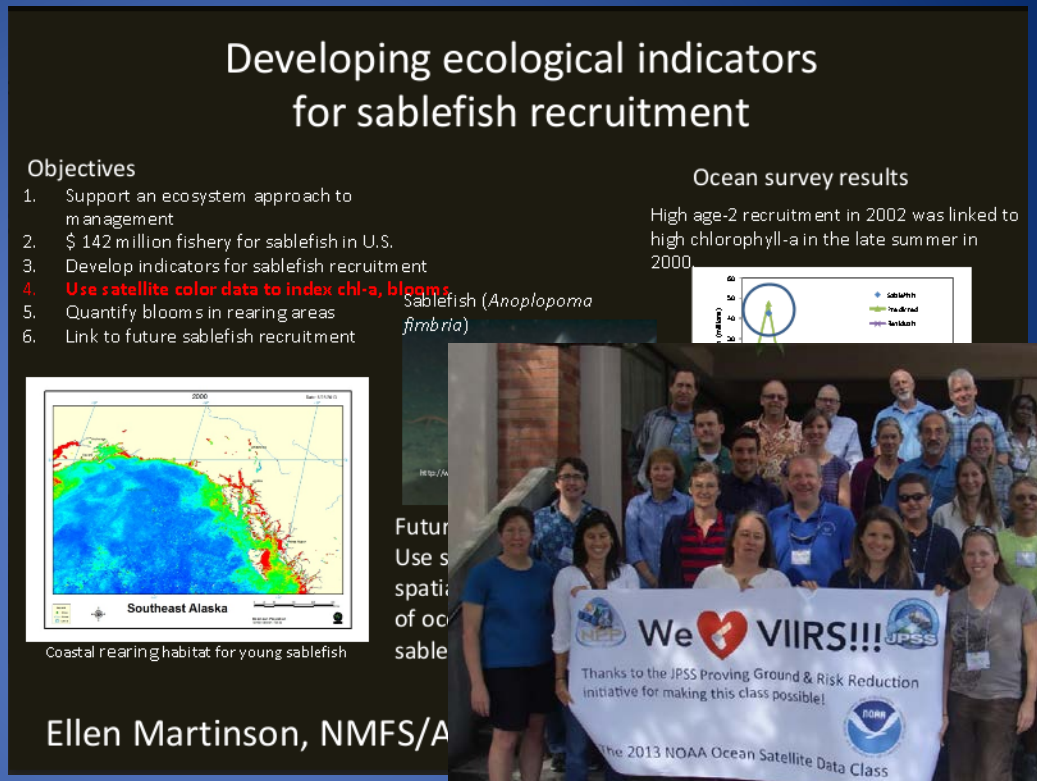
VIIRS Ocean Color & SST Data Users: NMFS

The **Satellite Data Training Course** conducted by Cara Wilson of **NMFS/SEFSC** is enabling fisheries research &operational applications.



High quality, long term time series satellite data are essential to an "Integrated Ecosystem Assessment" approach to fisheries management at NMFS.

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Highlights from VIIRS SST

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1. Continue Supporting Existing Users

- STAR Coast Watch (Paul DiGiacomo, Veronica Lance)
- STAR Geo-Polar Blended Team (Eileen Maturi, Andy Harris)
- Coral Reef Watch Team (Mark Eakin)
- CMC L4 (Dorina Surcel-Colan)
- Met Office (Simon Good, Emma Fiedler, Chongyuan Mao)

- *SST Breakout – several user presentations all day Thurs*

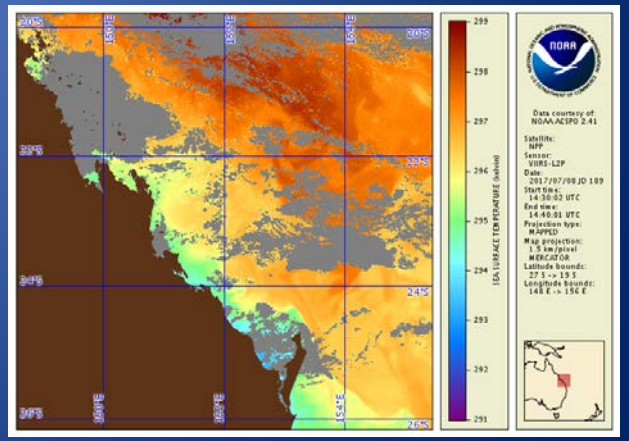
2. Significant Progress with Several New Users' Groups

- NCEP RTG Team (Bob Grumbine, Bert Katz)
- Australian Bureau of Meteorology (Helen Beggs, Chris Griffin, Pallavi Govekar)
- Danish Meteorological Institute (Jacob Høyer)

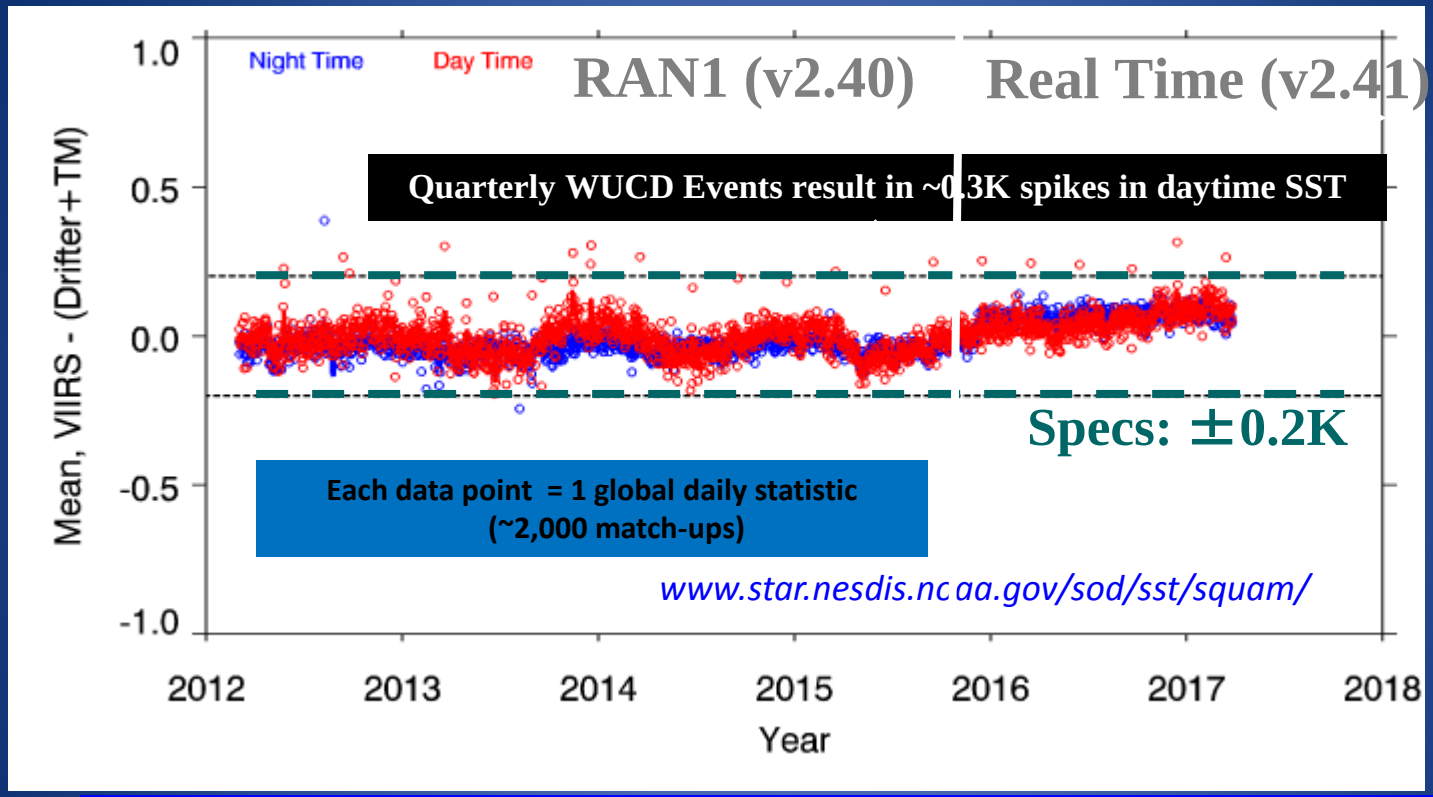
3. Emerging Users

- NOS West Coast Ocean Forecast System (Alexander Kurapov)
- NCEP NCODA Team (Ilia Rivin, Jim Cummings)
- NCEI/STAR (Tom Smith, Viva Banzon)
- JMA (Toshiyuki Sakurai)

L2P: Southern Great Barrier Reef, Australia SNPP VIIRS 8 July 2017



Validation of VIIRS SST Vs. Drifters + Trop. Moor. Global Bias (No SSES Bias Correction)

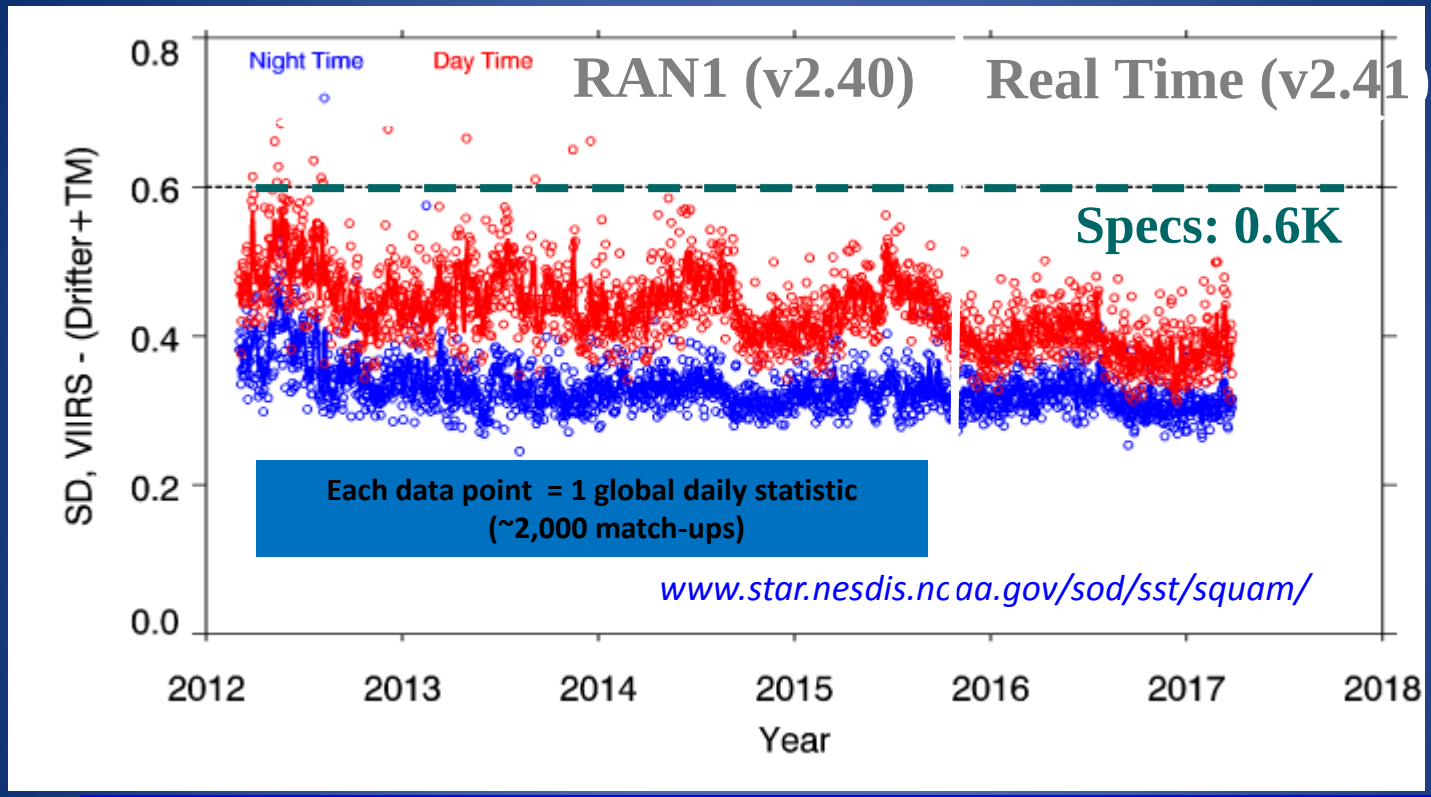


Day

Night

- Overall, product meets specs & users' requirements – except the WUCD events
- Quarterly spikes are due to Warm-Up Cool-Down exercises – working with SDR to resolve
- Biases are more consistent during RAN1 (Mar'12 – Dec'15). In NRT, a warming trend is seen
- **Working w/SDR to fix WUCD and set up infrastructure in STAR for RAN2 (in FY18)**

Validation of VIIRS SST Vs. Drifters + Trop. Moor. Standard Deviation (No SSES Bias Correction)



Day

Night

- Current SDs ~0.30K (Night) and ~0.40K (Day). Both meet specs & users' requirements
- SDs smaller @night (skin VIIRS SST is closer to buoy bulk SST) and larger during daytime
- ACSPO v2.41 appears less noisy, compared to previous version 2.40 used in RAN1
- **Working to set up infrastructure in STAR for RAN2 (planned in FY18)**

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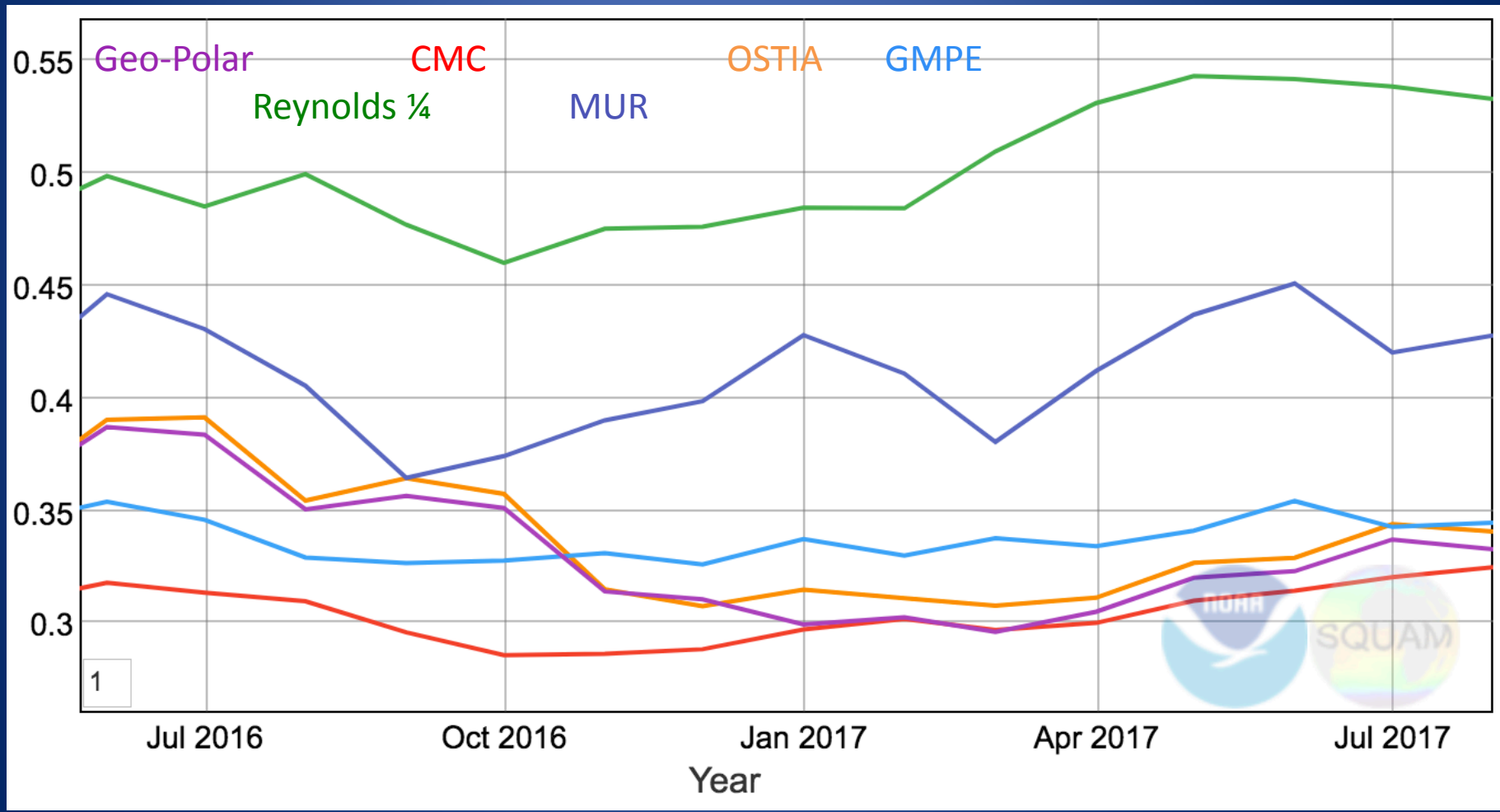
- VIIRS incorporated into Geo-Polar Blended 5-km global SST analysis



Significant impact on accuracy *cf.* independent ARGO data

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Highlights from VIIRS Ocean Color

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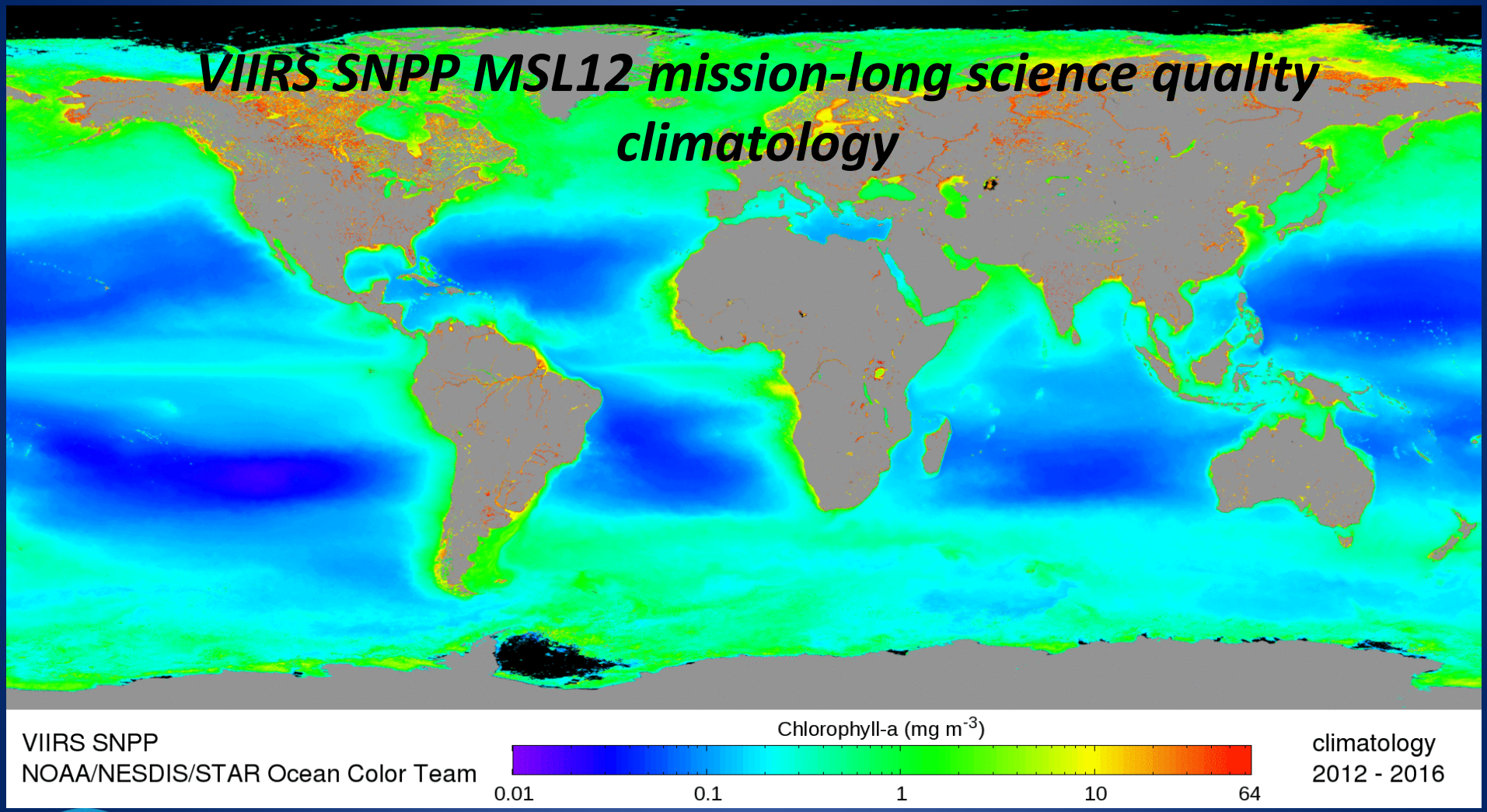

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Multi-Sensor Level 1 to Level 2 Processing System (MSL12) Both NRT and mission -long science quality data

Attribute	Near-Real Time	Science Quality Delayed Mode
Processing System	MSL12	MSL12
Latency:	~12h	Best effort, ~1-2 week delay
SDR:	IDPS Operational SDR	OC-improved IDPS SDR
Ancillary Data:	Global Forecast System (predicted)	Science quality (assimilated)
Spatial Cover	May be gaps due to various issues	Complete global coverage
Processed	OSPO	NOAA/STAR
Distributed by:	CoastWatch, OSPO	CoastWatch, NCEI
Archive Plans:	Yes, NCEI, via OSPO	Yes, NCEI, via CoastWatch
Reprocessing:	No	Yes, STAR team delivered v1.2 in 2017

Now Operational

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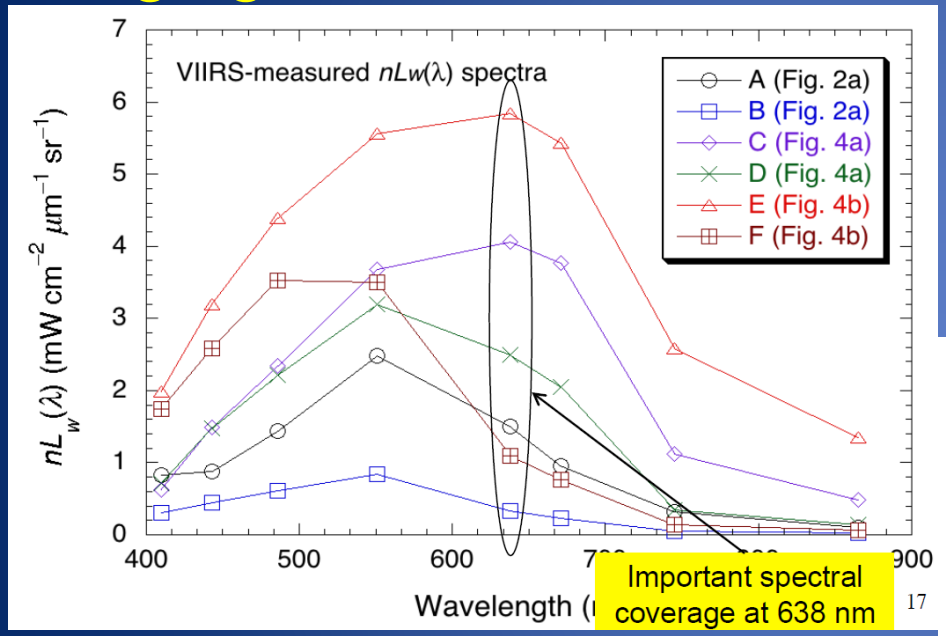
New VIIRS *nLw*(638) with Imaging Bands

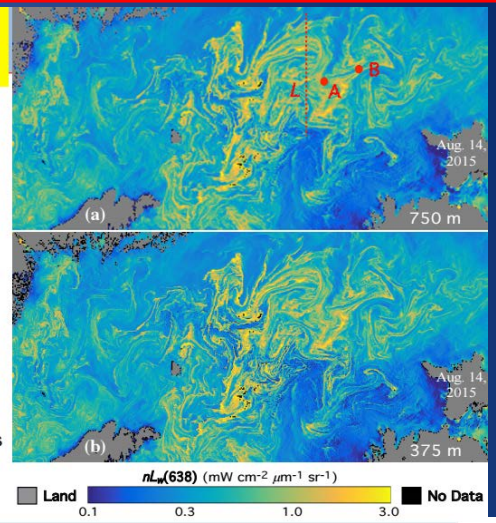


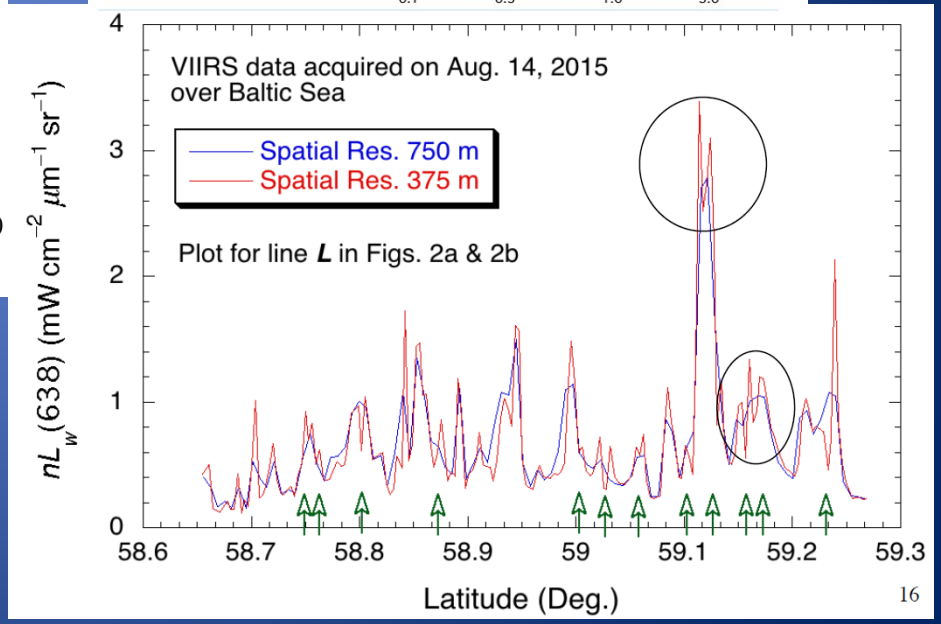
Wang, M. and L. Jiang (2017), "VIIRS-derived ocean color product using the imaging bands", Remote Sen. Environ. (Submitted).

New VIIRS nL_w(638) with Imaging Bands
(Resolution at 375 m)

Example:
Algae Bloom in the Baltic Sea on August 14, 2015

One can see differences between two images for bloom size < ~500 m, showing high spatial resolution data providing more details for bloom spatial distribution/features





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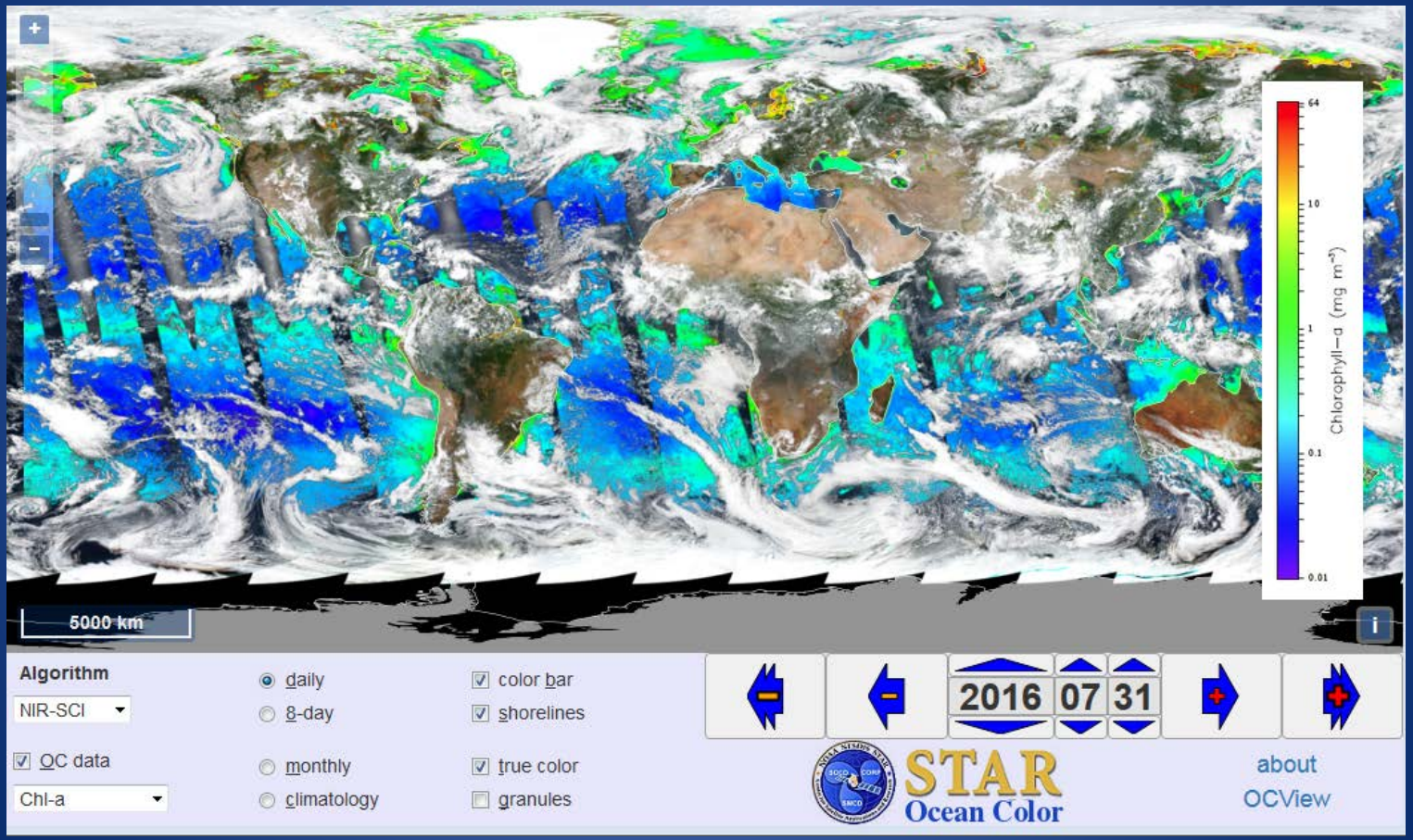
Many compliments received on OCView tool for easy, interactive image monitoring



http://www.star.nesdis.noaa.gov/sod/mecb/color/

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NOAA CoastWatch/OceanWatch
Data Dissemination of Ocean
Satellite Data Products
Including
VIIRS Ocean Color and SST

An integral part of the STAR
"moderate assurance" plan

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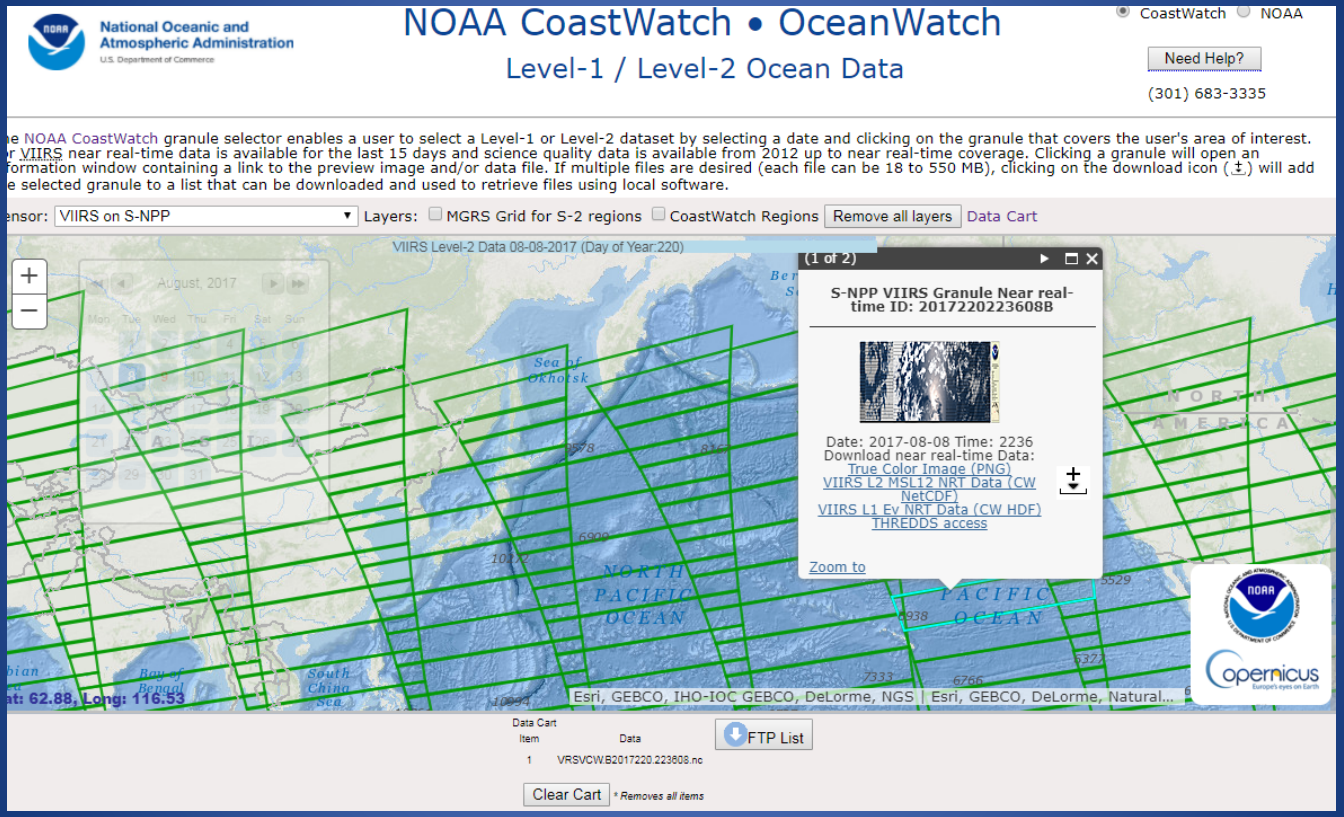
NOAA CoastWatch/OceanWatch: Distributor of Ocean Satellite Data



Multi-sensor multi-parameter data discovery, search and data cart tool

https://coastwatch.noaa.gov/cw_html/cw_granule_selector.html

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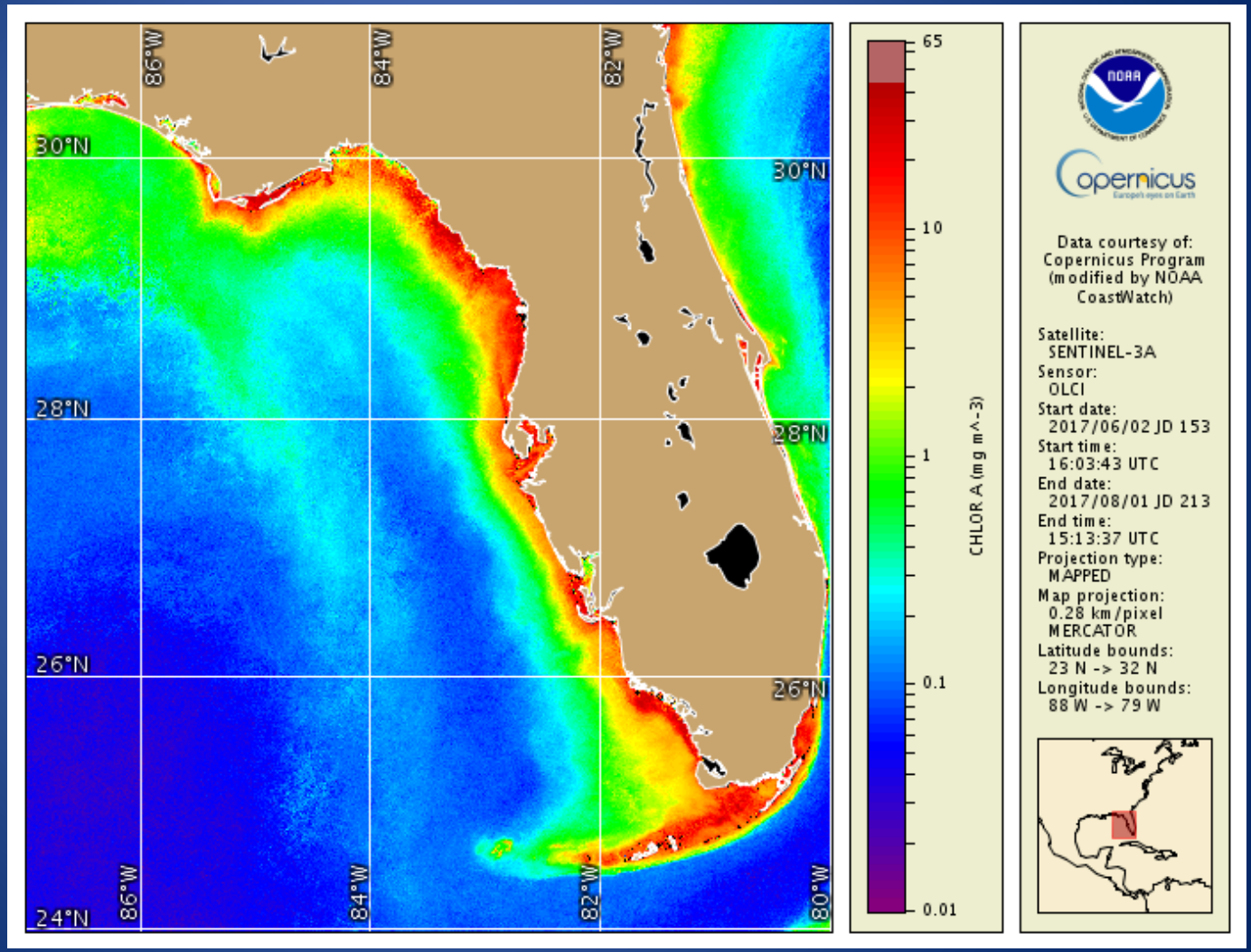
NOAA CoastWatch/OceanWatch: Distributor of Ocean Satellite Data

NOAA is primary distributor to US users of Sentinel-3 Marine data including Ocean Color from OLCI



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The case for Reprocessing

- **WHY"? ALL NOAA Line Offices** have expressed a need for consistent, fit-for-purpose quality, long-term time series ocean satellite observations to do their part in support of the NOAA Mission.

- **Reprocessing is essential** for the production of science quality time series data for earth and ocean observations and is expected by satellite data product user communities both within and external to NOAA.

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- **Operational:**
- **Science:**
- **Requirements:**
- **Measurement-Based:**
- **Integrated:**

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- **Operational:** Redefine
  Not just Near Real Time
- Science:
- Requirements:
- Measurement-Based:
- Integrated:

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- **Operational:** Redefine
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- **Science:** Crucial at every step
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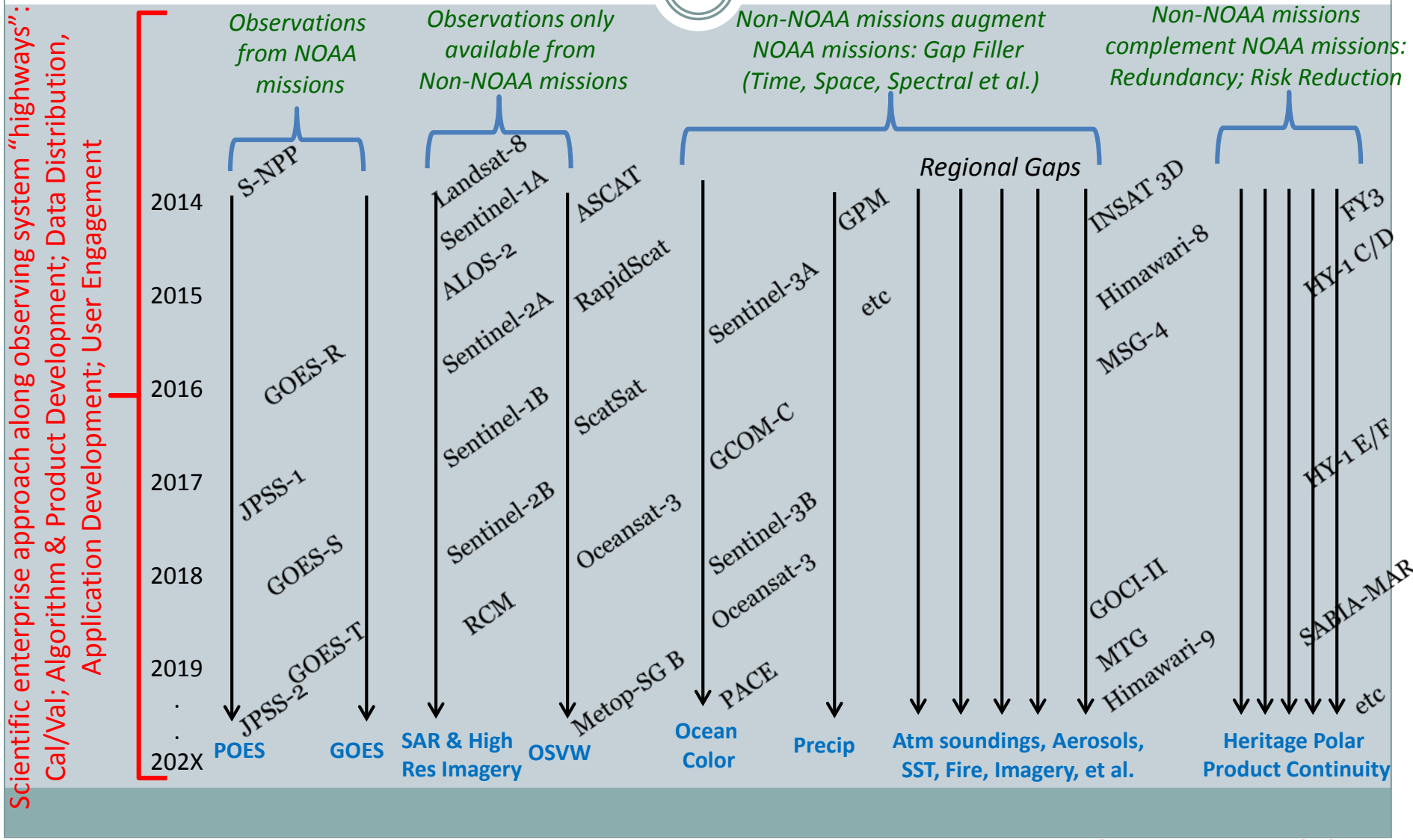
- **Measurement-Based:** Mission agnostic approach
- **Integrated:**

Measurement-based approach in support of users: Ensuring continuity & coverage

Observing System Highways: Utilize satellite data from NOAA & non-NOAA missions

Leverages existing science, technical, programmatic et al. infrastructure in NESDIS



Courtesy: Paul DiGiacomo & Paul Chang

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"Moderate Assurance" in STAR:

- Outlet for new STAR products (not already in OSPO)
- Retain flexible, nimble nature of STAR Science
- Upgrade capacity/reliability of STAR IT

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Thank you - Questions?

Ocean Color Breakout Session – all day WEDNESDAY
SST Breakout Session – all day THURSDAY

Summary of talks shown in these slides:

- *Bojkov, plenary this morning, 9:30 am*
- *Good, plenary today, 1:30 pm and Thurs.*
- *Hernandez et al. plenary today, 1:45 pm*
- *Sturm, Wed. 4:15 and Geiger, 4:30 pm*
- *Eakin, Thurs. 1:40 pm*