STAR Testbed/Reprocessing for Oceans Mission-long, Science-quality Time Series

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Operational = Near Real-Time

Operational = Near Real-Time (only)

Salmon survival in 2011 – what happened?

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NWFSC, NOAA Fisheries

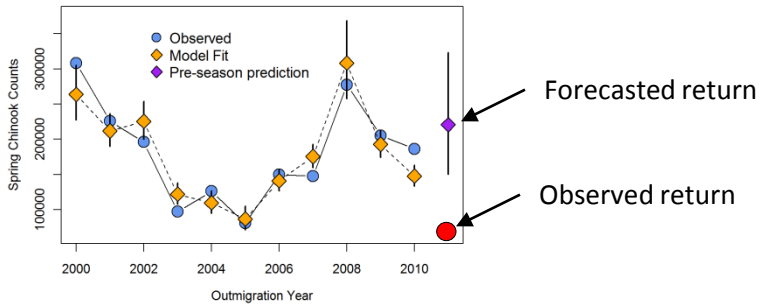


Figure 1. Observed and fitted adult spring Chinook salmon returns, with the forecasted and observed returns for fish entering the ocean in 2011.

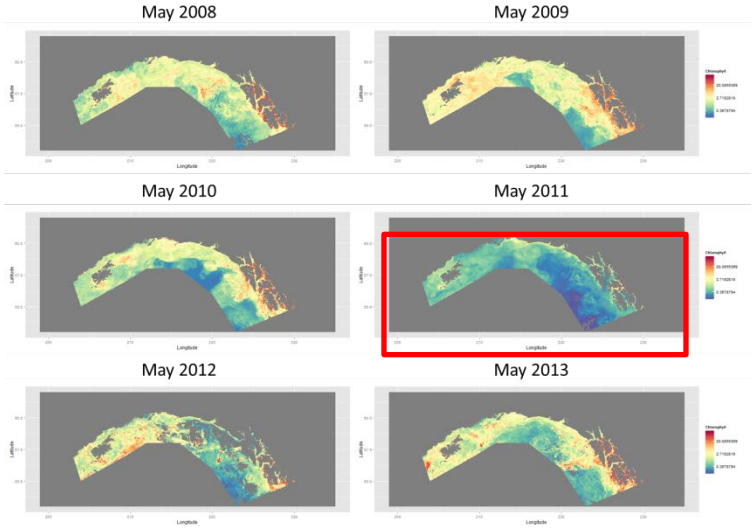


Figure 2. Chlorophyll concentration in May (2008-2013) in coastal Gulf of Alaska.

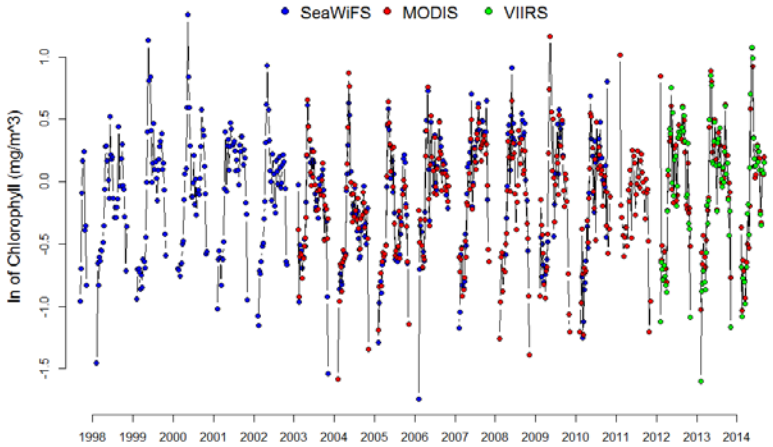


Figure 3. Time series of 8-day composite chlorophyll concentrations.

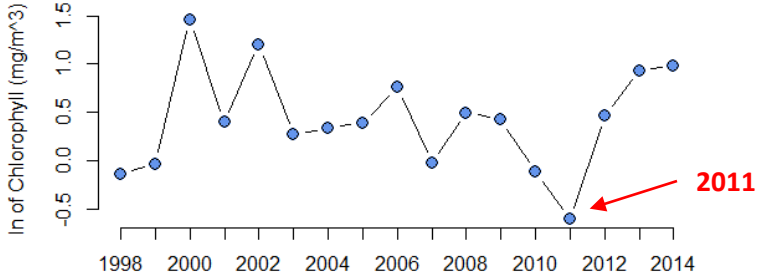
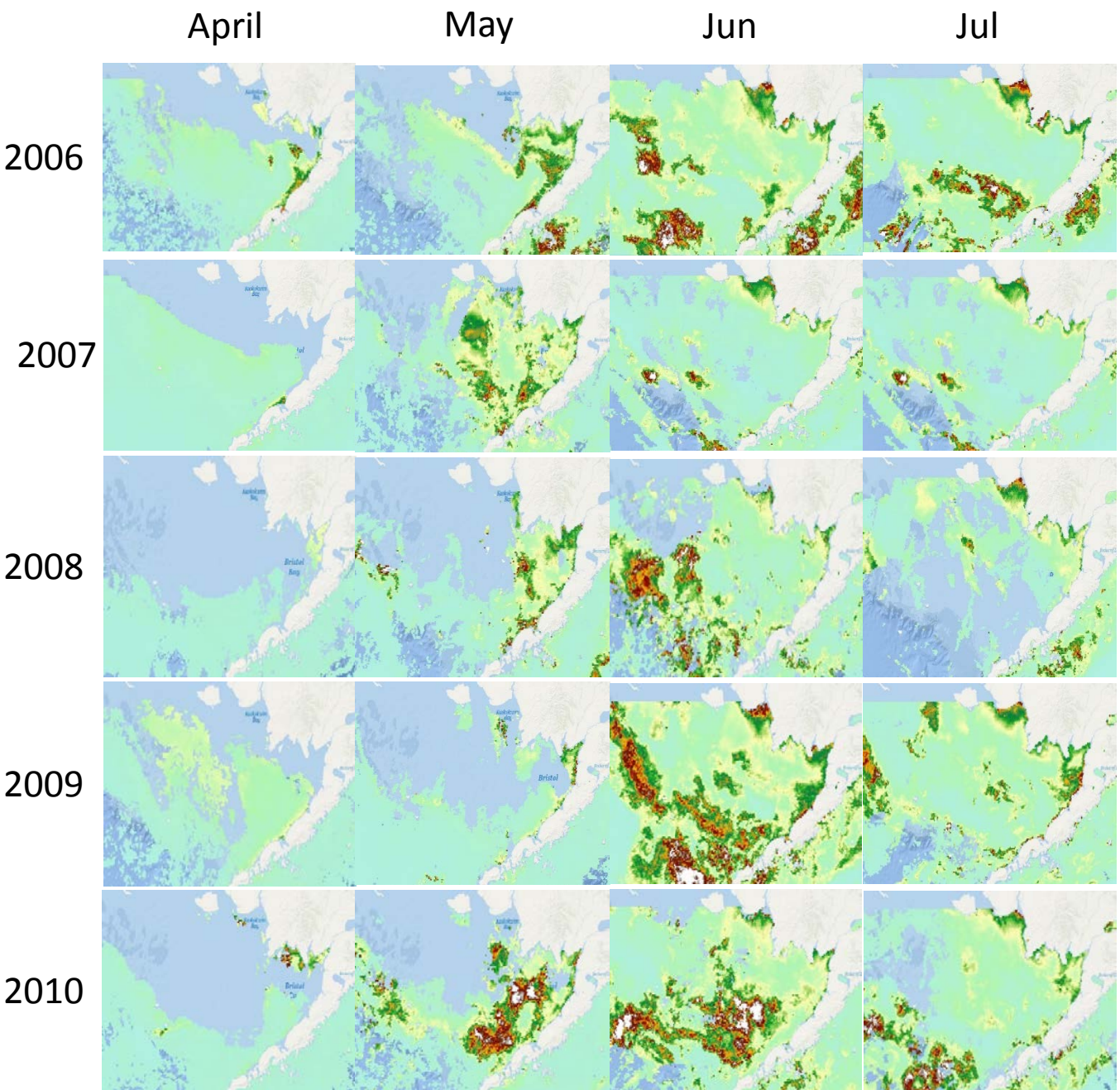


Figure 4. Time series of average April-May chlorophyll concentrations in coastal Gulf of Alaska. The lowest value (2011) suggests that low productivity could have negatively influenced salmon survival that year.

Jeanette Gann, NMFS/AFSC



2007 was an anomalous year for primary production, low nutrients, and low recruitment for pollock. Satellite data is crucial to fill in data gaps as our datasets and surveys are restricted to primarily late summer/early fall.

STAR Reprocessing for Oceans

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

- **Reprocessing is essential** for the production of science quality time-series data from atmospheric, terrestrial and oceanic (e.g., ocean color, SST) satellite observations

- These reprocessing efforts support satellite research and applications, as acknowledged & expected by the ocean et al. communities, both providers and users.

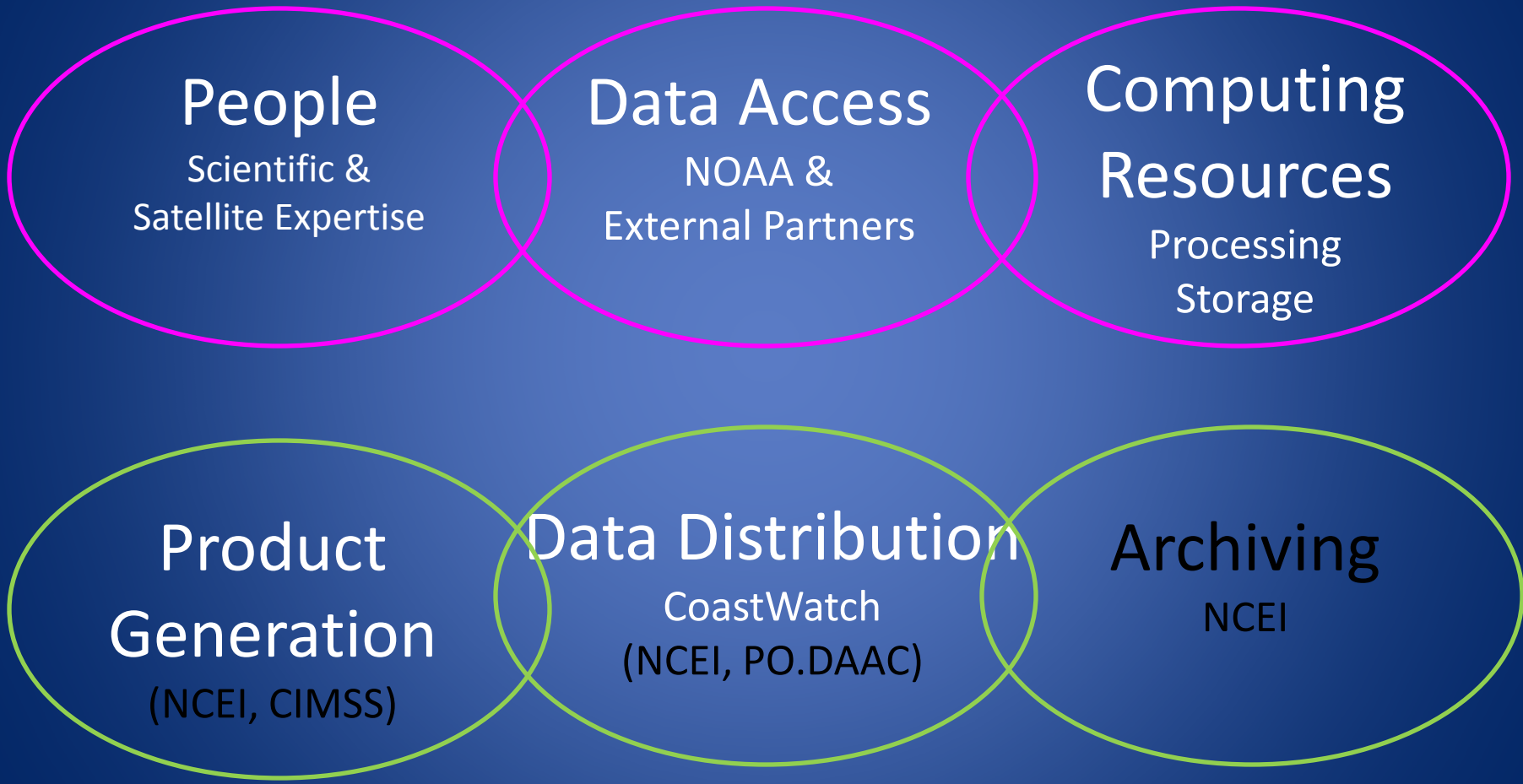
STAR Reprocessing in Support of Satellite Ocean Research & Applications

STAR/SOCD is currently working to produce science quality time series data from satellite-based ocean observations in support of research & applications, including:

- SST/ACSPO (*A. Ignatov et al.*) VIIRS SNPP; AVHRR
- Ocean Color/MSL12 (*M. Wang et al.*) VIIRS SNPP
- Blended 5km SST (*E. Maturi et al.*) Multiple (Polar & GEO)
- Sea Surface Height (*L. Miller, E. Leuliette)* Multiple
- SAR Winds (*F. Monaldo et al.*) Sentinel-1;Radarsat-2 et al.

STAR Reprocessing for Oceans

STAR contributions in support of reprocessing efforts:



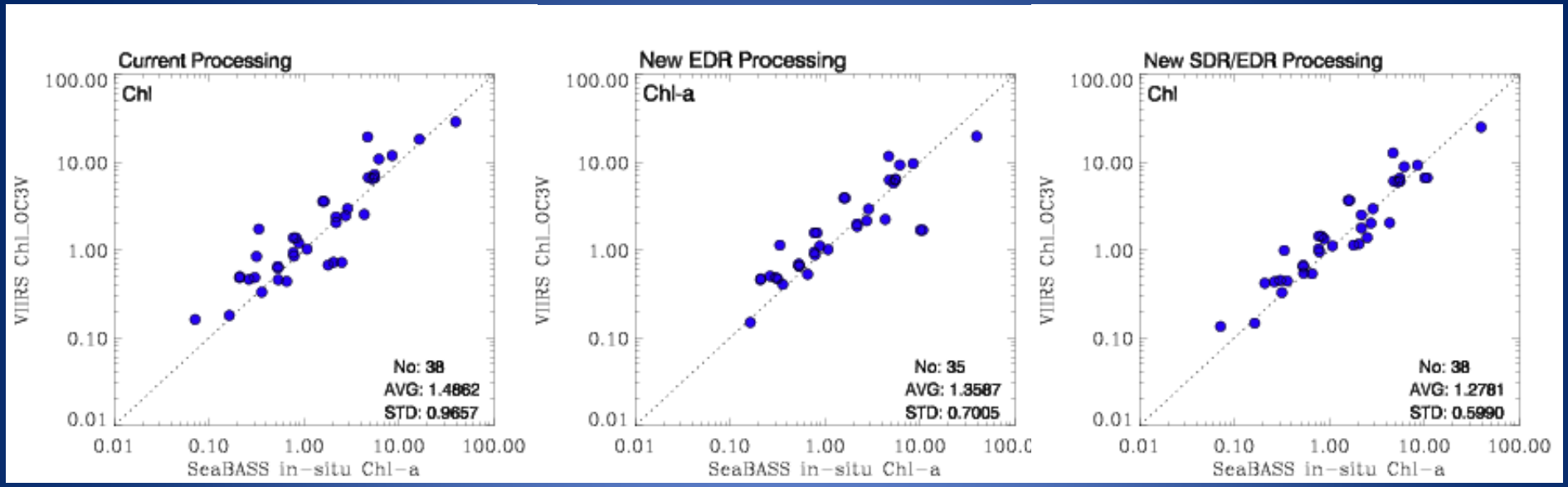
VIIRS Ocean Color EDR Reprocessing

Users require science quality time series Ocean Color data (i.e. NMFS, NOS, OAR, NWS, and outside NOAA agencies, academics, etc.)

The VIIRS Ocean Color EDR team is currently reprocessing mission-long, "Science Quality" VIIRS ocean color data.

Attribute	Near-Real Time	Science Quality Delayed Mode
Latency:	Best effort, as soon as possible (~12-24h)	Best effort, ~1-2 week delay
SDR:	IDPS Operational SDR	OC-improved IDPS SDR
Ancillary Data:	Global Forecast System (GFS) Model	Science quality (assimilated; GDAS) from NCEP
Spatial Coverage:	May be gaps due to various issues	Complete global coverage
Processed by:	CoastWatch, transferring to OSPO	NOAA/STAR
Distributed by:	CoastWatch	CoastWatch, NCEI
Archive Plans:	TBD	Yes, NCEI
Reprocessing:	No	Yes, ~2-3 years or as needed

Matchup Comparison of SeaBASS Chl-a



	Ratio of OC3V/Chl			OC3V vs Chl			log(OC3V) vs log(Chl)			No
	AVG	MED	STD	Slope	Intcpt	R^2	Slope	Intcpt	R^2	
Current Data Processing	1.4862	1.2273	0.966	0.812	1.225	0.78	0.866	0.112	0.81	38
New EDR Processing (2015-03-19)	1.3587	1.2210	0.701	0.487	1.391	0.66	0.743	0.102	0.77	35
New SDR/EDR Processing (2015-02-26)	1.2781	1.1933	0.599	0.652	1.099	0.83	0.857	0.085	0.89	38

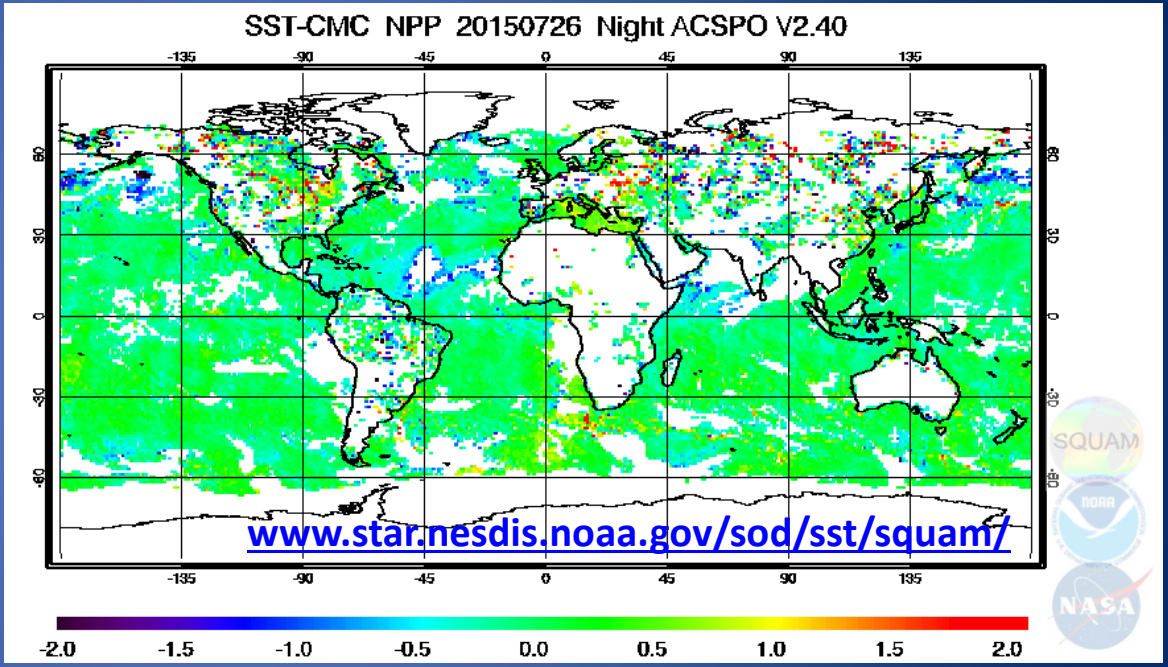
Improved with new MSL12 and new SDR/MSL12.

Accuracy for Chl-a is within ~30% for Chl-a of 0.1 to ~30 mg m^{-3}.

ACSPO VIIRS SST EDR Reprocessing

NOAA Advanced Clear-Sky Processor for Oceans (ACSPO) VIIRS SST product became operational in Mar 2014 and was declared fully validated with JPSS in Sep 2014

ACSPO SST has improved coverage over heritage and partners' SST products, especially over internal waters, in coastal and dynamic areas (Gulf Stream, Kuroshio, Agulhas), and in the Tropics and high latitudes



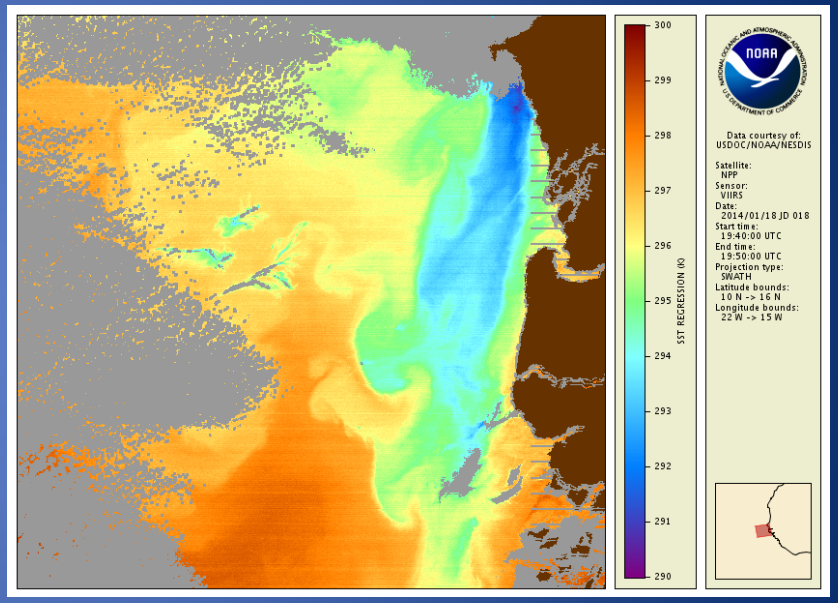
ACSPO VIIRS SST is monitored online in NRT in the NOAA SST Quality Monitor (SQUAM). Shown is deviation from Canadian Met Centre (CMC) global daily Analysis. ACSPO VIIRS SST has near-complete daily global coverage, during both day and night (except areas with persistent cloud). The VIIRS L2 and CMC L4 products are close. Reprocessing is underway to back-fill back to the beginning of the JPSS SST (Jan 2012), and generate uniform time series.

ACSPO VIIRS SST Reanalysis ("RAN1")

Users require science quality time series SST data (i.e. NMFS, NOS, OAR, NESDIS (STAR and NCEI), NWS NCEP, GHRSST, UK Met office, Canada Met Office, BoM of Australia, Japanese Met Agency, and other agencies, academics, etc.)

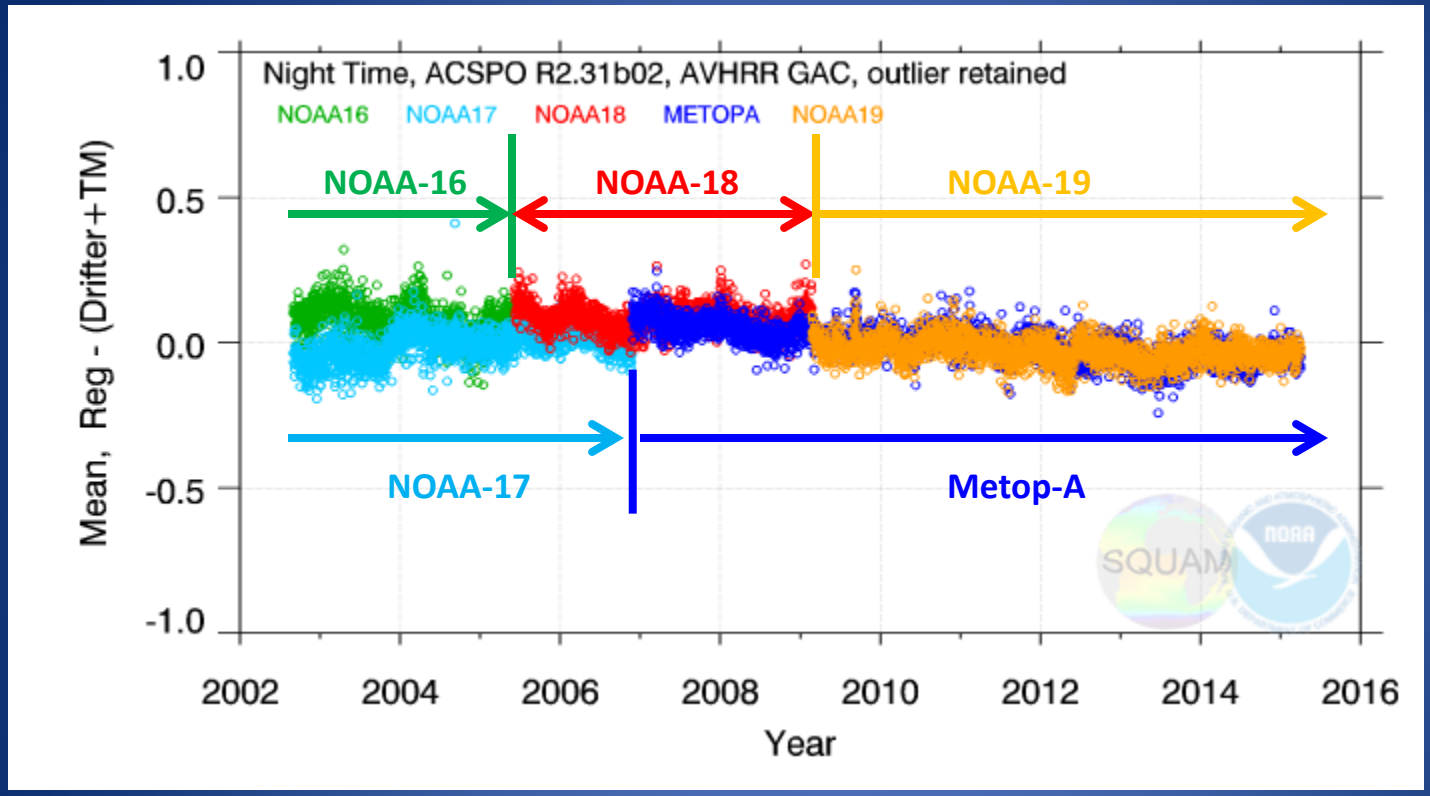
The ACSPO SST Team is currently doing mission-long, science quality VIIRS SST Reanalysis v1 ("RAN1"):

- In partnership with Univ. of Wisconsin – Madison, Space Science and Engineering Center (SSEC)
- RAN infrastructure has been set up and tested at UW/SSEC, including the following codes
  - Granulator (86sec → 10min)
  - destriping of individual VIIRS SST bands
  - ACSPO L2 (SST product in swath projection)
  - ACSPO L3U (0.02° gridded code)
- Validation and monitoring is an integral part of RAN
  - Match-ups with QCed in situ SSTs (from NOAA in situ SST Quality Monitor, iQuam www.star.nesdis.noaa.gov/sod/sst/iquam/
  - Display VIIRS RAN SSTs in NOAA SQUAM www.star.nesdis.noaa.gov/sod/sst/squam/
  - Display VIIRS RAN Brightness Temperatures in NOAA MICROS system www.star.nesdis.noaa.gov/sod/sst/micros/
- ACSPO VIIRS RAN1 L2 and L3U data from Jan 2012-pr will be archived w/PO.DAAC/Ed Armstrong and NCEI/Ken Casey
- NOAA CoastWatch will also serve reprocessed data to users
- Monitoring/Validation will be reported in SQUAM/MICROS



Example S-NPP VIIRS SST image produced by the NOAA ACSPO system

ACSPO VIIRS SST Reanalysis ("RAN1")



Afternoon

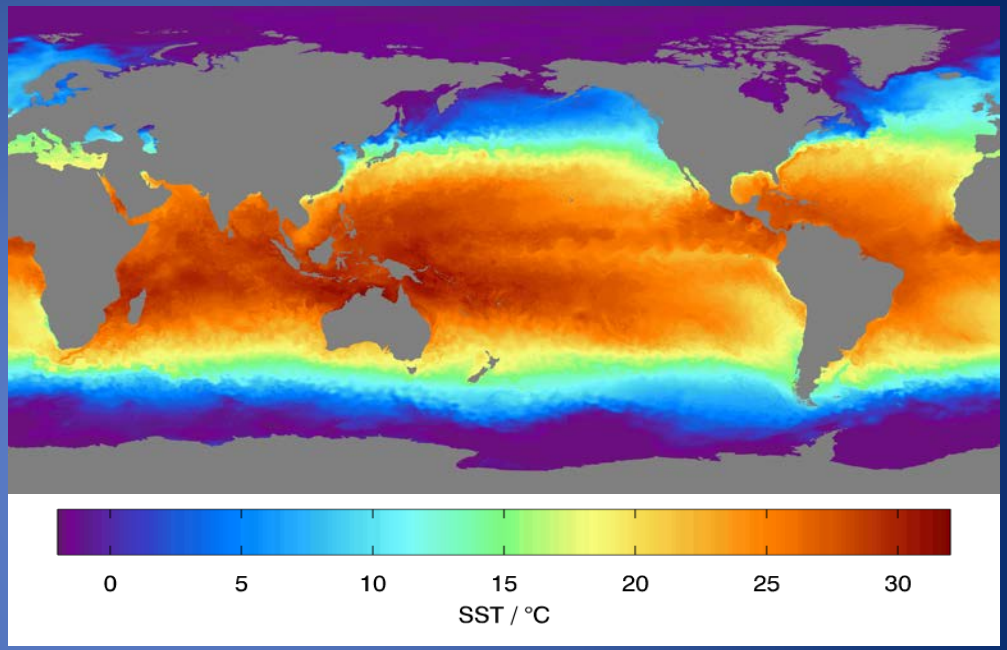
Mid-morning

- Unstable sensors/periods excluded = 5 AVHRRs reprocessed
- 2 platforms at a time: One mid-AM (N17, Metop-A) and one PM (N16/18/19)
- L2/L3U will be archived with PO.DAAC/Ed Armstrong & NCEI/Ken Casey
- Will be tested in NOAA geo-polar blended and other L4 analyses (2015/16)
- RAN2 (~2017) will reprocess 1994-pr; RAN3: 1981-pr

5 km Global Blended SST Analysis Reprocessing

These 5-km blended SST analyses are produced daily from 24 hours of polar and geostationary sea surface temperature satellite retrievals:

- S-NPP
- Metop-B,
- GOES-E/W
- Meteosat-10
- MTSAT-2 (will be replaced by Himawari-8 in late 2015.)



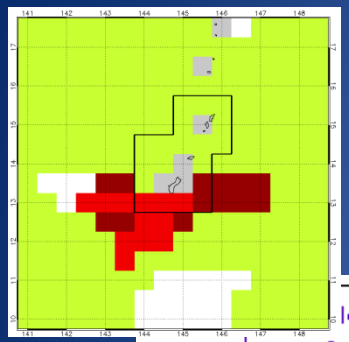
PHASE I 2004 to present September 2015

PHASE II 1994 to 2004 September 2016

Coral Reef Watch will use the latest 5 km global blended SST to generate a new climatology for their bleaching alert and monitoring products for the coral reefs around the globe.

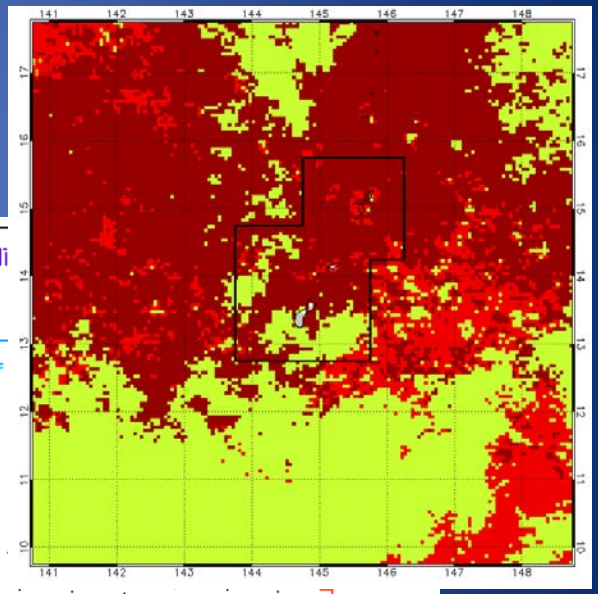
Coral Reef Watch
5 km Global Blended SST

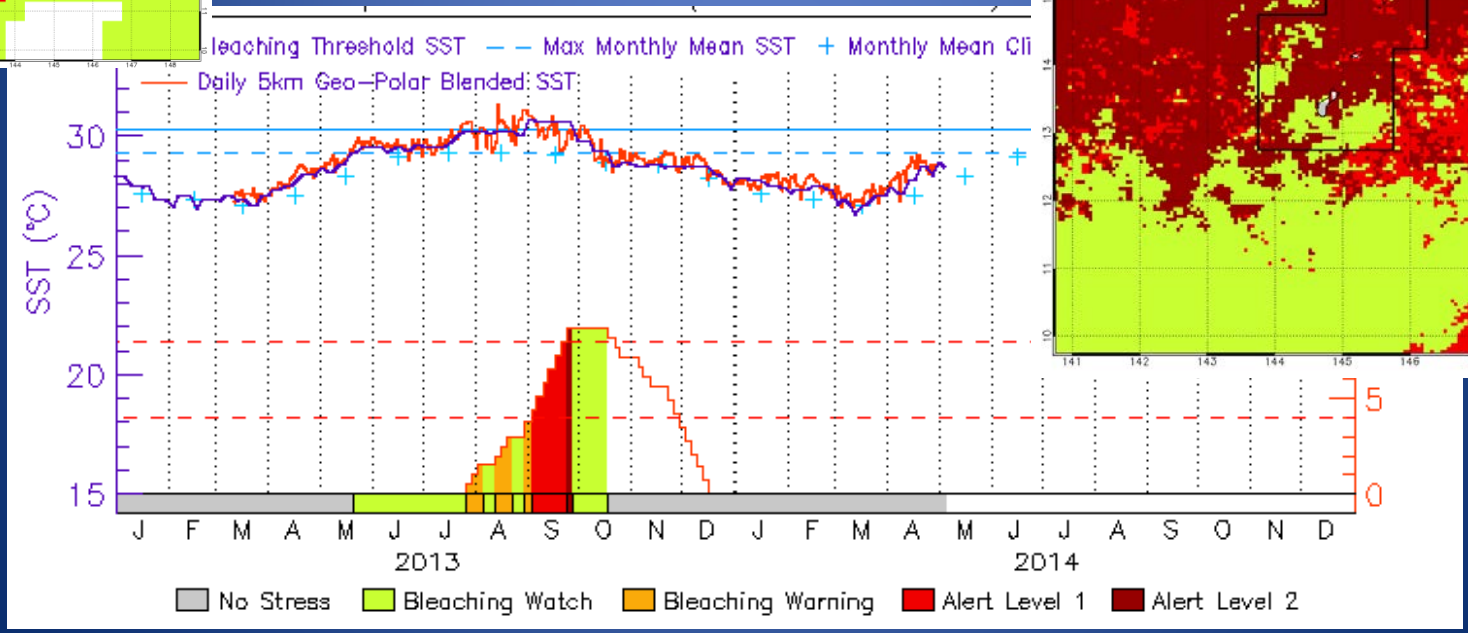
50-km, 3 Oct 2013



Prototype Regional Alert Products for Guam and Marianas Islands

5-km Bleaching Alert 3 Oct 2013





Coral Reef Watch
5 km Global Blended SST

Phase I:

Polar satellites 2005 – today

Geo satellites & Geo-Polar Blending

Purpose: bias-adjust vs Pathfinder

Near completion

Phase II :

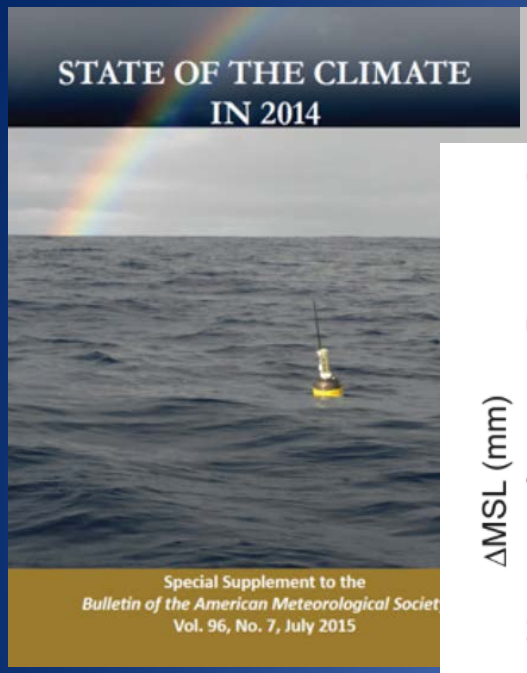
Polar satellites 1985 – today

Geo satellites & Geo-Polar Blending 1994 – today

Purpose: provide consistent climatology and record

Anticipated complete in 2016

Closing the Global Sea Level Budget



NOAA/STAR analysis shows 2/3 of recent sea level increase is due to mass (ice melt), 1/3 due to steric (ocean heating).

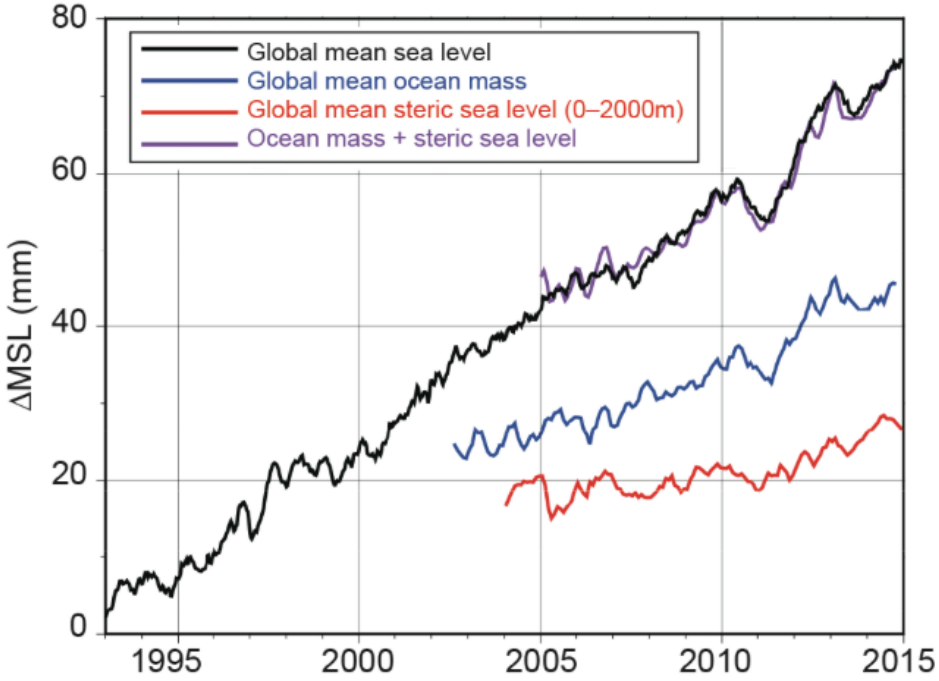
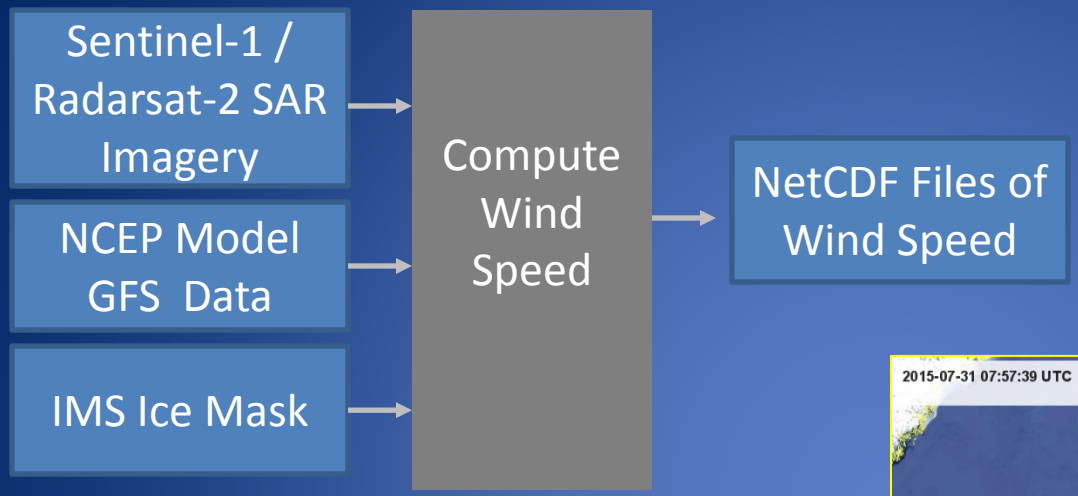


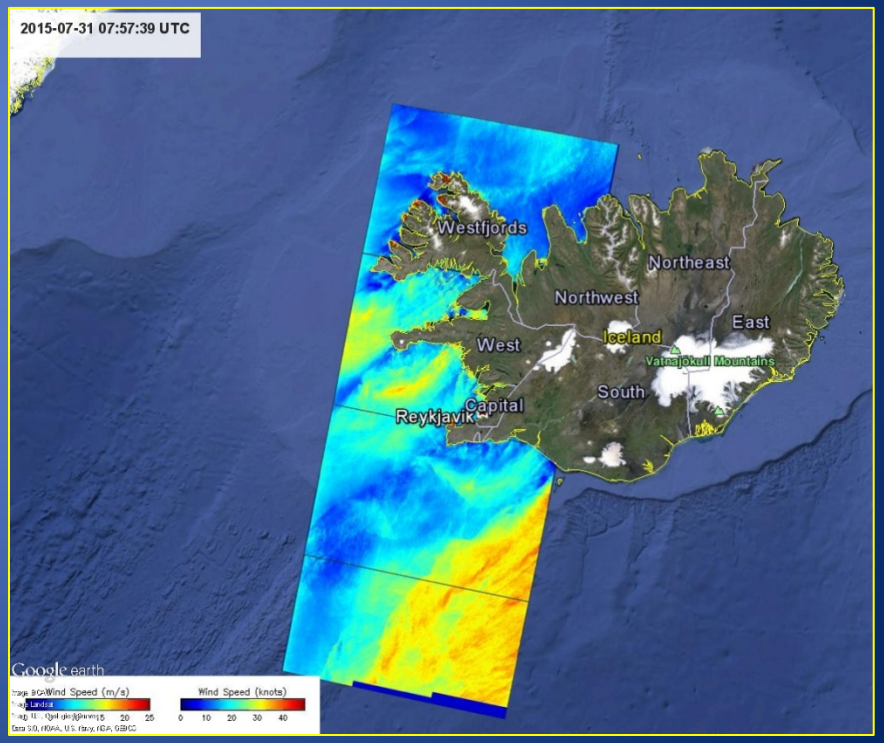
FIG. 3.27. Comparisons of global mean sea level from NOAA/NESDIS/STAR, global mean ocean mass from GRACE, and steric (density) sea level from Argo, with seasonal variations removed and 60-day smoothing applied.

Re-processing of Sentinel-1/Radarsat-2 Synthetic Aperture Radar Data: Winds



High resolution (50 m) SAR imagery is used to create a 500-m wind speed field stored in a netCDF file.

- There is sufficient information in the netCDF to re-compute wind speed using different model functions as they improve.
- Re-processing valuable for producing wind speed climatologies applicable to offshore wind power turbines.
- If we require wind speed resolutions smaller than 500-m, we need to re-process from the original SAR imagery.



Frank Monaldo

STAR Reprocessing for Oceans

- **Conclusion:**

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