



19th GHRSSST Science Team Meeting
4-8 June 2018, Darmstadt, Germany



NOAA ACSPO SST Products

(ACSPO: Advanced Clear Sky Processor for Ocean)

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NOAA; CIRA; GST Inc; CCNY

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Thanks to Yanni Ding (formerly CSU/CIRA) and Kai He (formerly GST. Inc)*



**Today, two new constellations of NOAA
satellites & sensors are in space:
Polar (JPSS/VIIRS) and Geo (GOES-R/ABI)**



New Generation SST sensors: Bands Used in ACSPO

VIIRS		ABI/AHI ¹	
Nadir: 0.74km Swath edge(67°) 1.5km		Nadir: 2km Swath edge(67°): 12km	
Global: Twice daily		FD: ABI/15 & AHI/10 min	
$\lambda, \mu m$	<i>Spec NEDT, K @300K</i>	$\lambda, \mu m$	<i>Spec NEDT, K @300K</i>
3.9*	0.11	3.9	≤ 0.10
8.6	0.05	8.6	≤ 0.10
10.8	0.07	10.4	≤ 0.10
12.0	0.07	11.2	≤ 0.10
—	—	12.4	≤ 0.10

- Superior spatial & temporal resolution
- More & better positioned SST bands
- Improved radiometric performance



SNPP/N20: New NOAA Polar Constellation

Launch of S-NPP
October 28, 2011



Joint Polar Satellite System (JPSS): Continuation of the NOAA heritage POES System

- ✓ SNPP launched in Oct 2011. SST: Feb 2012 – present
- ✓ J1/N20 launched in Nov 2017. SST: Jan 2018 – present
- ✓ J2/3/4 will follow in 2021, 2026, 2031

Two VIIRS sensors onboard SNPP and N20 form full JPSS constellation

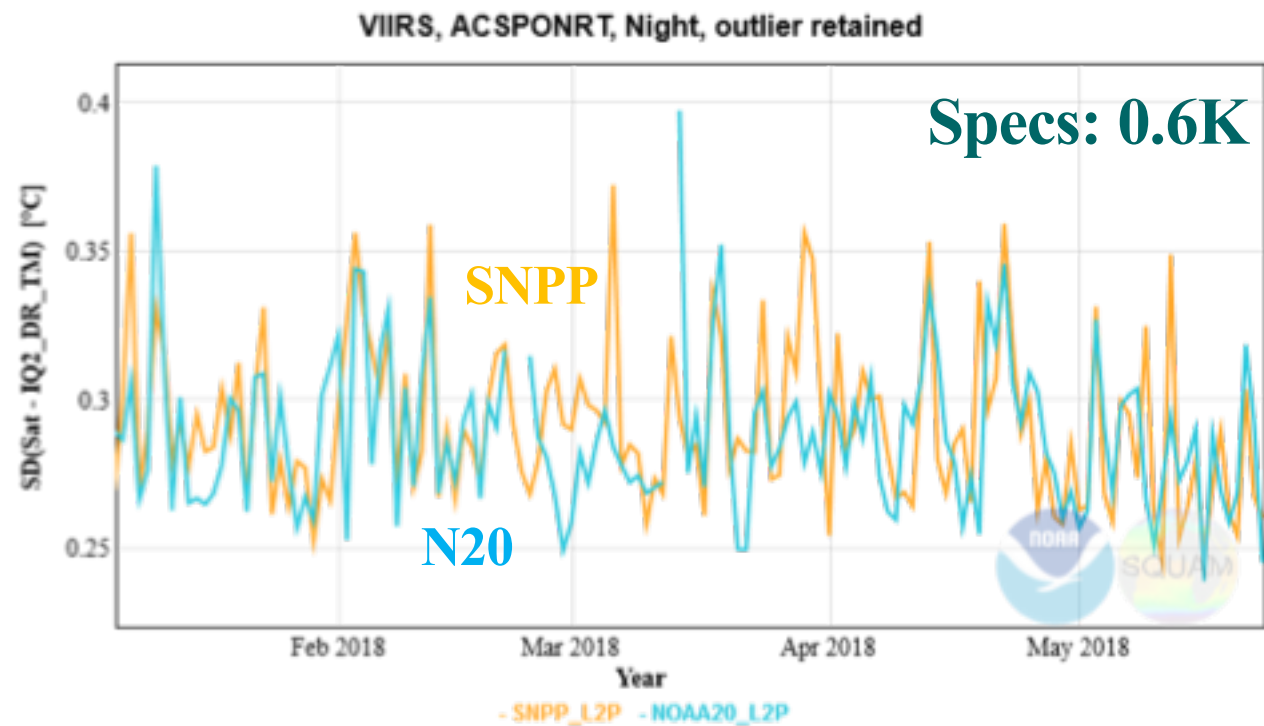
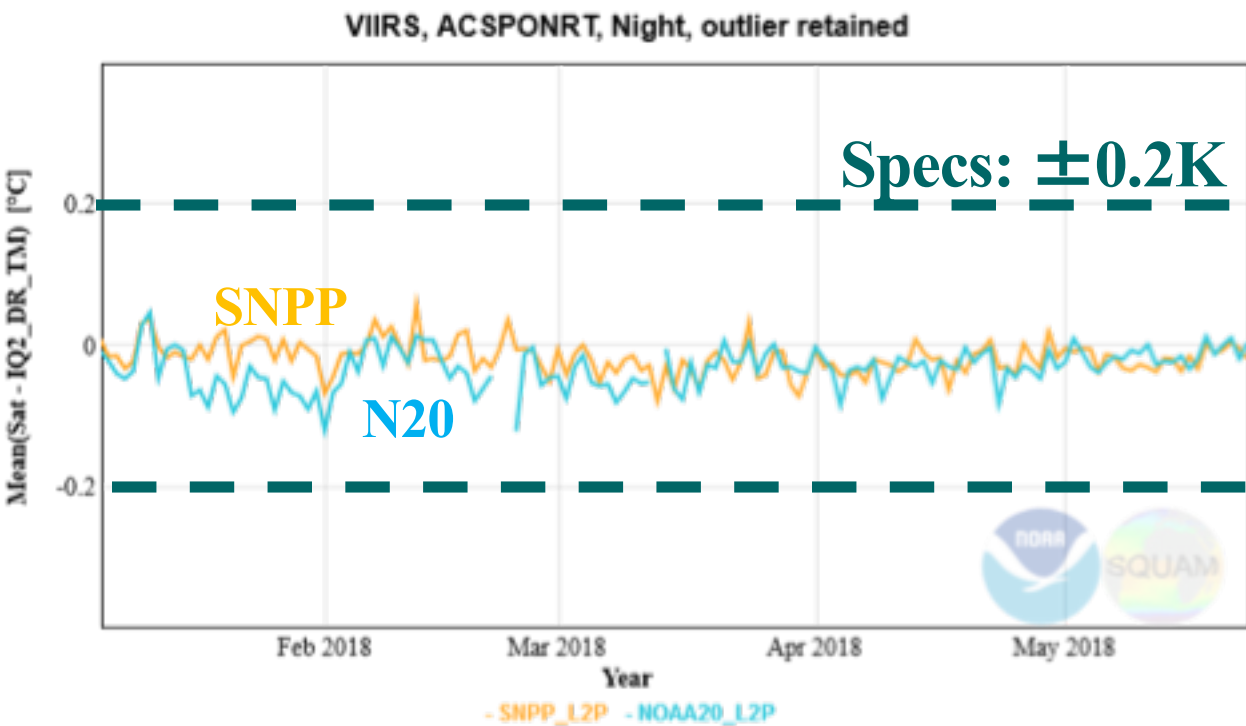
- ✓ SNPP SST: Operational, stable & accurate
- ✓ N20 SST: Experimental (pending integration of ACSPO 2.60 into operations)
- ✓ N20 SST provisional review: 18 Apr 2018
- ✓ Quality of N20 & SNPP SSTs is comparable

Launch of J1/N20
November 18, 2017





SNPP & N20 Night SSTs: Mean Biases and Std. Dev. wrt. *in situ*



- N20 VIIRS initially experienced some instabilities, which have been fully resolved
- SNPP & N20 biases/SDs are close & well within NOAA SST specs $\pm 0.2 K / 0.6 K$
- SNPP RAN2 & N20 RAN1 are planned with ACSPO v2.60 (Jonasson, poster)



GOES-R ABI and Himawari-8/9 AHI: Superior SST Sensors

Launch of GOES-R (G16)
19 November 2016



GOES “R” series Replaces Heritage GOES

- ✓ GOES-R/16 (G16) launched in Nov 2016
- ✓ GOES-S/17 (G17) launched in Mar 2018
- ✓ To be followed by GOES-T/U through 2036

Two ABIs on G16/17 will form GOES-R constellation

- ✓ G16 operational “East” (Jan 2018). High quality SST
- ✓ G17 parked between E/W for Cal/Val. Will be moved to “West” position later in 2018
- ✓ Unanticipated performance issues occurred with the ABI cooling system. NOAA investigates those



Launch of GOES-S (G17)
March 1, 2018



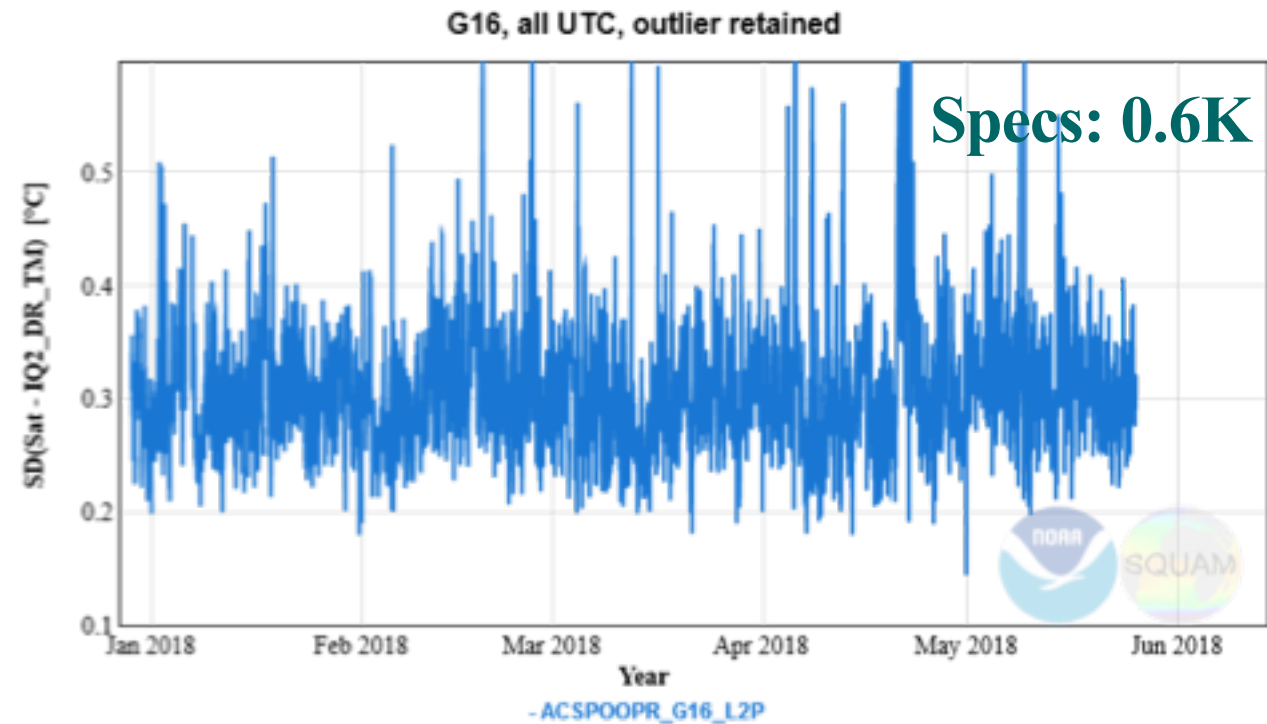
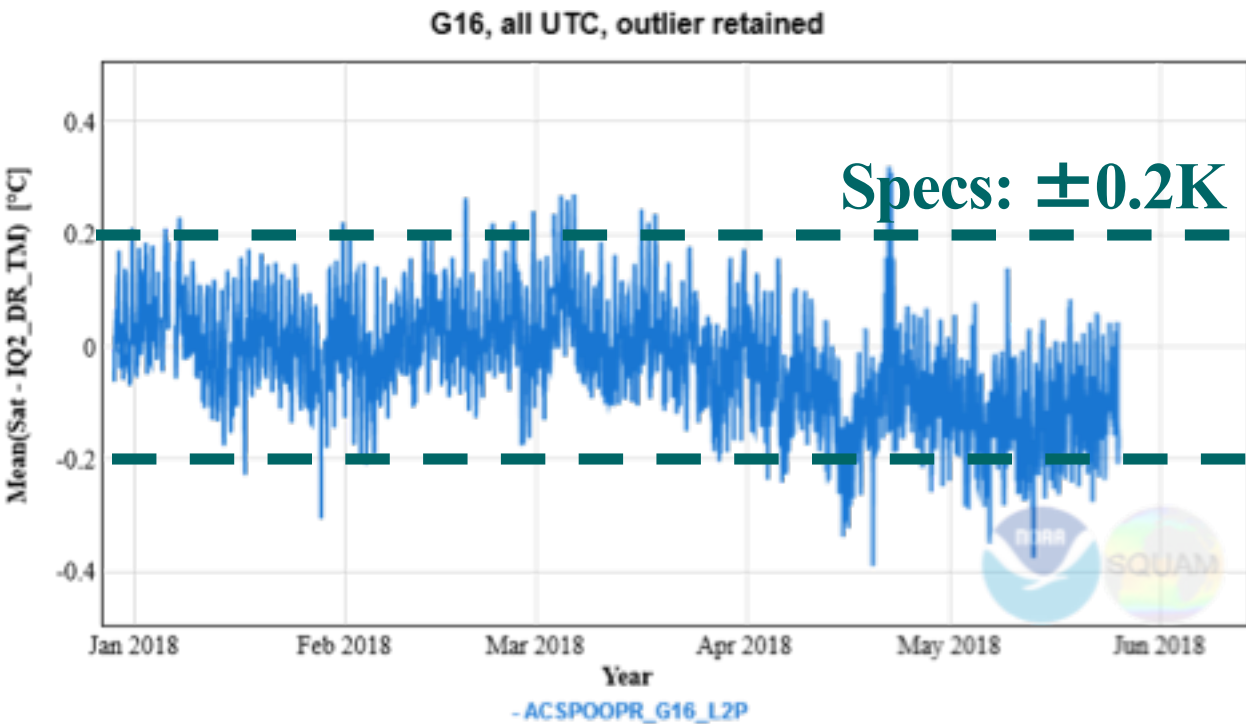
Launch of Himawari-8
October 7, 2014

Himawari-8/9 replace MTSAT series

- ✓ Himawari-8 (H08) launched in Oct 2014
- ✓ Himawari-9 (H09) launched in Nov 2016
- ✓ Carry ABI twin sensor – AHI
- ✓ AHI ACSP0 product is generated



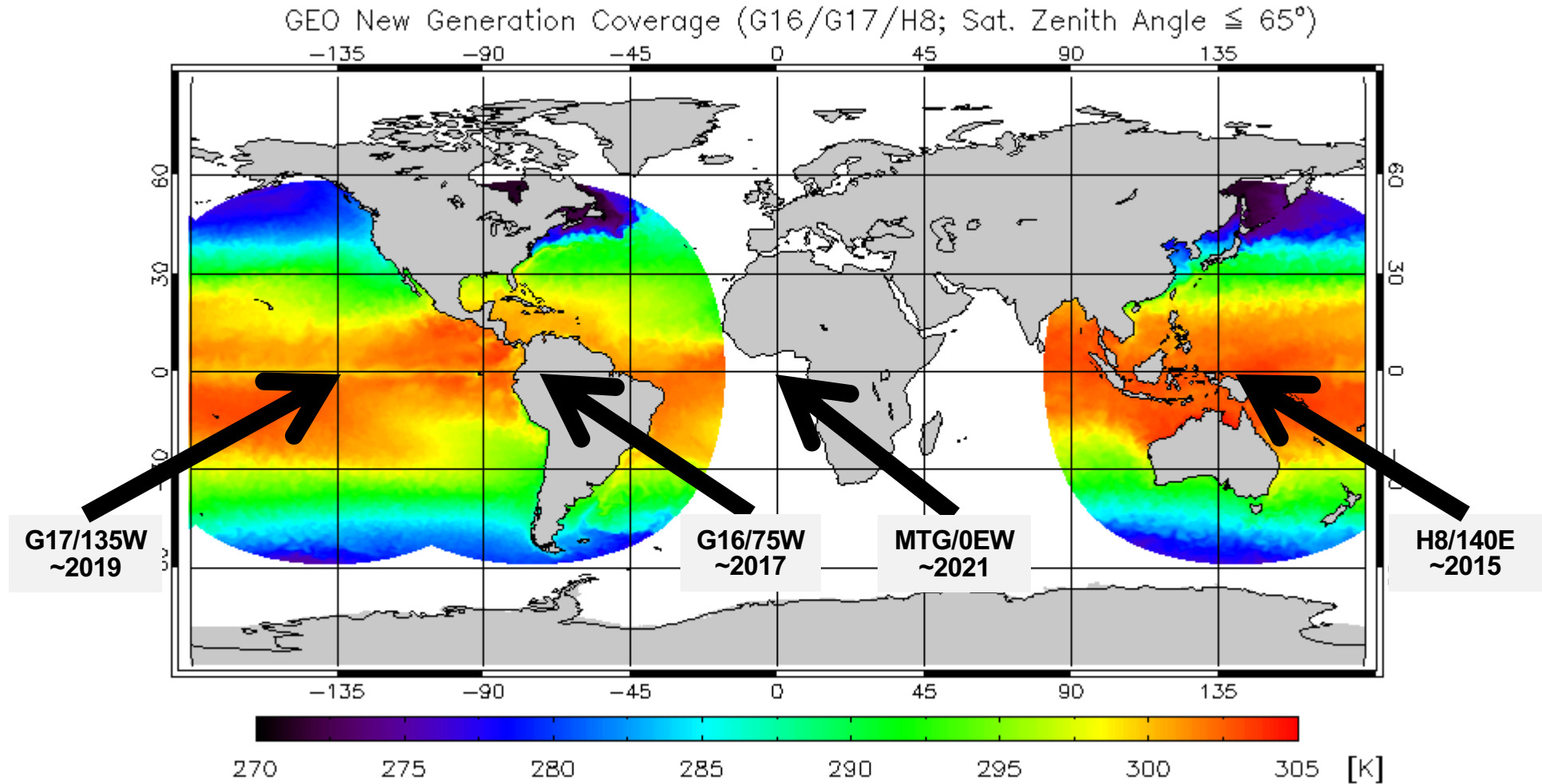
G16 ACSPO 2.50 SST: Mean Bias & Std. Dev wrt. *in situ*



- ACSPO 2.50 real-time product is largely within NOAA SST Specs
- ACSPO 2.60 employs the superior collated algorithm (Gladkova et al @ Thu)
- We plan a uniform reprocessing of full ABI record & archival @ PO.DAAC (2018-2019)



Emerging New-Gen NOAA GEO SST Constellation





**ACSPO products are also generated from
AVHRR (GAC, FRAC) and MODIS,
for long-term consistency**



Several GAC/FRAC AVHRRs and 2 MODISs are also processed in ACSPO



NOAA-19

Advanced Very High Resolution Radiometers (AVHRR)

- ✓ GAC/4km: Operational: N18/19; Metop-A/B (L2P/L3U)
- ✓ FRAC/1km: Operational: Metop-A/B (L2P/L3U)
- ✓ Plan to process Metop-C (launch planned: Sep 2018)
- ✓ GAC RAN1: 2002 – pr.; N16/17/18/19/Metop-A (L2P/3U)
- ✓ GAC RAN2 (2018): reprocess RAN1 period with ACSPO 2.60 + add N14 (1995-2002) (L2P/L3U)



Metop-B



Aqua

Moderate Resolution Imaging Spectroradiometers (MODIS) – 1km

- ✓ ACSPO MODIS SST will be produced in medium assurance mode in 2018
- ✓ Objective: Provide MODIS L3U for NOAA L3C/S super-collated product
- ✓ No RAN is currently planned (priorities are: VIIRS, ABI/AHI, AVHRR)



Terra



ACSPO Data Products



ACSPO Data Products & Volumes (GB/Sensor/Day)

Polar

Sensor	L1b	L2P	L3U (0.02°)
VIIRS	210	26.0	0.5
AVHRR FRAC	8	7.5	0.4
AVHRR GAC	0.8	0.7	0.3
MODIS	42	7.1	0.5

- All polar L2P/3U data reported in 10min granules (144/day): L2P (swath) & L3U (0.02°)
- All GEO data reported as 1hr FD files (24/day): L2P/C (swath) & L3U/C (0.02°)
- Users requested 0.01° L3U, (Super) Collated L3C/S & polar stereographic projection

Geo

Sensor	L1b	L2C (1hr)	L3C (0.02°)
G16/17 ABI	19	6.2	0.6
H08 AHI	28	6.5	0.6

- L3Us are of comparable (sometimes superior) quality and much smaller than L2Ps
- See Matt Pennybacker's presentation on ACSPO L3Us on 7 Jun (Thu) @AM



ACSPO Users and Data Access



ACSPO Users: 1 of 2

Established

- ✓ CMC (D. Surcel-Colan)
- ✓ EUMETSAT / EUMETCast (S. Elliott)
- ✓ Met Office OSTIA (S. Good / C. Mao / R. Reid / E. Fiedler)
- ✓ NOAA CoastWatch (P. DiGiacomo / V. Lance / R. Vogel)
- ✓ NOAA Geo-Polar Blended (E. Maturi / A. Harris)
- ✓ Australian Bureau of Meteorology (H. Beggs / C. Griffin / P. Govekar)
- ✓ Danish Meteorological Institute (J. Høyer)
- ✓ NOAA NOS West Coast Ocean Forecast Systems /WCOFS (A. Kurapov)
- ✓ NOAA Ocean Prediction Center (J. Sienkiewicz / R. Daniels)
- ✓ NOAA Climate Prediction Center (Y. Xue / T. Sluka)
- ✓ NOAA OAR/GLERL (G. Leshkevich / S. Liu)
- ✓ U. Melbourne (A. Babanin/H. Zhang / I. Yang)
- ✓ NOAA Coral Reef Watch (M. Eakin / W. Skirving / G. Liu / E. Geier)
- ✓ NOAA NOS Chesapeake Bay Ocean Forecast System/CBOFS (C. Brown)
- ✓ U. MD Ocean Modeling Group (J. Carton / G. Chepurin)
- ✓ Digital Globe, Inc. (J. Li)



ACSPO Users: 2 of 2

Established

- ✓ U. Rhode Island (P. Cornillon)
- ✓ Oregon State Univ. (Ivo Pasmans)
- ✓ NOAA/AOML CW (J. Trinanes)
- ✓ Earth and Space Research (C. Gentemann)
- ✓ Roffer's Ocean Fishing Forecasting Service/ROFFS, Inc. (M. Roffer / M. Upton)

Emerging

- ✓ NOAA Polar Watch (C. Wilson / D. Robinson)
- ✓ NOAA NMFS (C. Wilson / K. Hyde / K. Shotwell / M. Abecassis)
- ✓ NCEP NCODA (J. Cummings / I. Rivin / A. Mehra)
- ✓ NASA Global Model Assimilation Office (R. Todling / S. Akella)
- ✓ Japan Met Agency/MGDSST (T. Sakurai)
- ✓ Monterey Bay Aquarium Research Institute (MBARI) (M. Messie)
- ✓ NOAA OISST (T. Smith / V. Banzon)
- ✓ NCEP RTG (B. Grumbine / B. Katz)
- ✓ JPL MUR (M. Chin)



ACSPO Data Access

- ✓ NOAA OSPO PDA (“Product Distribution & Access”; formerly “Data Distribution Server”) – Operational (SNPP VIIRS L2P/L3U, G16 L2P/L3U, AVHRR GAC/GRAC L2P L3U; In the future N20 L2P/L3U, G16/17 L2/3C, and MODIS L2P/L3U)
- ✓ EUMETCast – Operational (NPP L3U; Future: N20 L3U)
- ✓ NOAA Coast Watch – Pre-Archive (all Sensors)
- ✓ NASA PO.DAAC – Archive (SNPP VIIRS L2P/L3U; In the future N20 L2P/L3U, G16/17 L3C)
- ✓ NOAA NCEI – Archive (SNPP VIIRS L2P/L3U; In the future N20 L2P/L3U, G16/17 L3C)



Coast Watch SST page

The screenshot shows a web browser window displaying the NOAA CoastWatch SST page. The browser's address bar shows the URL https://coastwatch.noaa.gov/cw_html/sst.html. The page header includes the NOAA logo and the text "The National Oceanic and Atmospheric Administration" and "NOAA CoastWatch • OceanWatch". A search bar is visible with the text "Search" and a "Submit" button. Below the header, the page title is "Sea Surface Temperature (SST)". The main content area contains a paragraph explaining satellite SST, followed by a list of NOAA ACSP0 and NOAA Heritage products. A large blue link https://coastwatch.noaa.gov/cw_html/sst.html is overlaid on the bottom of the page. The footer includes the NOAA logo and the text "NOAA Satellites and Information" and "National Environmental Satellite, Data, and Information Service".

- *CW SST provides entry points to all ACSP0 products, both NRT & RAN*
- *For instance, PO.DAAC & NCEI archive SNPP VIIRS SST – the CW page provide access points for those, etc*



Current Priorities

- Support Two New Sensors: N20 VIIRS & G17 ABI
- Facilitate ACSPO data access
 - Work w/PO.DAAC to archive N20 L2P/L3U & G16 (and eventually G17) L3C SST
- Reanalyses
 - RAN2s: SNPP/VIIRS and AVHRR/GAC
 - RAN1s: N20/VIIRS and G16/ABI and H08/AHI
- ACSPO Products in the pipeline
 - Consistent line of L3Us from all polar and L3C from all geo sensors
 - Geo: Collated L2C/L3C
 - Polar: Thermal fronts & pattern recognition improvements
 - Polar L3C/S: Focus on US regional users, then generalize to globe
 - 0.01° L3U

We work with individual users to ensure that their needs are fully satisfied



Topics to Discuss at GHRSSST-XIX

GHRSSST Products from New-Gen GEO Satellites

- ✓ ACSPO v2.60 introduces collated SSTs: L2C and L3C
- ✓ Apparently there is no consensus in GHRSSST about the “L2C” (L3C is OK)
- ✓ This will be discussed on 7 June (Thu) @PM



More ACSPO Resources at GHRSSST-XIX

- Irina Gladkova: Geo Hourly SST, 7 Jun (Thu) @AM
- Matt Pennybacker: ACSPO L3U products, 7 Jun (Thu) @AM
- Olafur Jonasson (presented by Matt Pennybacker): Towards 2nd SNPP VIIRS Reanalysis (RAN2; Poster)
- Boris Petrenko – Training geo regression SST vs L4 (Poster)
- GHRSSST Product Levels – Breakout, 7 Jun (Thu) @PM

Thank You!