NOAA ACSPO* SST Products

***ACSPO = Advanced Clear-Sky Processor for Ocean, NOAA enterprise SST system**

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NOAA; GST Inc; CCNY

ACSPO supported by NOAA JPSS and GOES-R Programs

ACSPO data are archived in PO.DAAC in close partnership with
Ed Armstrong, Wen-Hao Li, Tim McKinght

New NOAA Polar and Geostationary Constellations: JPSS VIIRS and GOES-R ABI

JPSS VIIRS		GOES-R ABI (Himawari-8/9 AHI, GK2A AMI)	
Nadir: 0.74km Swath edge(67º) 1.5km		Nadir: 2km Swath edge(67º): 12km	
Global: Twice daily		FD: 10 min	
λ, μm	*Spec NEDT, K @300K*	*λ, μm*	*Spec NEDT, K @300K*
3.7	0.11	3.9	≤ 0.10
8.6	0.05	8.4	≤ 0.10
10.8	0.07	10.3	≤ 0.10
12.0	0.07	11.2	≤ 0.10
–	–	12.3	≤ 0.10

JPSS/GOES-R carry VIIRS/ABI sensors have superior spatial & temporal resolution, more & better positioned SST bands, improved radiometric performance

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

- All ACSPO products are available in two flavors: L2P (swath) and L3 (0.02° gridded)
  - Polar L3U products: Uncollated in time
  - Geo L3C products: Collated in time (1-hr produced by collating 10-min data; collation algorithm presented at GHRSST-XIX)
- L3 products are smaller & preferred by users
- Many US users requested a sensor-agnostic super-collated gridded product, L3S. Work is underway, Gladkova et al, Tue, 11:20am

Polar: 10-min granules; 144/day

Sensor	L2P	L3U (0.02°)
VIIRS*	26.0	0.5 (×58)
AVHRR FRAC*	8.0	0.5 (×16)
AVHRR GAC	0.7	0.5 (×1.5)
MODIS*	7.5	0.5 (×16)

Geo: 1-hr FD granules; 24/day

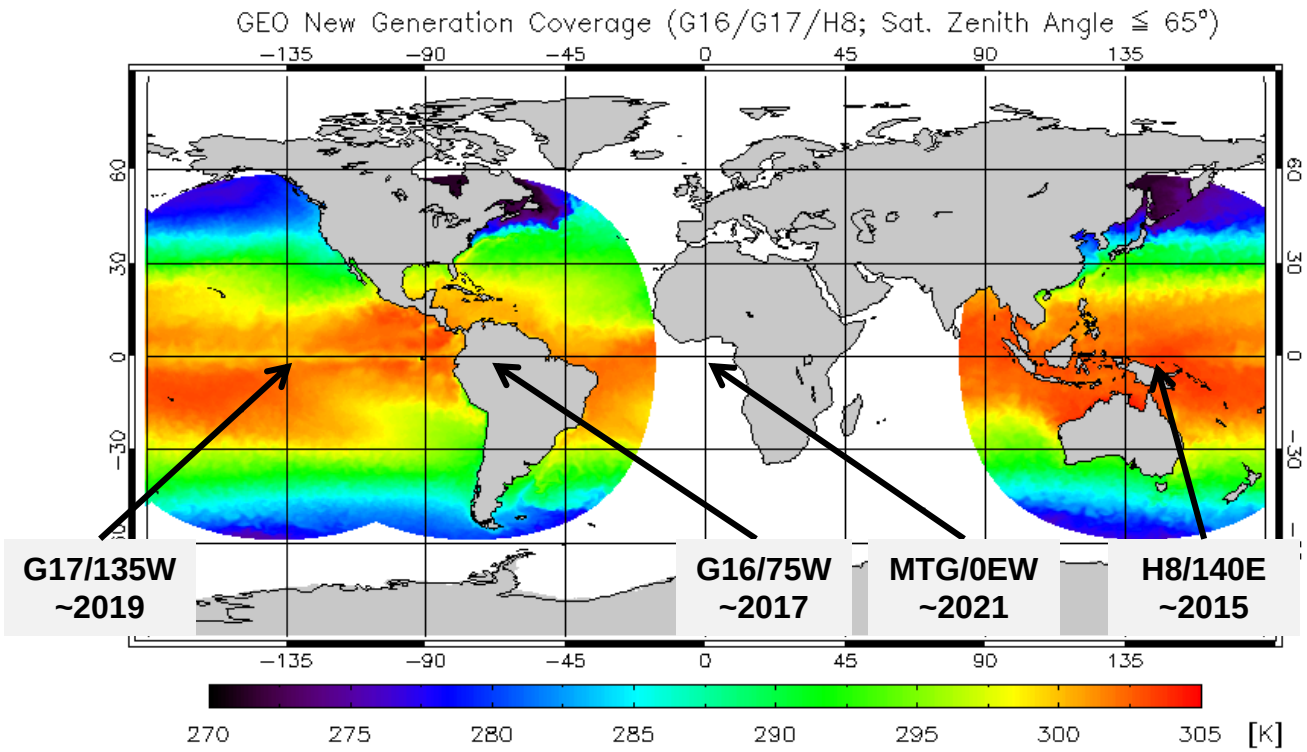
Sensor	L2P	L3C (0.02°)
G16/17 ABI**	1.0	0.6 (×1.6)
H08 AHI**	1.0	0.6 (×1.6)

* VIIRS/FRAC/MODIS L2Ps are heavy.. Should take a look?

** Geo L2Ps were ~6.5 Gb/day before lat/lons were removed

Major ACSPO Progress Since GHRSST-XIX

NOAA is producing VIIRS RAN2 (NPP/N20) and ABI RAN1 (G16/G17) L2/L3 products, & working with PO.DAAC partners to archive



VIIRS Reanalysis-2 ("VIIRS RAN2")

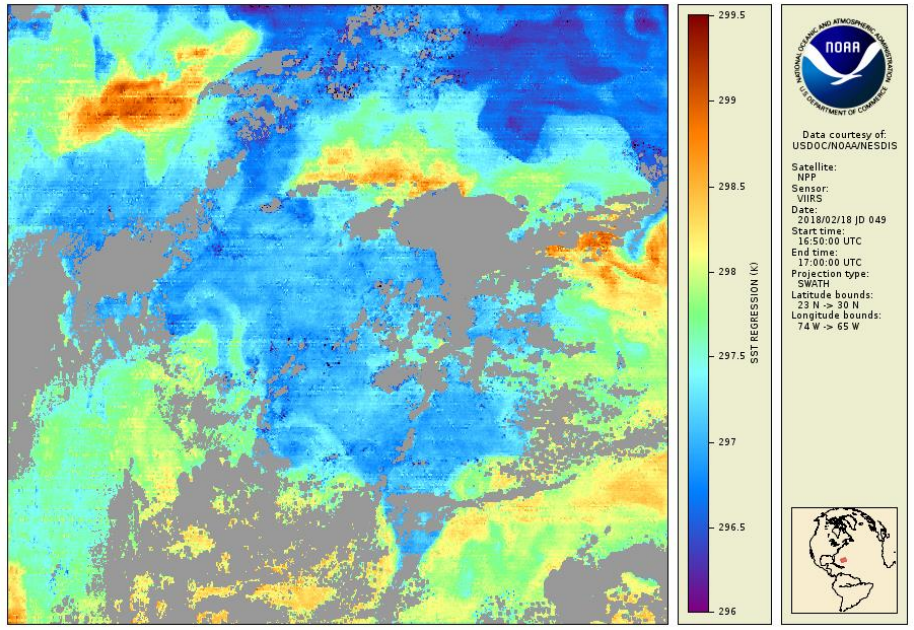
- Uniformly process w/ACSPO v2.61 two VIIRSs from NPP (Feb'2012 – pr) & N20 (Jan'2018 – pr)
- Correct known VIIRS L1b issues (quarterly NPP/N20 warm-up cool-downs & initial N20 IR anomalies)

ABI Reanalysis-1 ("ABI RAN1")

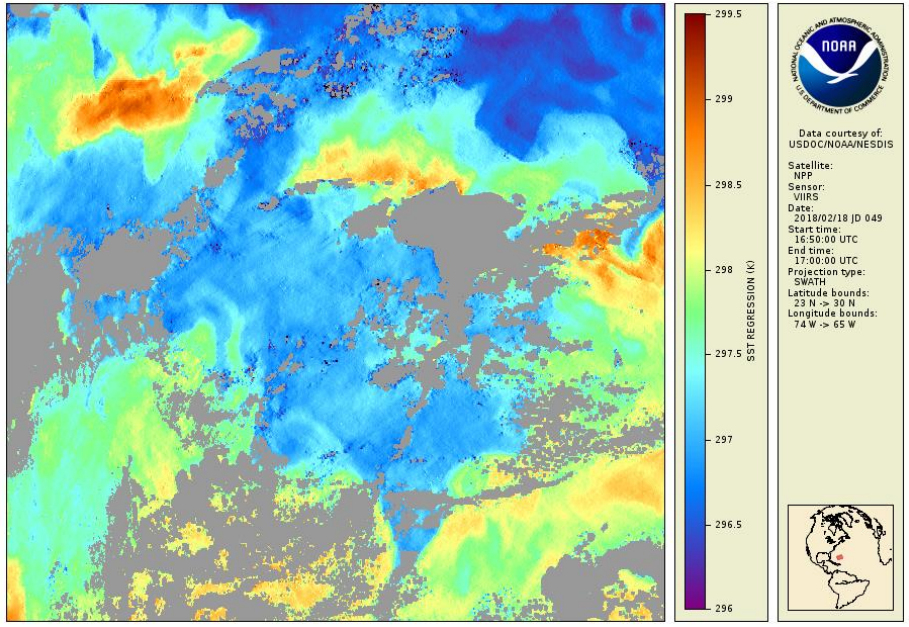
- Uniformly process full ABI record w/ACSPO v2.70 (for the first time, using collation-in-time)
- Current ABI RAN1 includes G16 (Dec'2017 – pr)
- G17 will be added, pending finalizing its algorithms
- Correct known CAL issue w/G16/ABI (Jun'2018), mitigate G17/ABI sensor anomalies

In ACSPO 2.61, the BT & SST L2P imagery is destriped

- Any residual striping in BTs is amplified in SST
- In ACSPO 2.61, all channels used in SST retrievals are destriped
- Bouali and Ignatov (2014) algorithm is employed (with implementation described in Mikelsons et al., 2015)



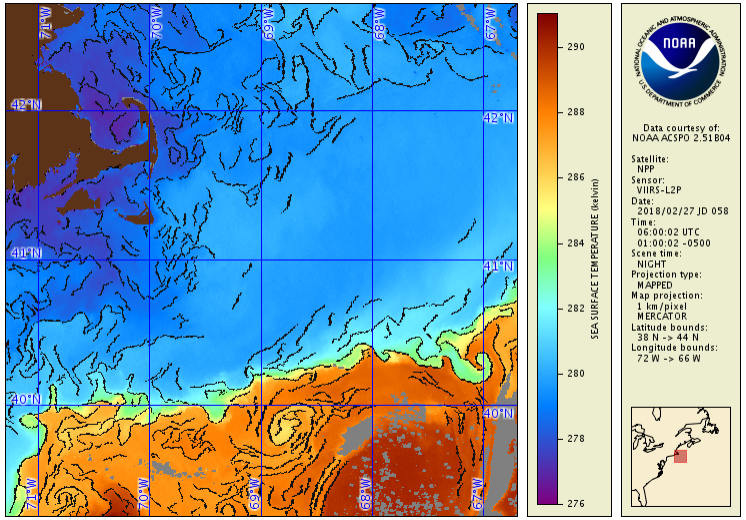
SST from original VIIRS BTs

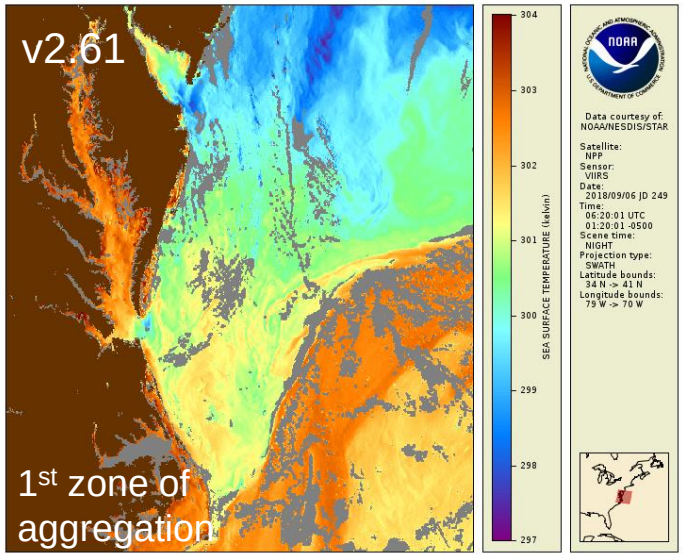


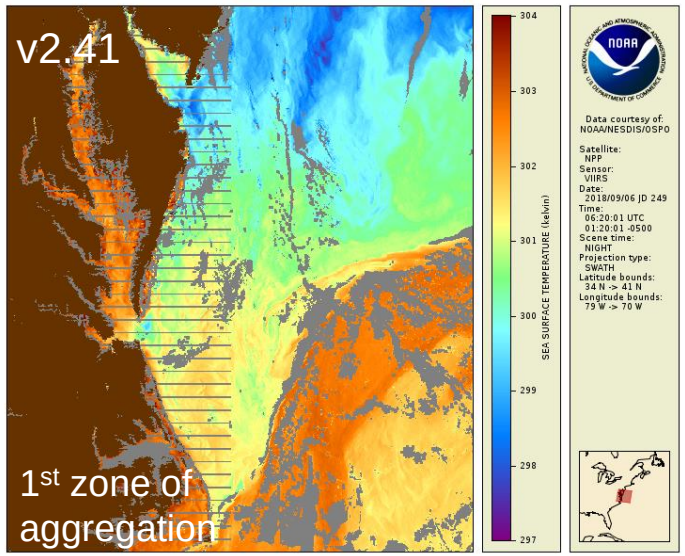
SST from destriped VIIRS BTs

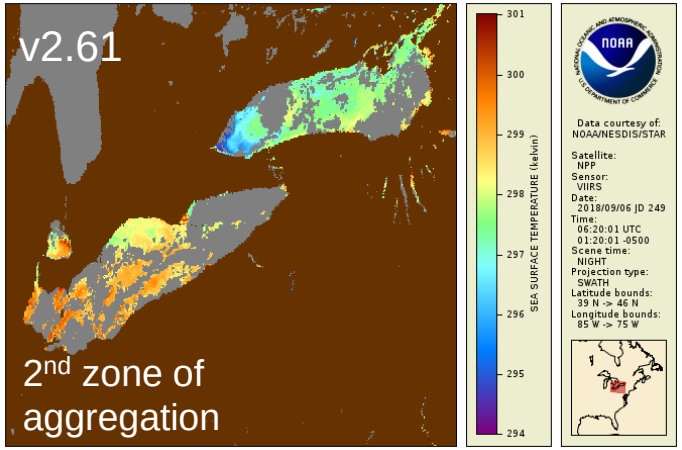
In ACSPO 2.61, the BT & SST L2P imagery is resampled

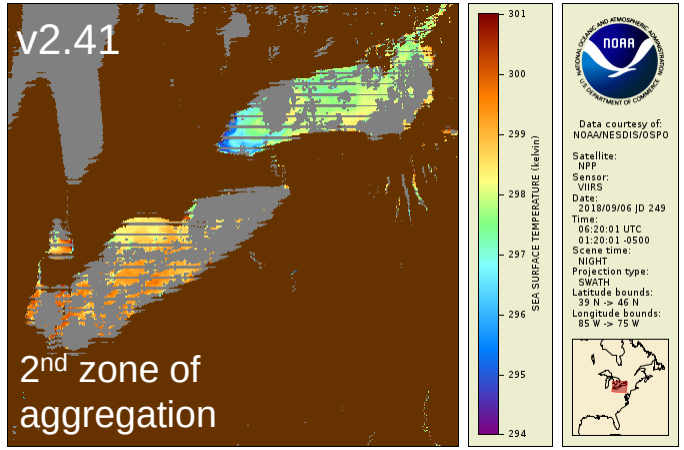
- VIIRS & MODIS are multi-detector sensors, affected by bow tie deletions and distortions
- In ACSPO 2.61, BTs employed in SST retrievals are resampled using Gladkova et al. (2016) algorithm
- ACSPO is now ready for pattern recognition & thermal fronts detection. Those are currently being explored.



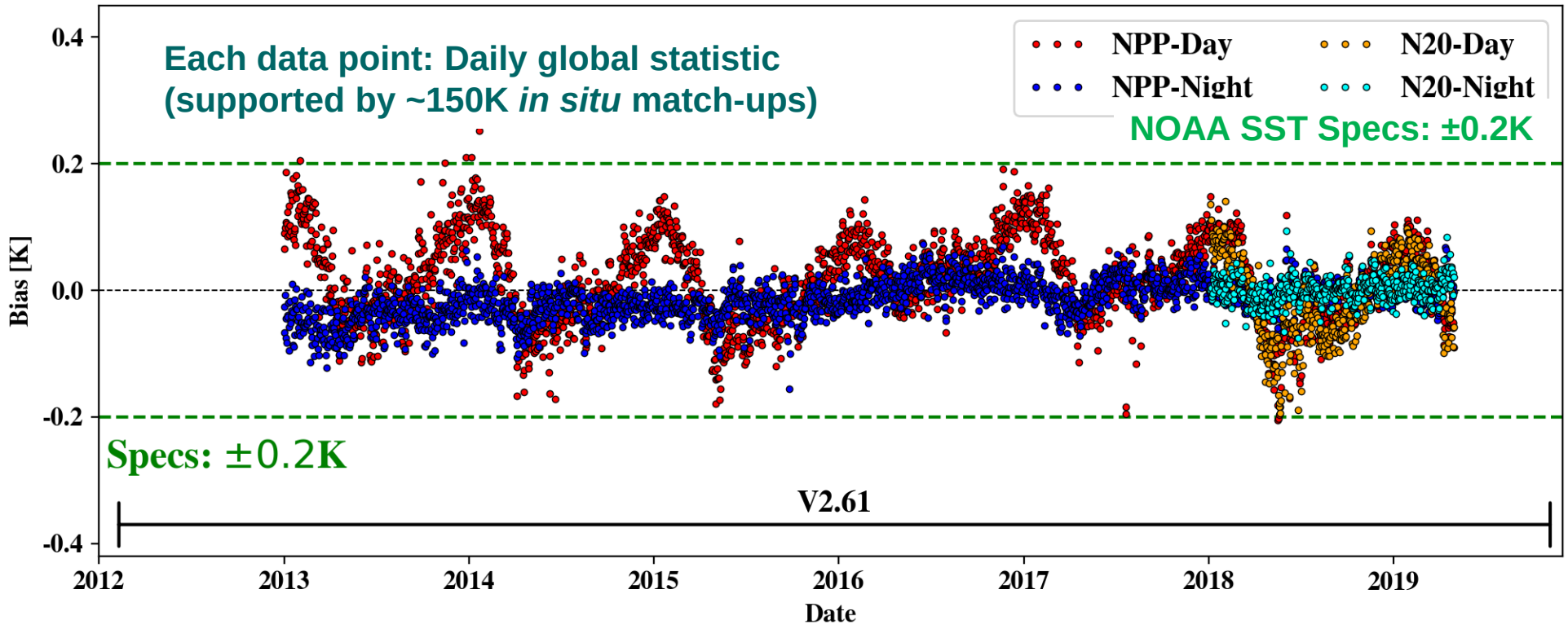






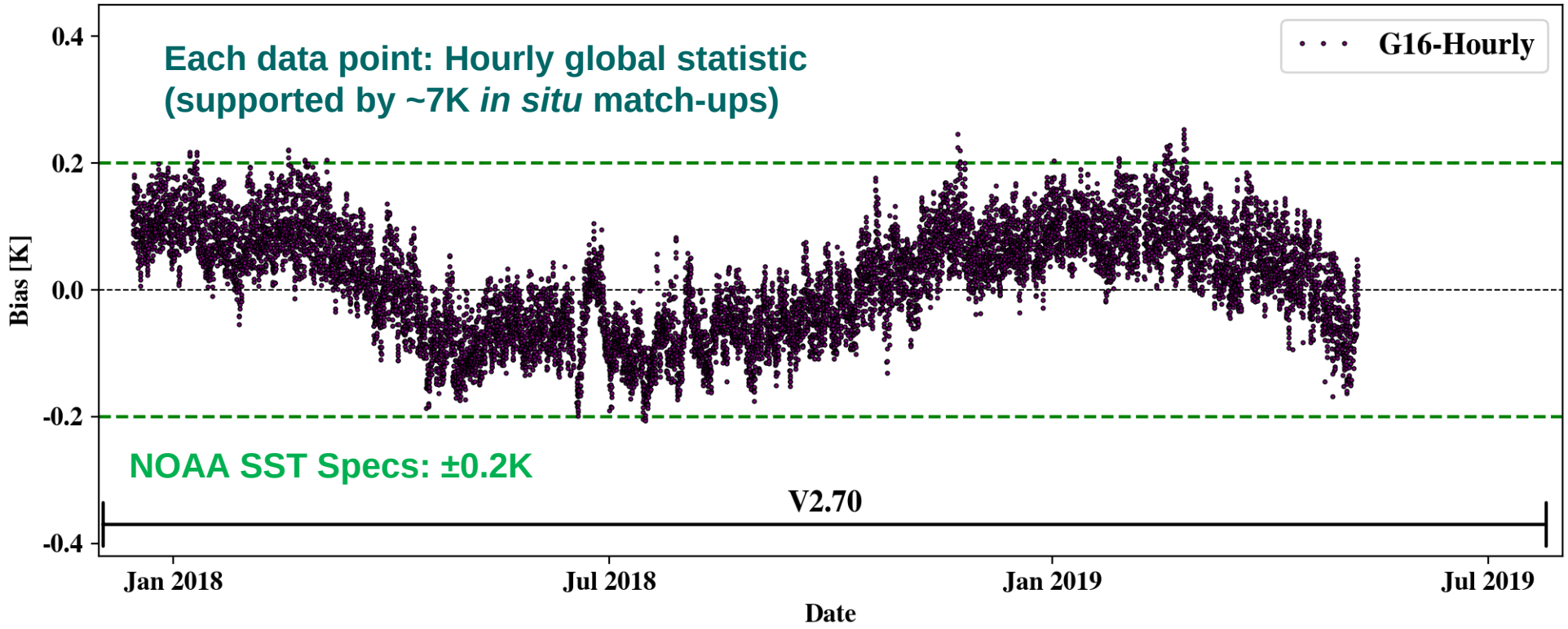


VIIRS RAN2 minus *i*Quam2 (Drifters + Trop. Moorings) SST



- NPP and N20 SSTs consistently reprocessed with ACSPO v2.61 constituting “VIIRS RAN2”
- Archival w/PO.DAAC underway (plan to complete in 2019)
- More details: Poster Jonasson et al. “ACSPO VIIRS SST Reanalysis 2 (RAN2)”

G16/ABI RAN1 minus *i*Quam2 (Drifters + Trop. Moorings) SST

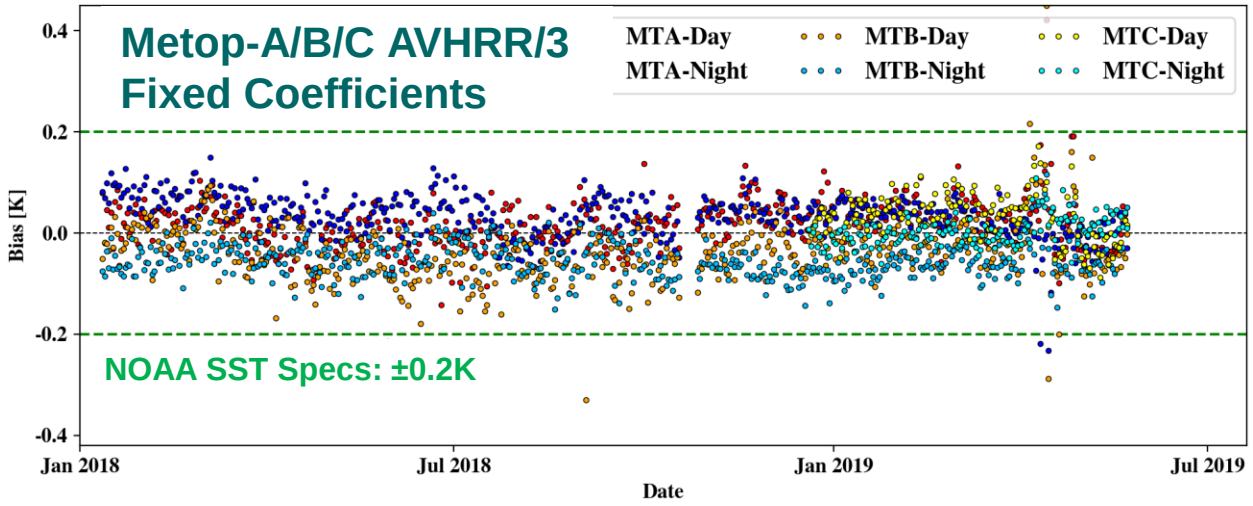


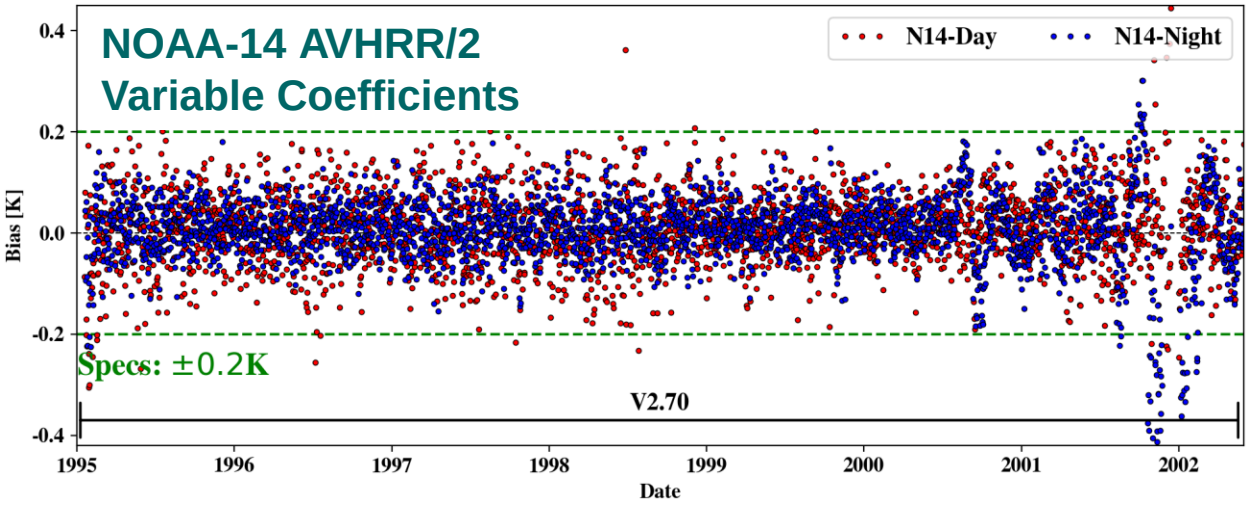
- G16 SSTs consistently reprocessed with ACSPO v2.70 constituting “ABI RAN1”
- G17 algorithms are currently being finalized and will be included in ABI RAN1
- G16 RAN1 archived w/PO.DAAC: L2P (doi:10.5067/GHG16-2PO27; 10.5067/GHG16-3UO27)
- More details: Poster Pennybacker et al “Geo Collation algorithm from G16/17 and H08”

Other ACSPO Developments Since GHRSST-XIX

NOAA Operational AVHRR Processing

- Processing of GAC data discontinued (4 Jun 2019)
- Production of L2P/L3U from Metop-A/B FRAC commenced with ACSPO 2.70 (4 Jun 2019)
- Metop-C (launched Nov 2018 and experimentally processed since Dec 2018) is in family w/Metop-A/B
- NOAA is looking for best platform to run Metop-C. In interim, STAR runs “moderate assurance” processing



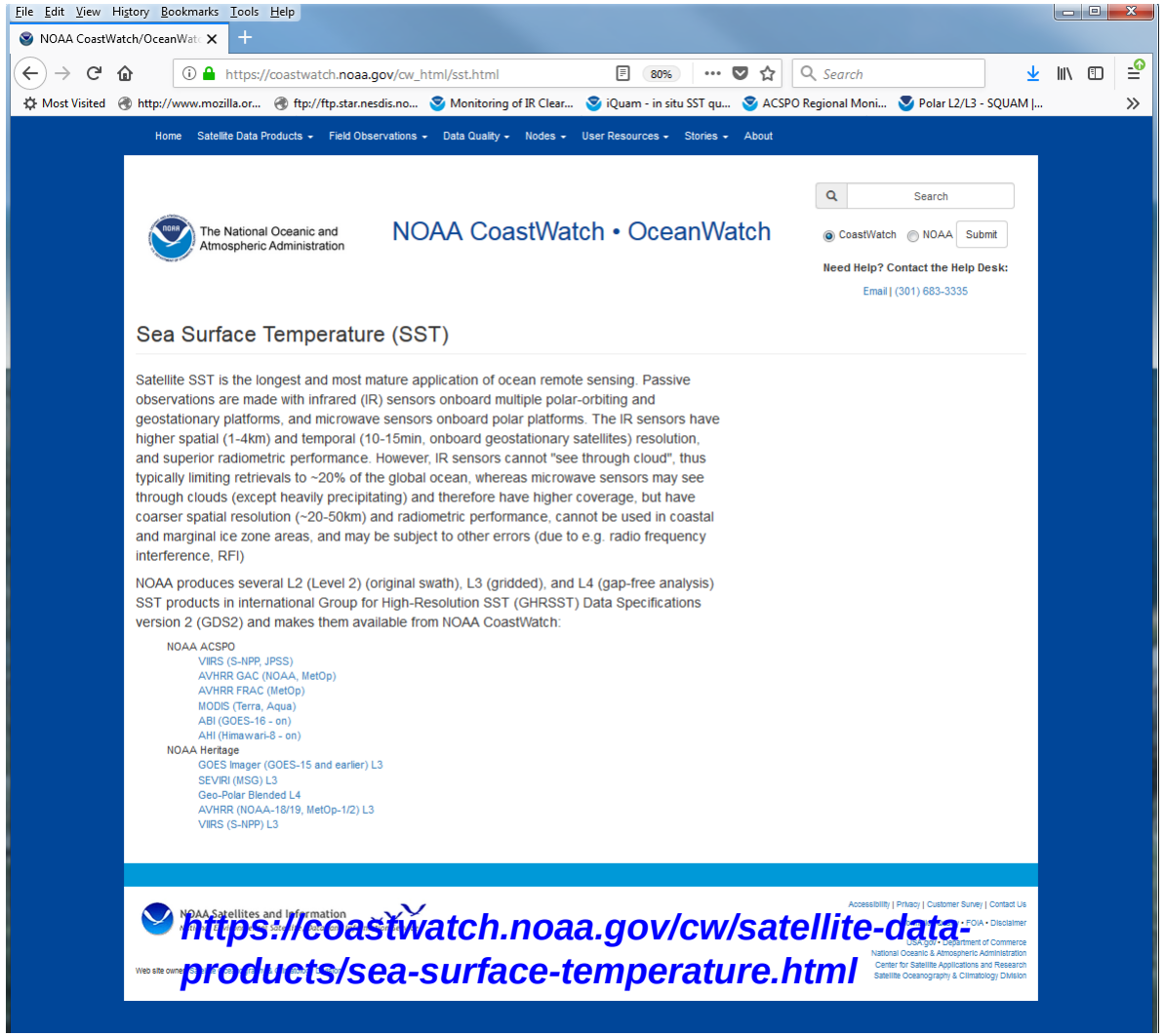


2nd AVHRR GAC Reanalysis (AVHRR GAC RAN2)

- AVHRR GAC RAN1 (released in 2015) covered period from 2002 – pr, AVHRR/3 only (Ignatov et al. 2016)
- Work is underway to add AVHRR/2 & release RAN2
- Shown are time series of NOAA-14, from 1995-2002 (processed with variable regression coefficients)
- Working to add other AVHRR/2s (NOAA-7/9/11) & release AVHRR GAC RAN2

ACSPO Data Access

- ✓ NOAA PDA (“Product Distribution & Access”; formerly “Data Distribution Server”) – Operational (NPP/N20 VIIRS L2P/L3U, G16/G17 ABI L2P/L3U, AVHRR GAC/FRAC L2P/L3U; MODIS L2P/L3U)
- ✓ EUMETCast – Operational (NPP/N20 L3U)
- ✓ NOAA Coast Watch – Pre-Archive (all Sensors) (Also provides entry points to all NRT and RAN ACSPO products, e.g. PO.DAAC, NCEI)
- ✓ NASA PO.DAAC – Archive (NPP/N20 VIIRS L2P/L3U; G16/17 ABI L2P/L3C)
- ✓ NOAA NCEI – Archive (NPP/N20 VIIRS L2P/L3U; In the future G16/17 ABI L2P/L3C)



Priorities for Coming Year

Focus on Reprocessing

- **(Advanced)** Complete NPP/N20 VIIRS RAN2 & archive w/PO.DAAC/NCEI
- **(Advanced)** Complete ABI RAN1 (add G17) & archive w/PO.DAAC/NCEI
- **(Test Runs)** Produce AHI RAN1, explore archival with PO.DAAC/NCEI
- **(Test Runs)** Continue working towards AVHRR GAC RAN2 (1981 – present)
- **(Hasn't started)** Reprocess full records of 3 AVHRR FRACs and 2 MODISs

New ACSPO Products in Pipeline (requested by users)

- Thermal fronts & Pattern recognition improvements (initially, VIIRS only)
- Polar Data Fusion / Super-Collated L3C/S

Suggested Topics to Discuss at GHRSST-XIX

GDS2 and Polar L2P Data Size Discussion

- ✓ satellite_zenith_angle reported as 8bit (1deg quantization) rendering it useless for many applications (e.g., SST retrievals)
  - Suggest report as 16bit (0.01deg)
- ✓ The dt_analysis is also reported as 8bit (0.1K quantization), which is crude for any high-accuracy quantitative applications
  - Suggest report as 16bit (0.01K quantization)
- ✓ These changes are insignificant for file size (especially after compression)
- ✓ Reduce polar L2P size by half (VIIRS: 10TB/yr; MODIS/FRAC: ~4Tb/yr)
  - Remove brightness temperatures? (not part of GDS2; we are not aware of users; can provide BTs offline, if needed)
  - Revisit reporting lat/lon for each pixel – e.g. similarly to EUMETSAT https://www.eumetsat.int/website/wcm/idc/idcplg?IdcService=GET_FILE&dDocName=PDF_VIIRS_SDR_PF_UG&RevisionSelectionMethod=LatestReleased&Rendition=Web

More ACSPO Resources at GHRSST-XX

- Irina Gladkova (Oral): Towards Hi-Res Multi-Sensor gridded ACSPO SST Product, 4 Jun (Tue) @11:20AM
- Matt Pennybacker (Poster): ACSPO Collated SST Products from G16/17 and H08, 4 Jun (Tue), 17:00-18:00
- Olafur Jonasson (Poster; Presented by Sasha Ignatov): VIIRS SST Reanalysis 2 (“VIIRS RAN2”), 6 Jun (Thu), 16:00-17:00

Thank You!