JPSS SST Products

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NOAA; CIRA; GST Inc; CUNY

JPSS SST Team

Name	Affiliation	Funding	Tasks
Ignatov	STAR	NOAA	Lead, JPSS Algorithm & Cal/Val
Stroup, Kihai, Dash, Liang, Petrenko, Xu, Bouali, Zhou, Gladkova, Mikelsons	STAR/CIRA STAR/STG STAR/GST STAR/GST	JPO, NOAA ORS, GOES-R, NASA	Monitoring , VAL, comparison of SSTs (SQUAM), Radiances (MICROS), in Situ SSTs (*i*Quam) Users support; ~~IDPS SST code,~~ ACSPO code and products (L2, L3); Match ups w/iQuam; Destriping and other L1b fixes; Algorithms improvements: Clear-Sky Mask, SST
May, Cayula, McKenzie, Willis	NAVO	Navy, NJO	NAVO SEATEMP SST & Cal/Val VIIRS Cloud Mask evaluation in IDPS and comparisons with NAVO Cloud Mask
Minnett Kilpatrick	U. Miami	JPO, U. Miami	Uncertainty & instrument analyses; RTM; VAL vs. drifters & radiometers; skin to sub-skin conversion; high-latitude and full swath focus
Arnone Fargion	USM/NRL UCSD	NJO, USM	SST Algorithm Analyses, SST improvements at slant view zenith angles/swath edge; SST consistency from multiple passes
LeBorgne Roquet	Meteo France	EUMETSAT	Processing VIIRS and Cal/Val using O&SI SAF heritage; Comparisons with AVHRR/SEVIRI

Acknowledgements

- ACSPO Users
  - NOAA: CRW, NOS, CW, geo-polar blend, NCDC
  - (Inter)national Users – CMC, BoM, UK MO, JMA, DMII, JPL
- JPSS Program – Mitch Goldberg, Kathryn Schontz, Bill Sjoberg
- NASA SNPP Project Scientist – Jim Gleason
- NOAA NDE Team – Tom Schott, Dylan Powell, Bonnie Reed
- JPSS DPA – Eric Gottshall, Janna Feeley, Bruce Gunther
- VIIRS SDR & GSICS – Changyong Cao, Frank DeLuccia, Jack Xiong, Mark Liu, Fuzhong Weng
- NESDIS/STAR JPSS Team – Ivan Csiszar, Lihang Zhou, Paul DiGiacomo, many others
- NOAA CRTM Team – Yong Han, Yong Chen, Mark Liu

VIIRS SST Products

IDPS – NOAA Interface Data Processing Segment (IDPS)

- ✓ Official NPOESS SST EDR, Now owned by NOAA JPSS PO
- ✓ Developed by NGAS; Operational at Raytheon; archived at NOAA CLASS
- ✓ Jan 2014: JPO recommends to “discontinue the IDPS EDR, concentrate on ACSPO sustainment, development, and Cal/Val”
- ✓ IDPS will be phased out as soon as ACSPO SST is archived at JPL/NODC

→ *ACSPO – NOAA Advanced Clear-Sky Processor for Ocean (ACSPO)*

- ✓ NOAA heritage SST system
- ✓ Operational with global AVHRR 4km-GAC & 1km-FRAC
- ✓ Terra/Aqua MODIS & S-NPP VIIRS – experimental Jan’2012
- ✓ SNPP VIIRS – operational Mar 2014, GDS2 archival at JPL/NODC underway

→ *NAVO – SEATEMP*

- ✓ Builds on NAVO AVHRR & NOAA pre-ACSPO heritage
- ✓ Transitioned from NOAA to NAVO in 1994, “Shared Processing Agreement”
- ✓ Operational with S-NPP since Mar 2013
- ✓ GDS2 archived at JPL/NODC since May 2013

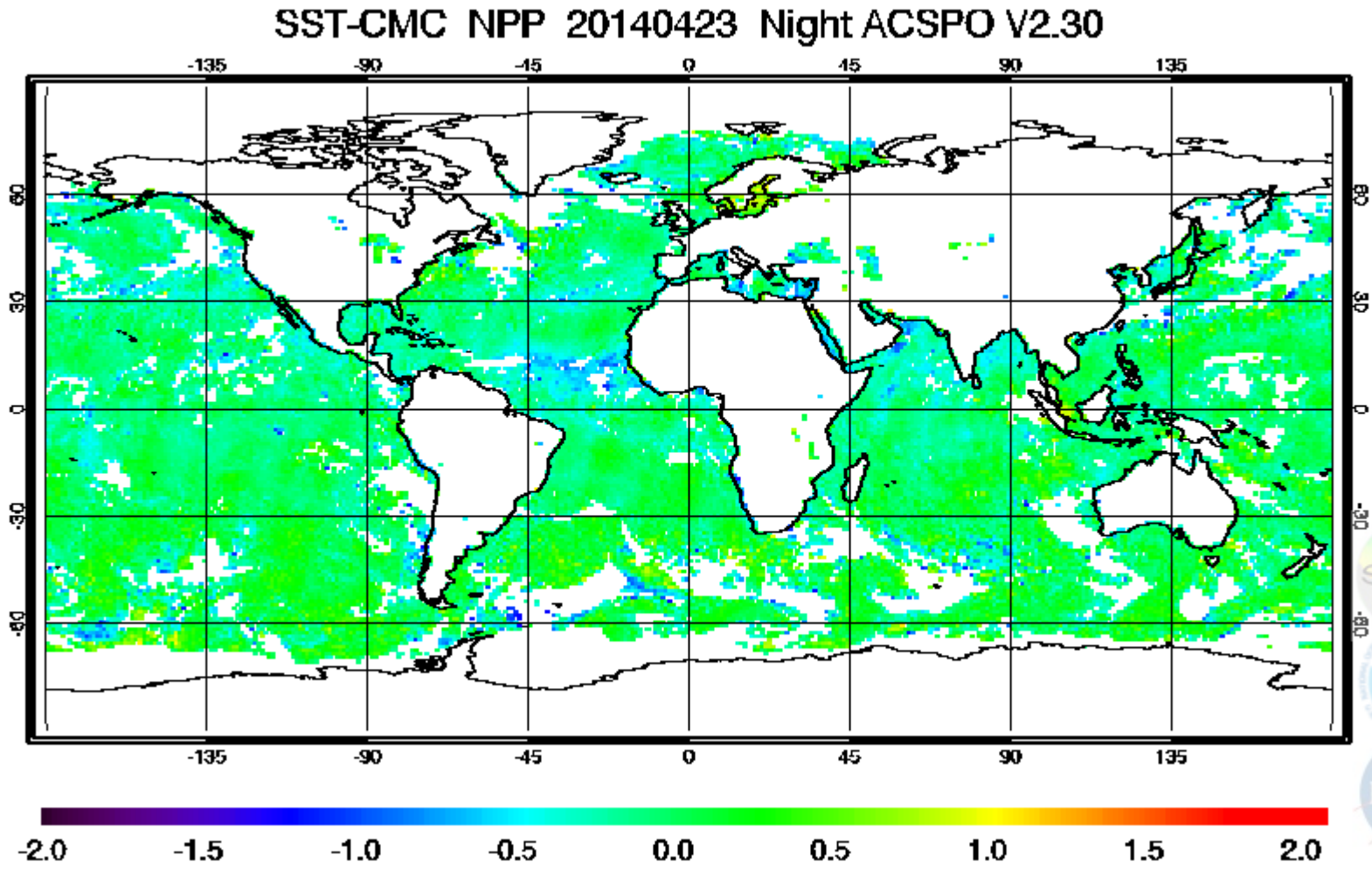
Objective & Methodology

- **Objective: Compare ACSPO and NAVO SSTs to advise users on the specifics of the two products**

- **Methodology: Compare ACSPO/NAVO SST domain & performance against two global reference SSTs**
  - **L4 SST (Canadian Met Centre CMC0.2 Analysis. Note that VIIRS data are not assimilated in CMC0.2)**
  - ***in situ* SST (QCed drifting buoys in iQuam *www.star.nesdis.noaa.gov/sod/sst/iquam/*)**

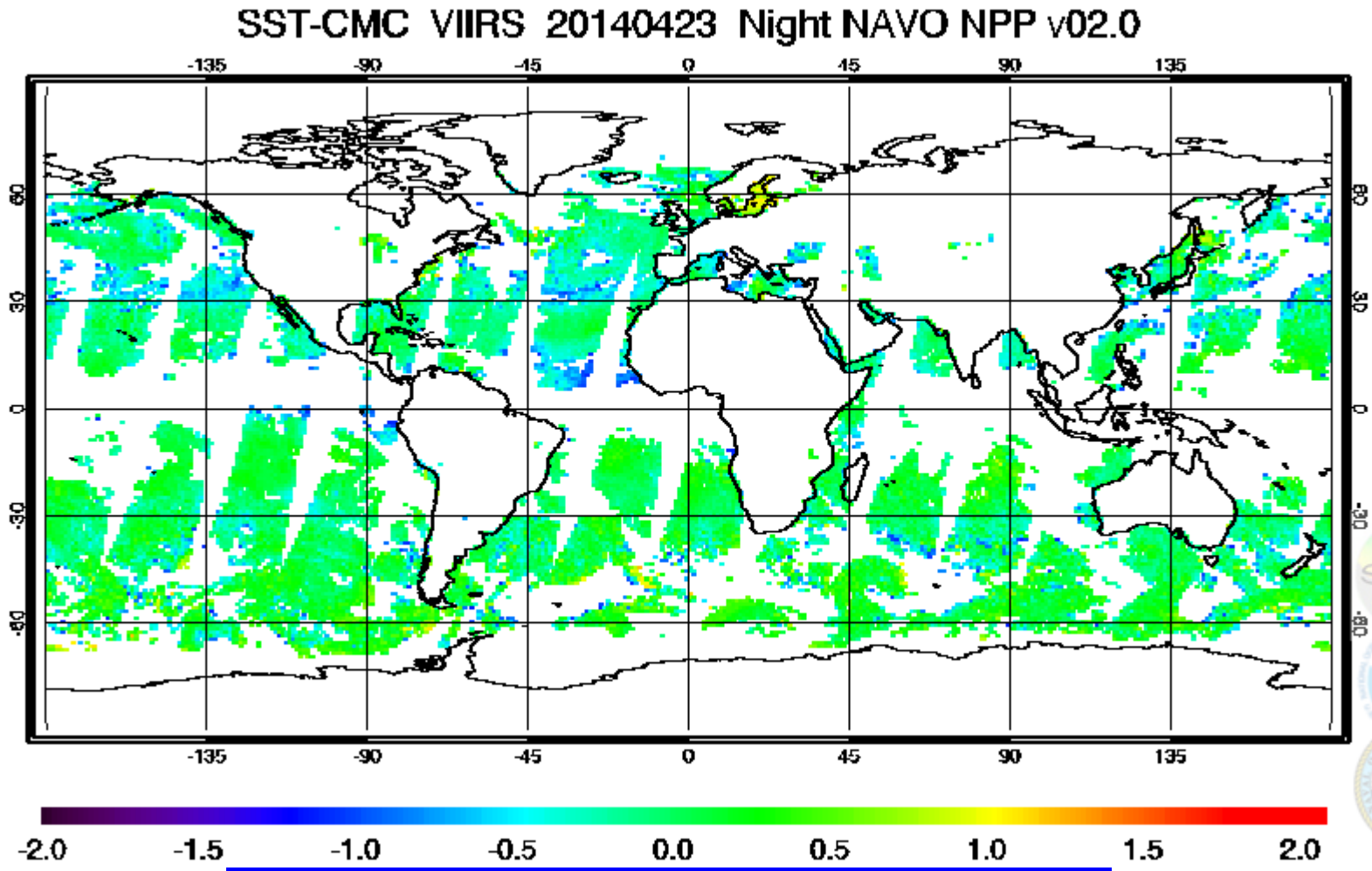
Data: one representative day of global data – 23 April 2014 – in SST Quality Monitor (SQUAM)
www.star.nesdis.noaa.gov/sod/sst/squam/

NIGHT: ACSPO L2 minus CMC L4
23 April 2014



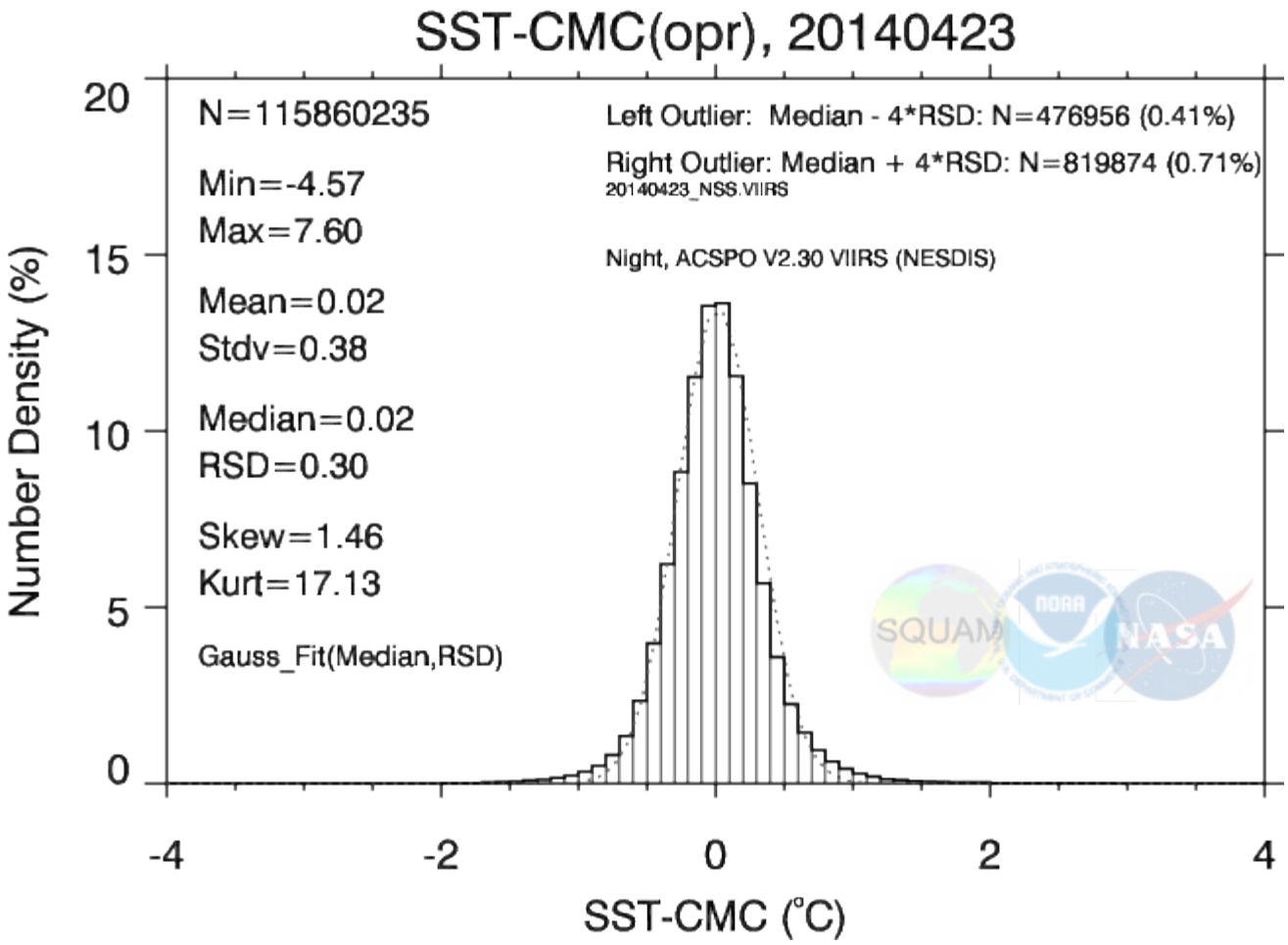
- ***Delta close to zero as expected***
- ***Cold spots – Residual Cloud/Aerosol leakages***

NIGHT: NAVO L2 minus OSTIA L4
23 April 2014



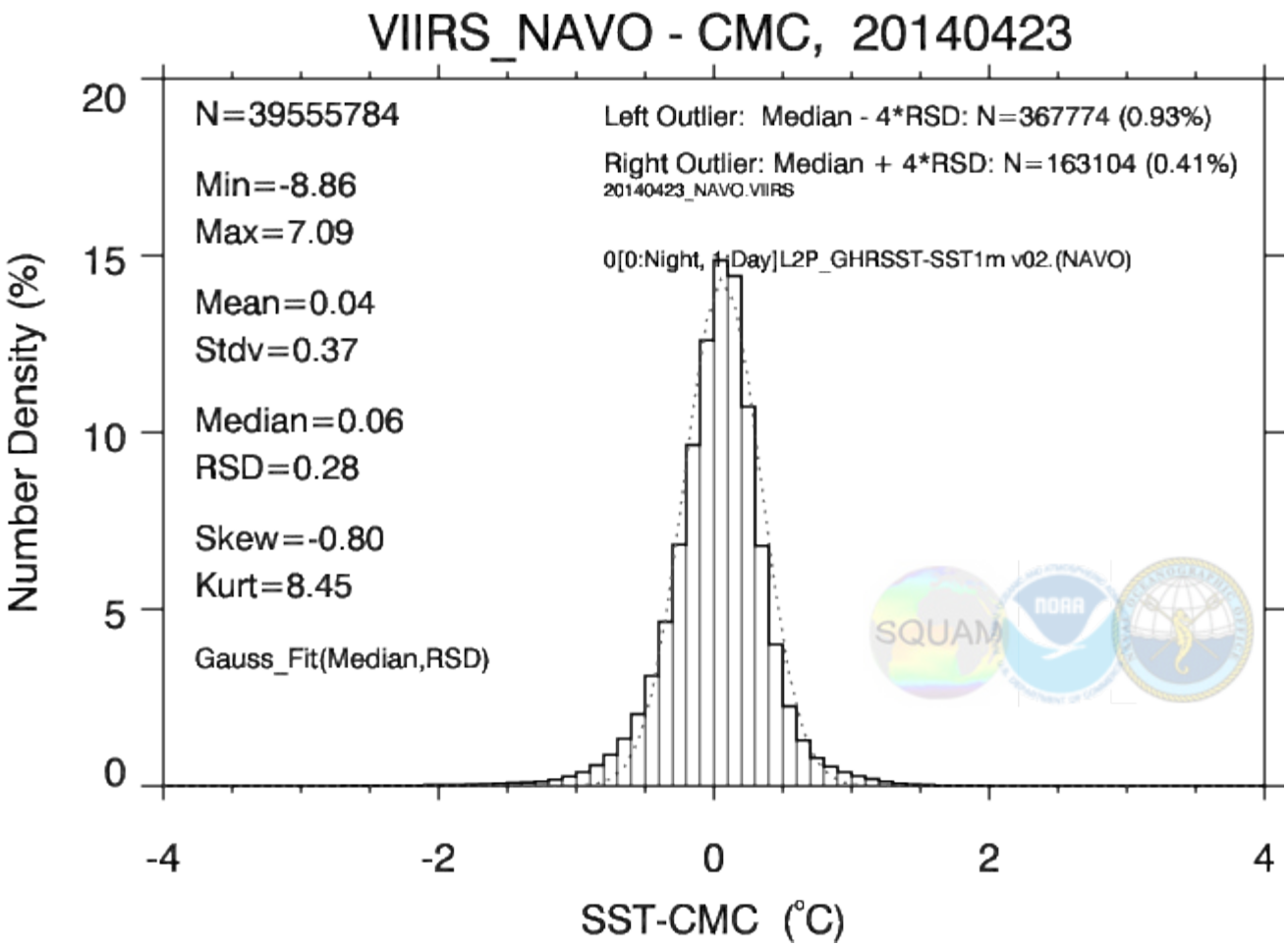
- ***Retrievals limited to VZA<54°***

NIGHT: ACSPO L2 minus CMC L4
23 April 2014



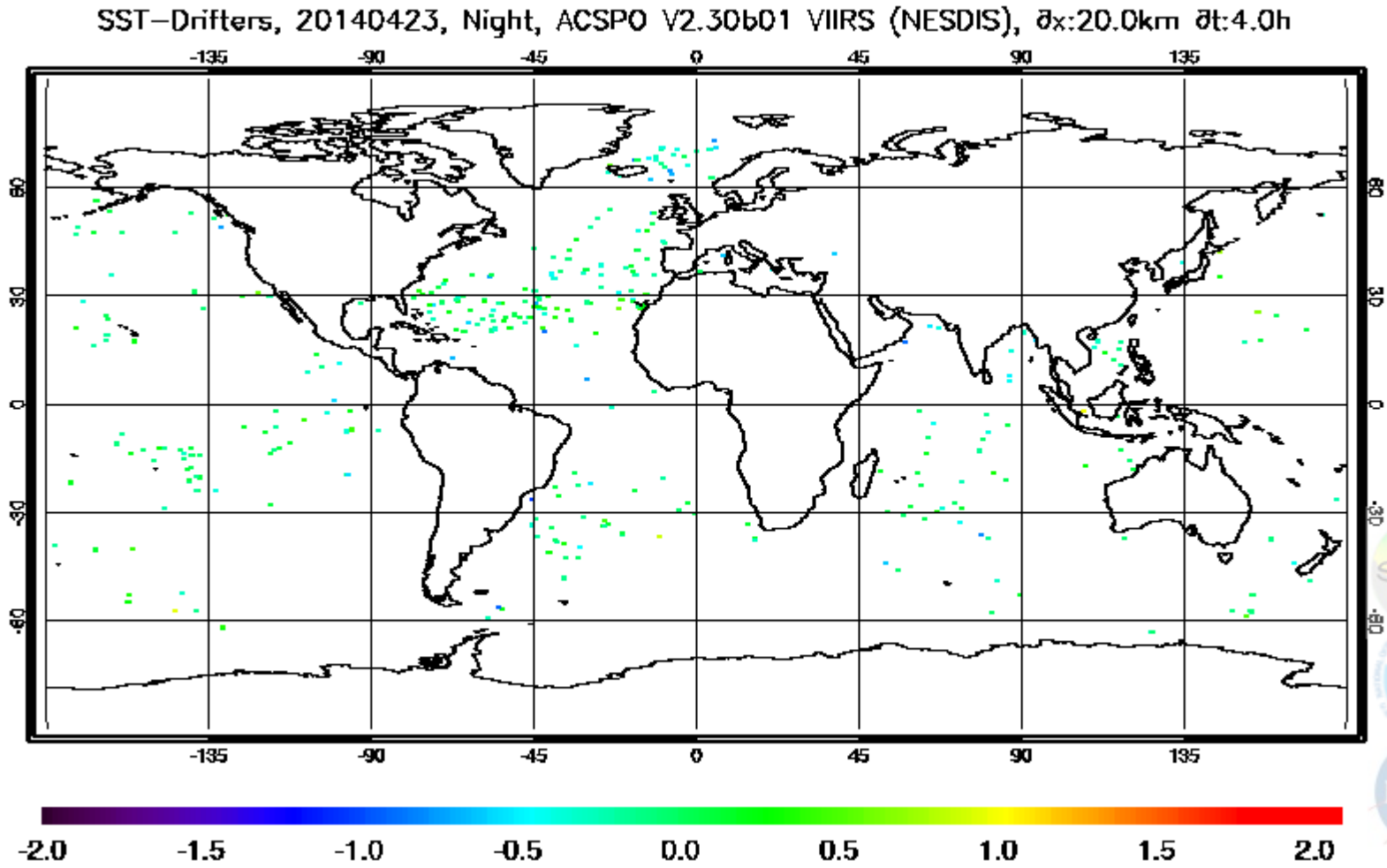
- ***Shape close to Gaussian***

NIGHT: NAVO L2 minus CMC L4
23 April 2014



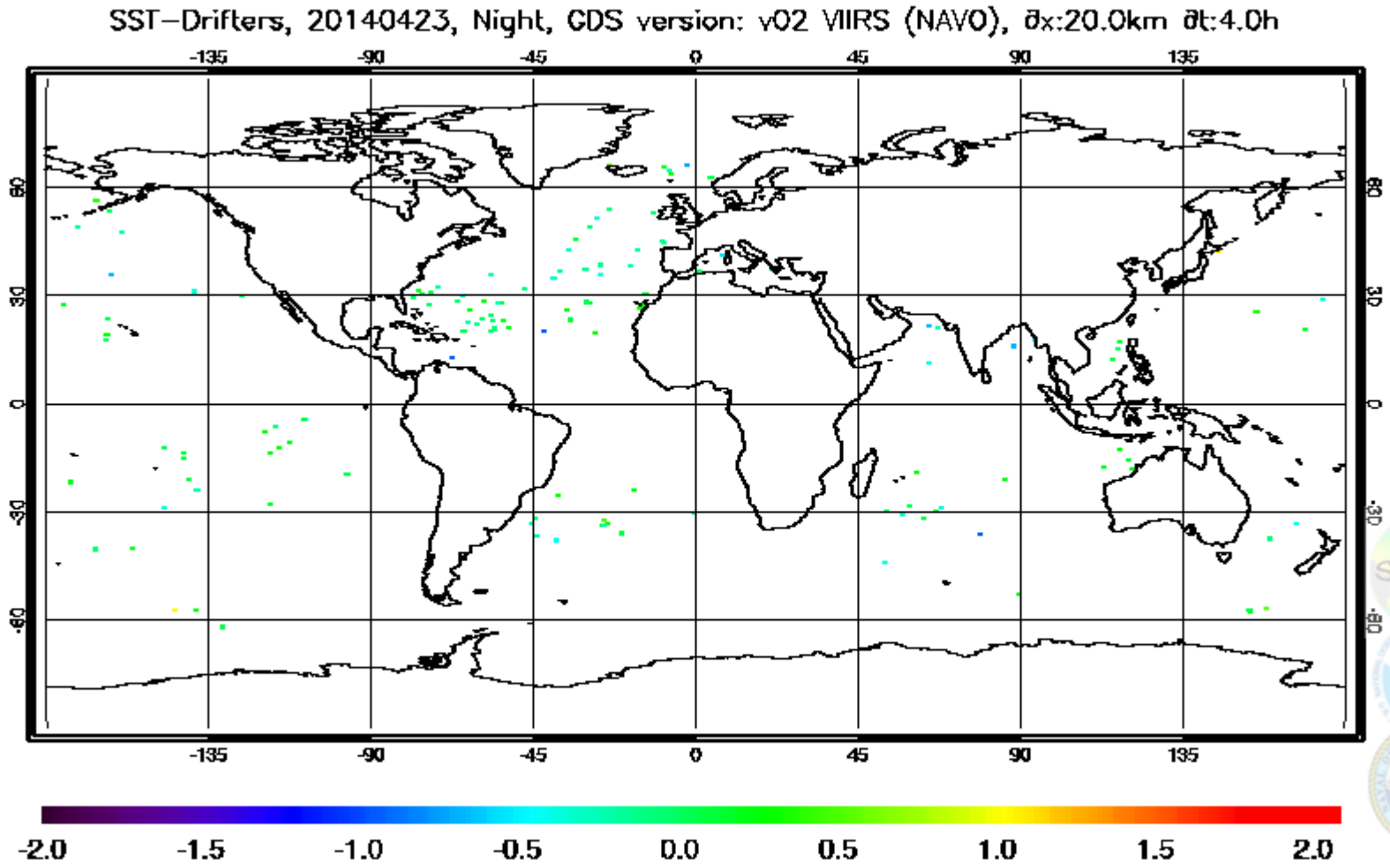
- ***Shape close to Gaussian***
- ***Domain smaller, STD slightly better***

NIGHT: ACSPO L2 minus *in situ* SST
23 April 2014



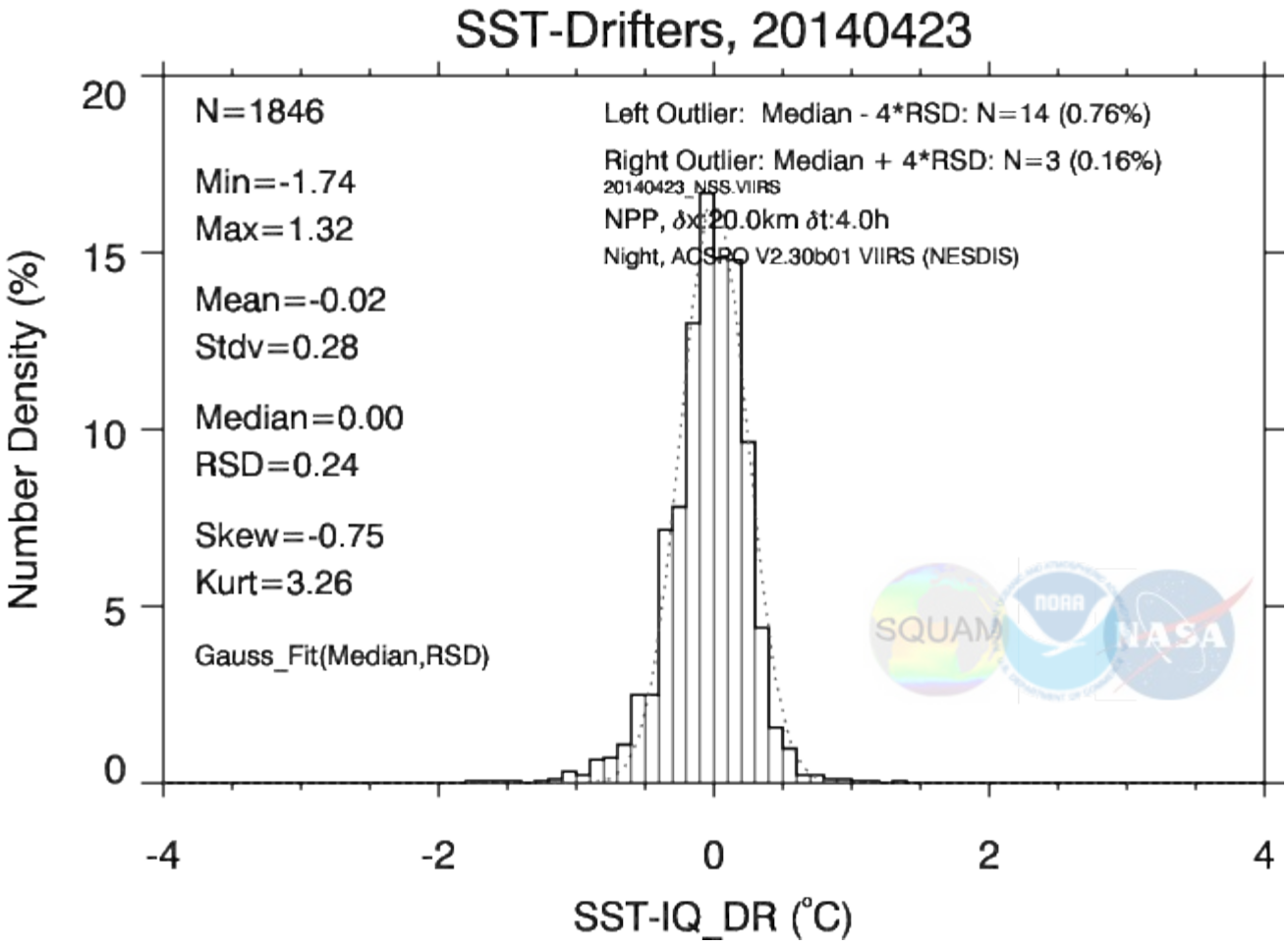
- ***Much sparser data coverage***
- ***Not fully representative of the globe***

NIGHT: NAVO L2 minus *in situ* SST
23 April 2014



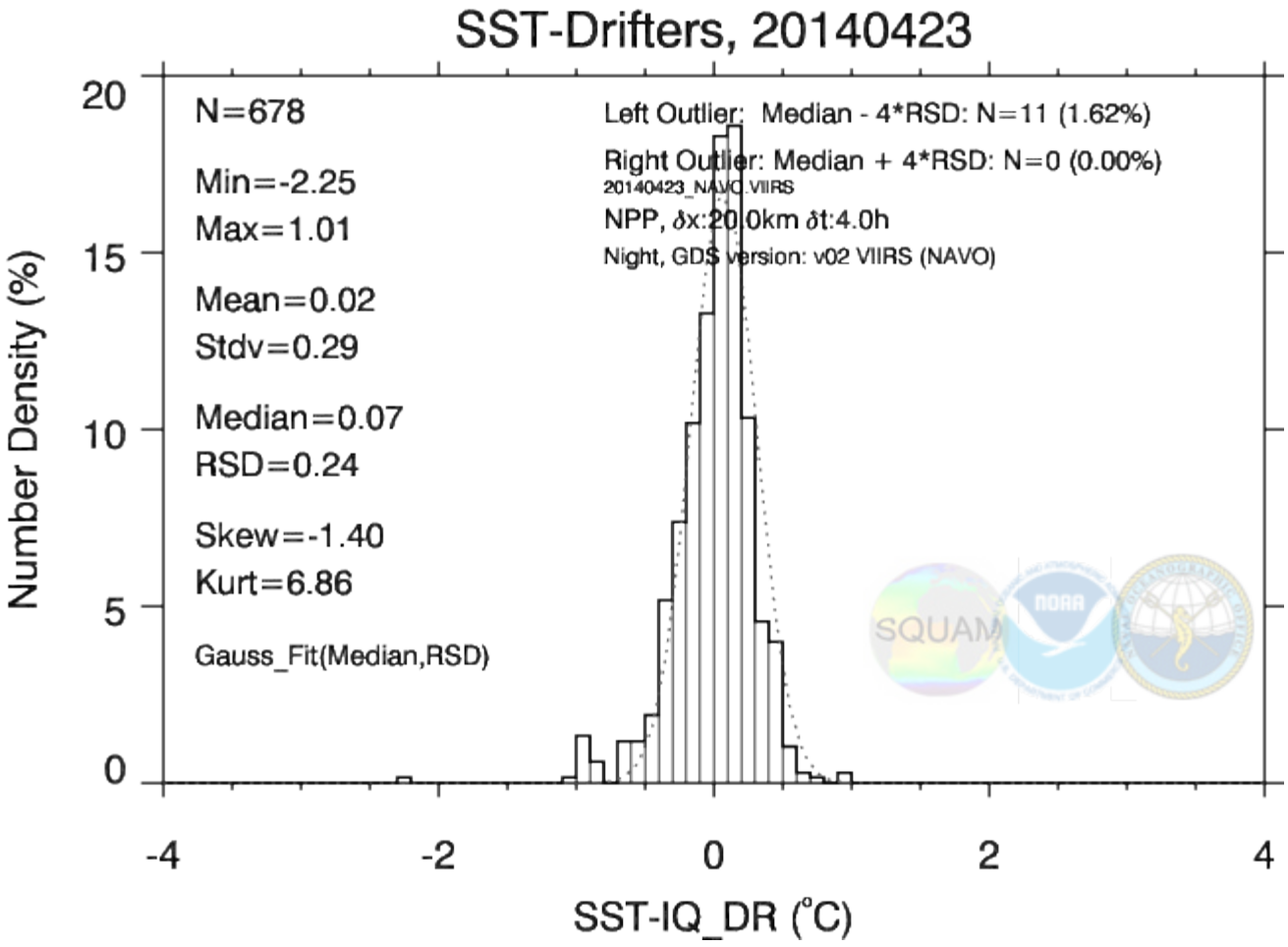
- ***Much sparser data coverage***
- ***Not fully representative of the globe***

NIGHT: ACSPO L2 minus *in situ* SST
23 April 2014



- ***Shape close to Gaussian – small cold tail***
- ***Performance Stats well within specs (Bias<0.2K, STD<0.6K)***

NIGHT: NAVO L2 minus *in situ* SST
23 April 2014



- ***Shape close to Gaussian – small cold tail***
- ***Performance Stats well within specs (Bias<0.2K, STD<0.6K)***

NIGHT – Summary

ΔT = "VIIRS minus CMC" SST (expected ~0)

	NOBS (%ACSPO)	Min/ Max	Mean/ STD	Med/ RSD
IDPS	116.8M (101%)	-13.1/+12.6	-0.04/0.46	-0.00/0.31
ACSPO	115.9M (100%)	- 4.6/+7.6	-0.02/0.38	-0.02/0.30
NAVO	39.5M (34%)	- 8.9/+7.1	+0.04/0.37	+0.06/0.28

- *IDPS: SST domain is +1% larger than ACSPO, All stats degraded*
- *NAVO: SST domain is factor of ×3 smaller than ACSPO, stats improved*

ΔT = "VIIRS minus in situ" SST (expected ~0)

	NOBS (%ACSPO)	Min/ Max	Mean/ STD	Med/ RSD
IDPS	2,082 (113%)	-2.9/+5.6	-0.06/0.43	-0.01/0.26
ACSPO	1,846 (100%)	-1.7/+1.3	-0.02/0.28	-0.00/0.24
NAVO	678 (37%)	-2.3/+1.0	+0.02/0.29	+0.07/0.24

- *IDPS: SST domain is +13% larger than ACSPO, All stats degraded*
- *NAVO: SST domain is factor of ×3 smaller than ACSPO, stats comparable*

DAY – Summary

ΔT = "VIIRS minus CMC" SST (expected ~0)

	NOBS (%ACSPO)	Min/ Max	Mean/ STD	Med/ RSD
IDPS	120.4M (100%)	- 28.7/+10.4	+0.20/0.77	+0.24/0.45
ACSPO	121.0M (100%)	- 5.4/+ 9.2	+0.29/0.59	+0.21/0.41
NAVO	41.3M (34%)	- 8.2/+ 7.5	+0.28/0.56	+0.22/0.40

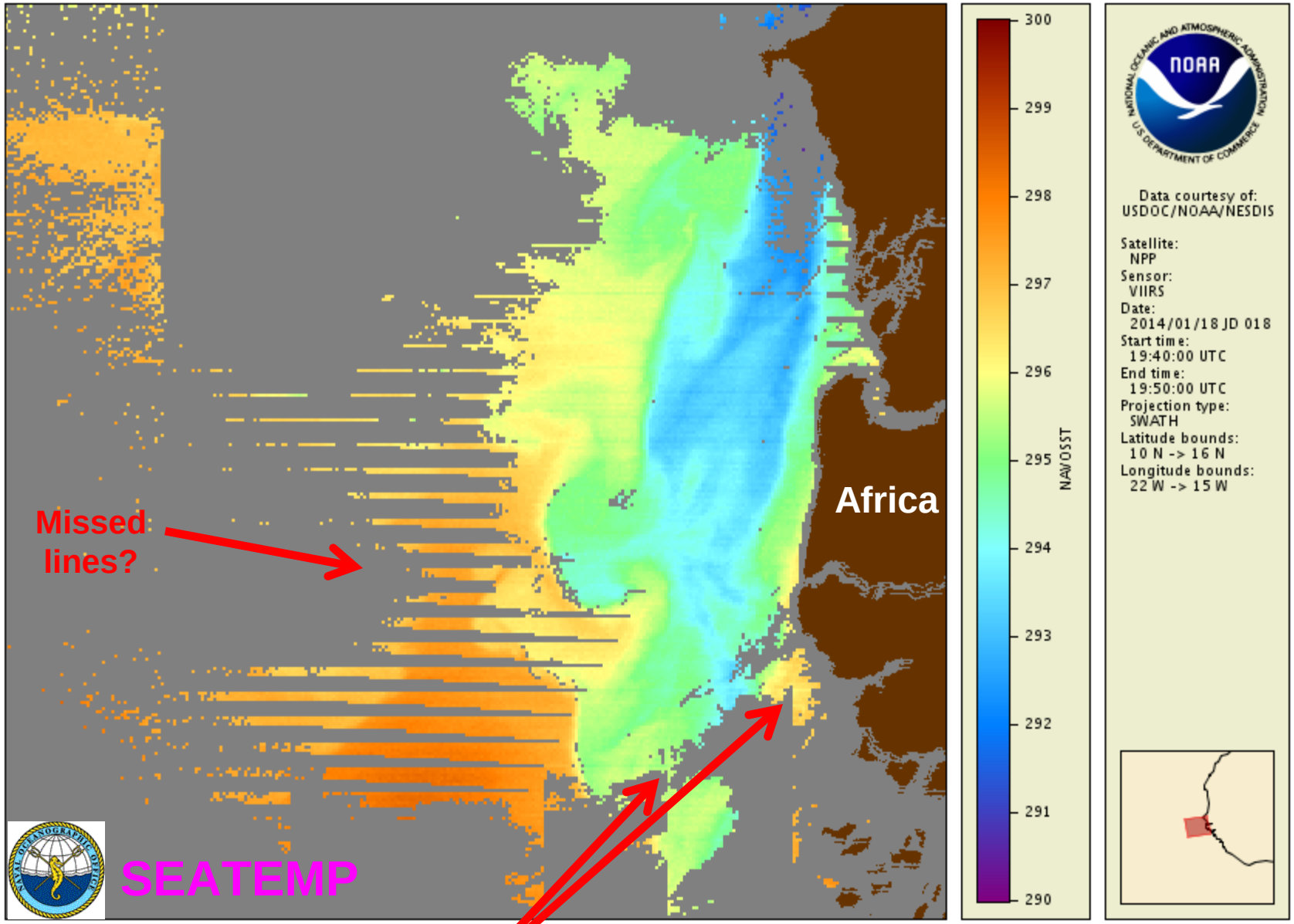
- *IDPS: SST domain is comparable with ACSPO, All stats degraded*
- *NAVO: SST domain is factor of ×3 smaller than ACSPO, stats comparable*

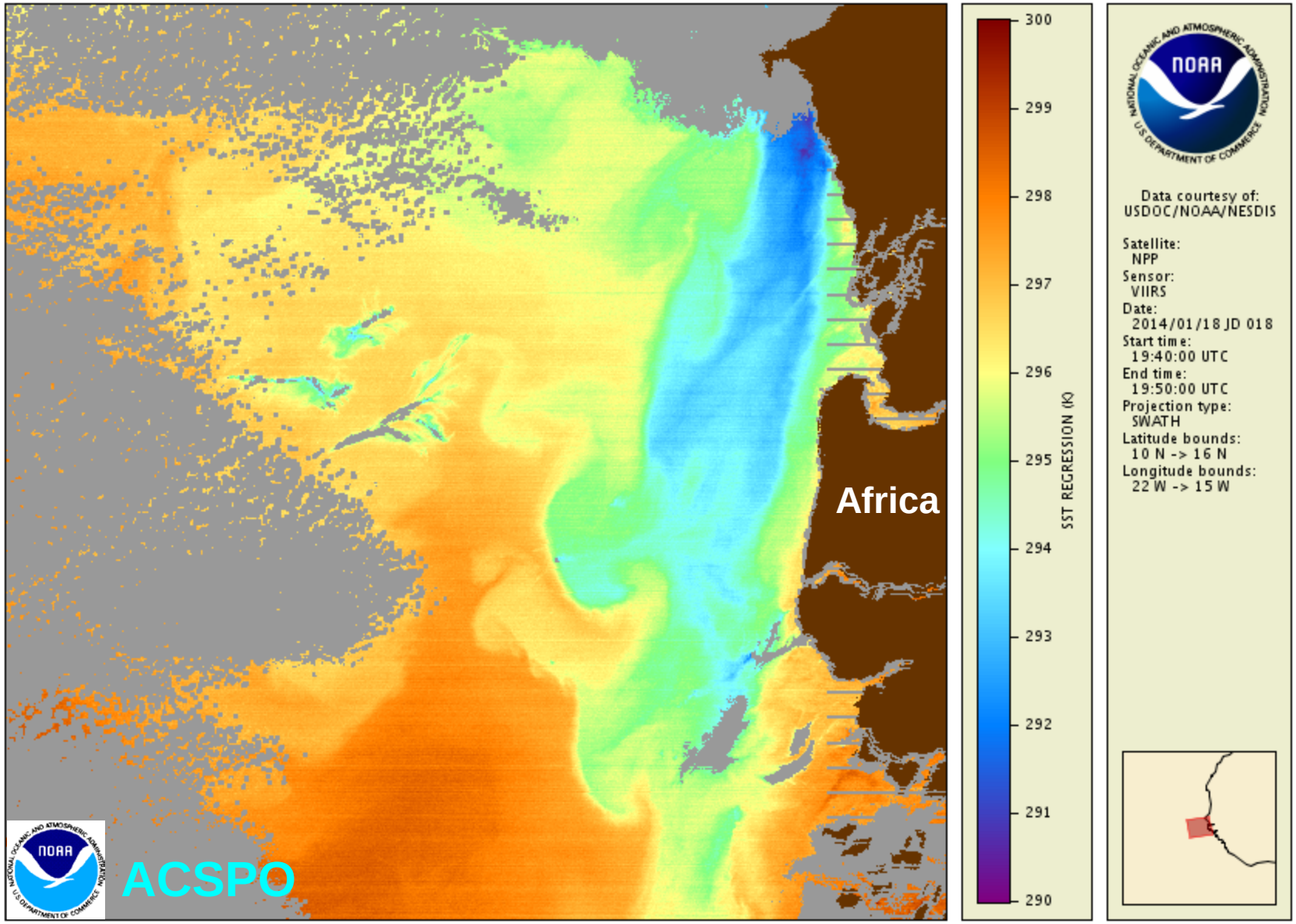
ΔT = "VIIRS minus in situ" SST (expected ~0)

	NOBS (%ACSPO)	Min/ Max	Mean/ STD	Med/ RSD
IDPS	1,758 (105%)	-5.3/+2.7	-0.06/0.77	+0.10/0.48
ACSPO	1,680 (100%)	-1.4/+2.8	+0.07/0.42	+0.06/0.37
NAVO	510 (30%)	-1.2/+2.1	+0.12/0.35	+0.07/0.35

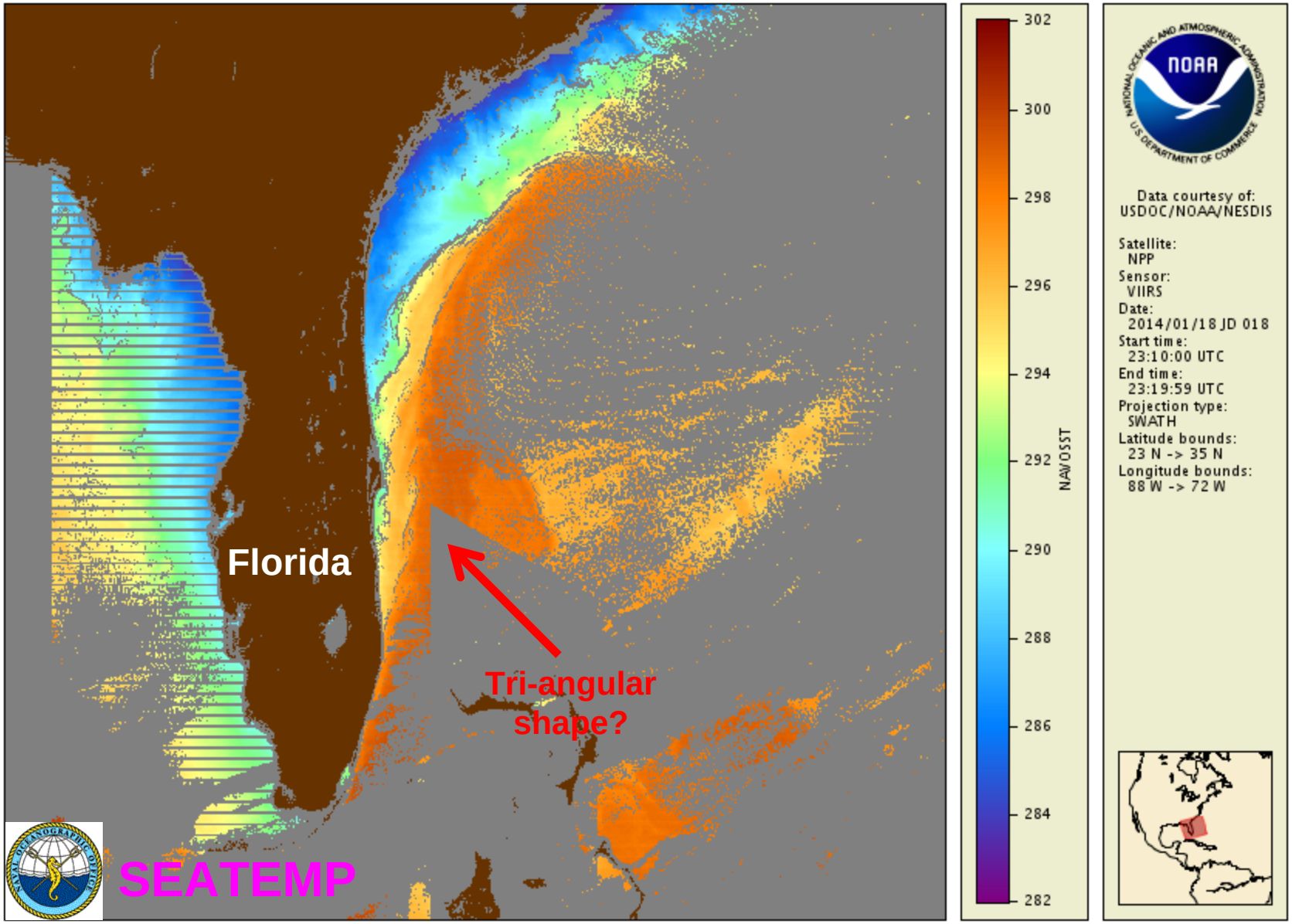
- *IDPS: SST domain is +5% larger than ACSPO, All stats degraded*
- *NAVO: SST domain is factor of ×3 smaller than ACSPO, stats improved*

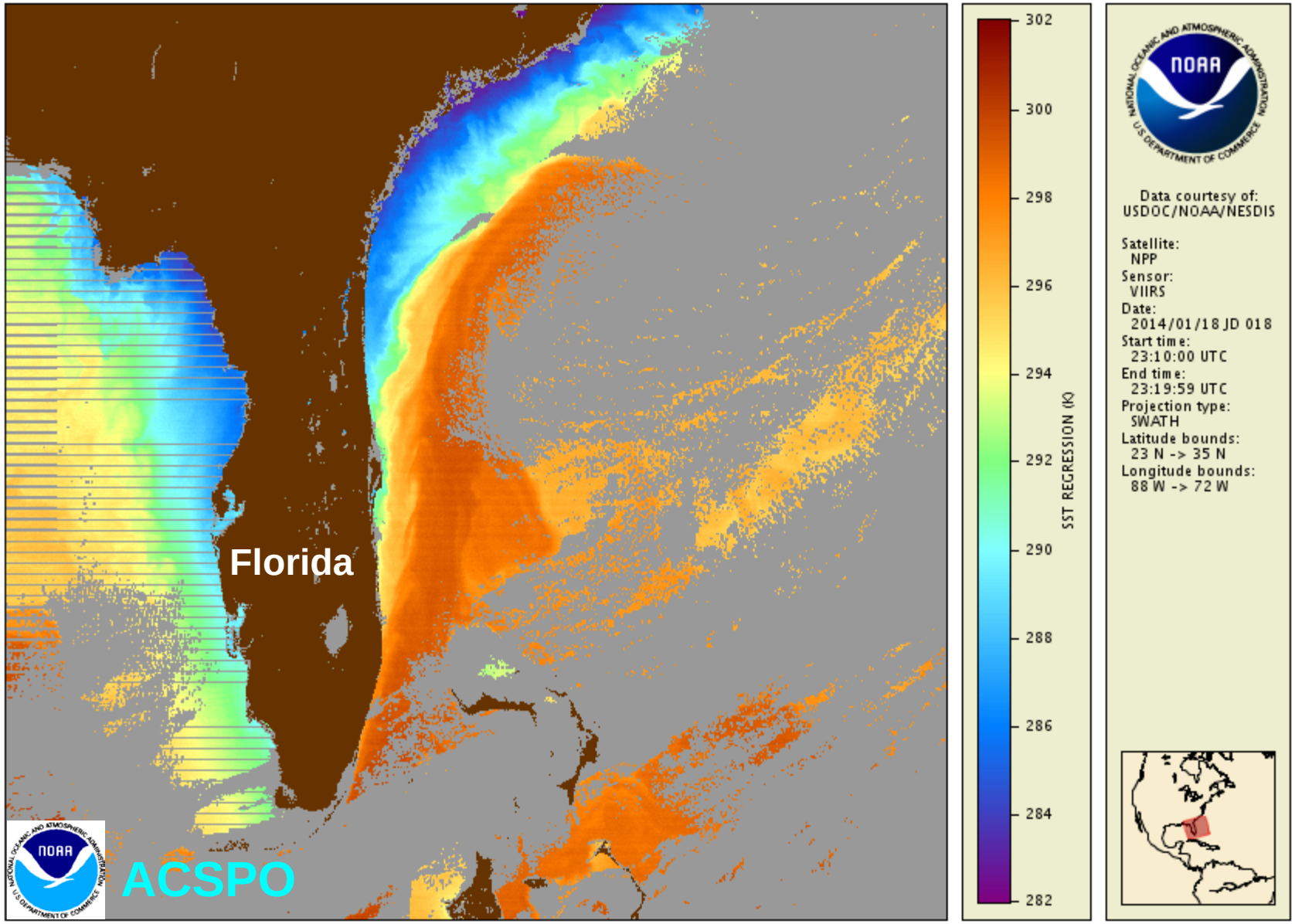
ACSPO_V2.30b01_NPP_VIIRS_2014-01-18_1440-1450_20140314.174252_NAVO



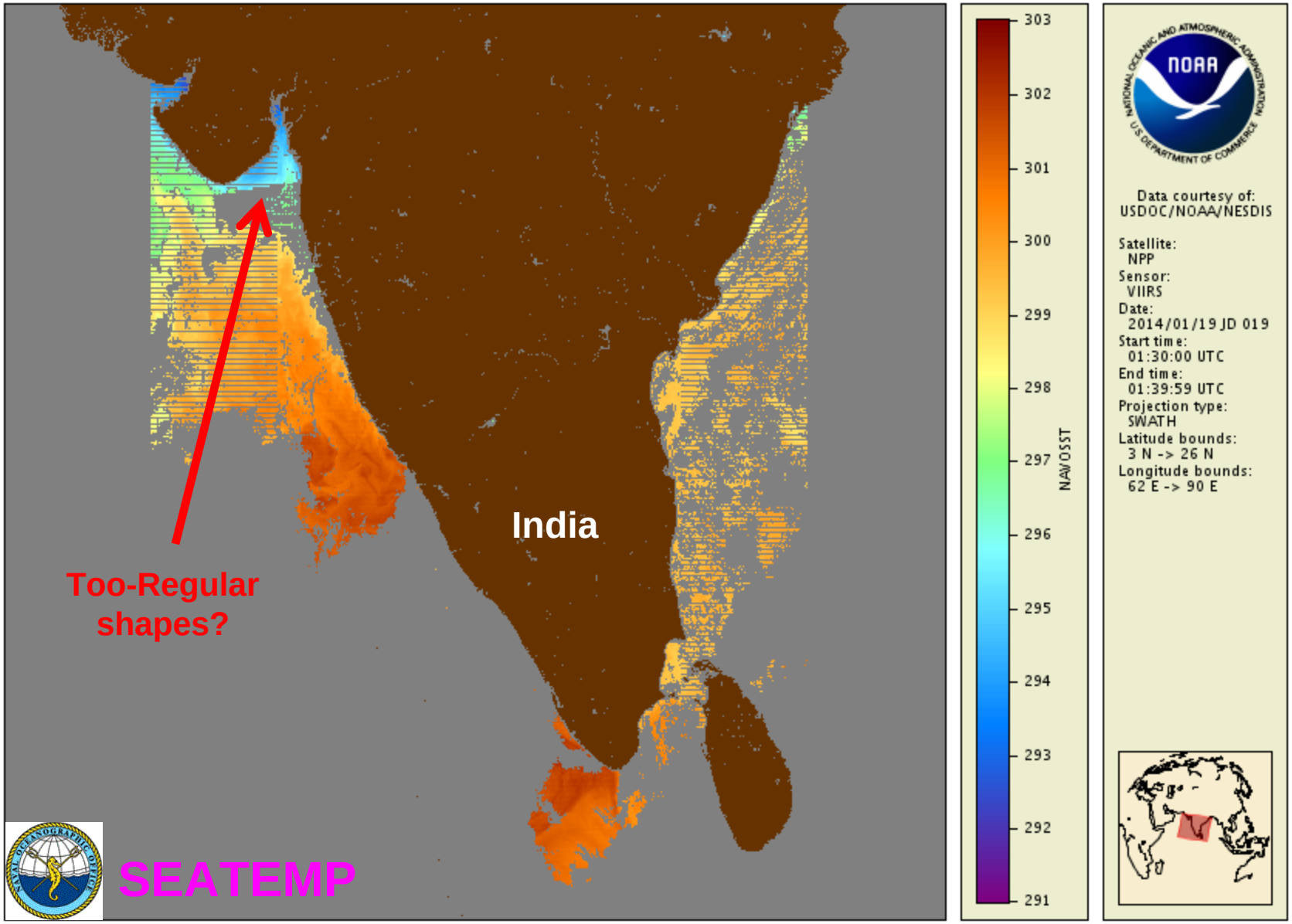

Africa
ACSPO
300
299
298
297
296
295
294
293
292
291
290
SST REGRESSION (K)
Data courtesy of:
USDOC/NOAA/NESDIS
Satellite:
NPP
Sensor:
VIIRS
Date:
2014/01/18 JD 018
Start time:
19:40:00 UTC
End time:
19:50:00 UTC
Projection type:
SWATH
Latitude bounds:
10 N -> 16 N
Longitude bounds:
22 W -> 15 W

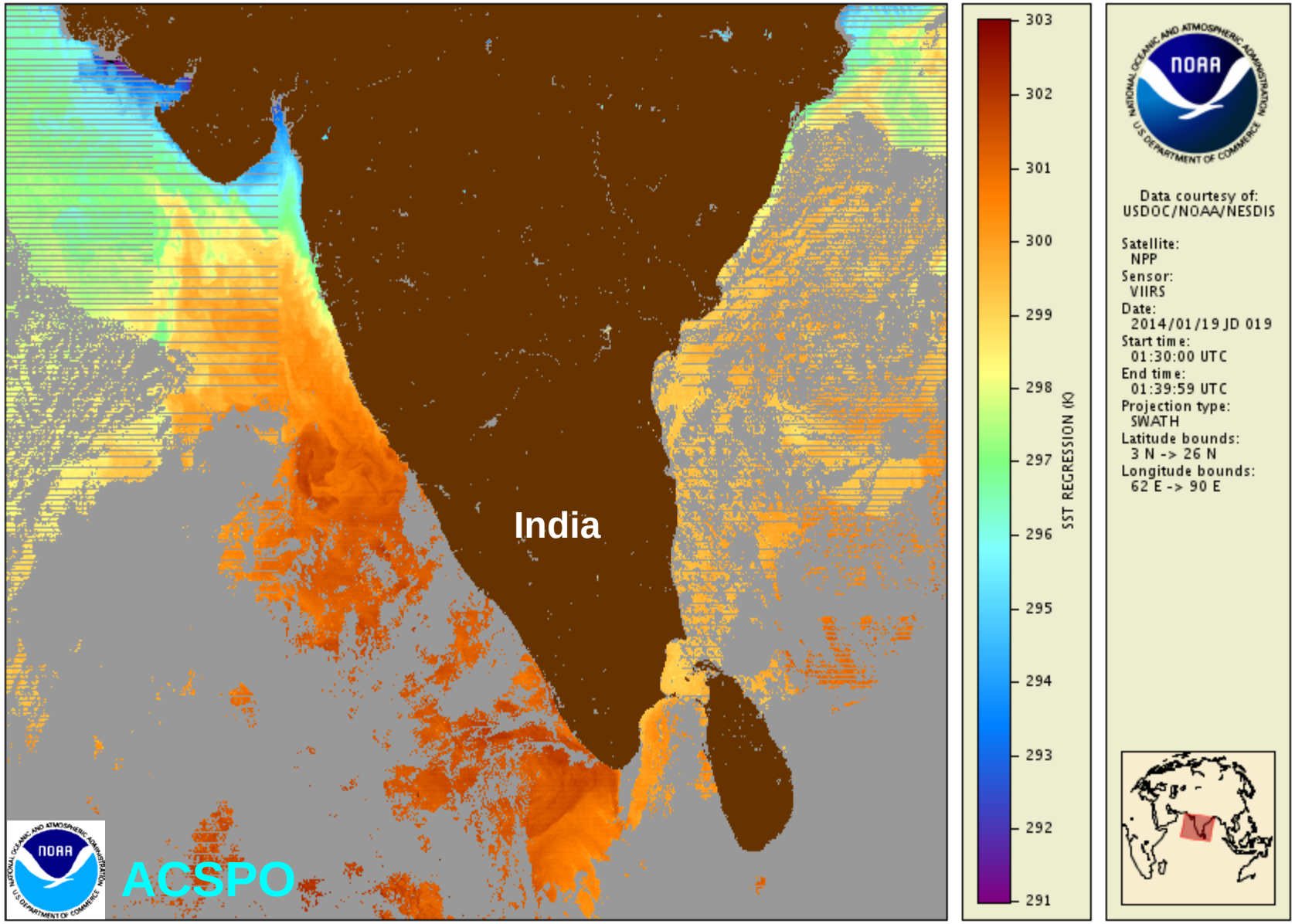
ACSPO_V2.30b01_NPP_VIIRS_2014-01-18_1810-1819_20140314.184153_NAVO



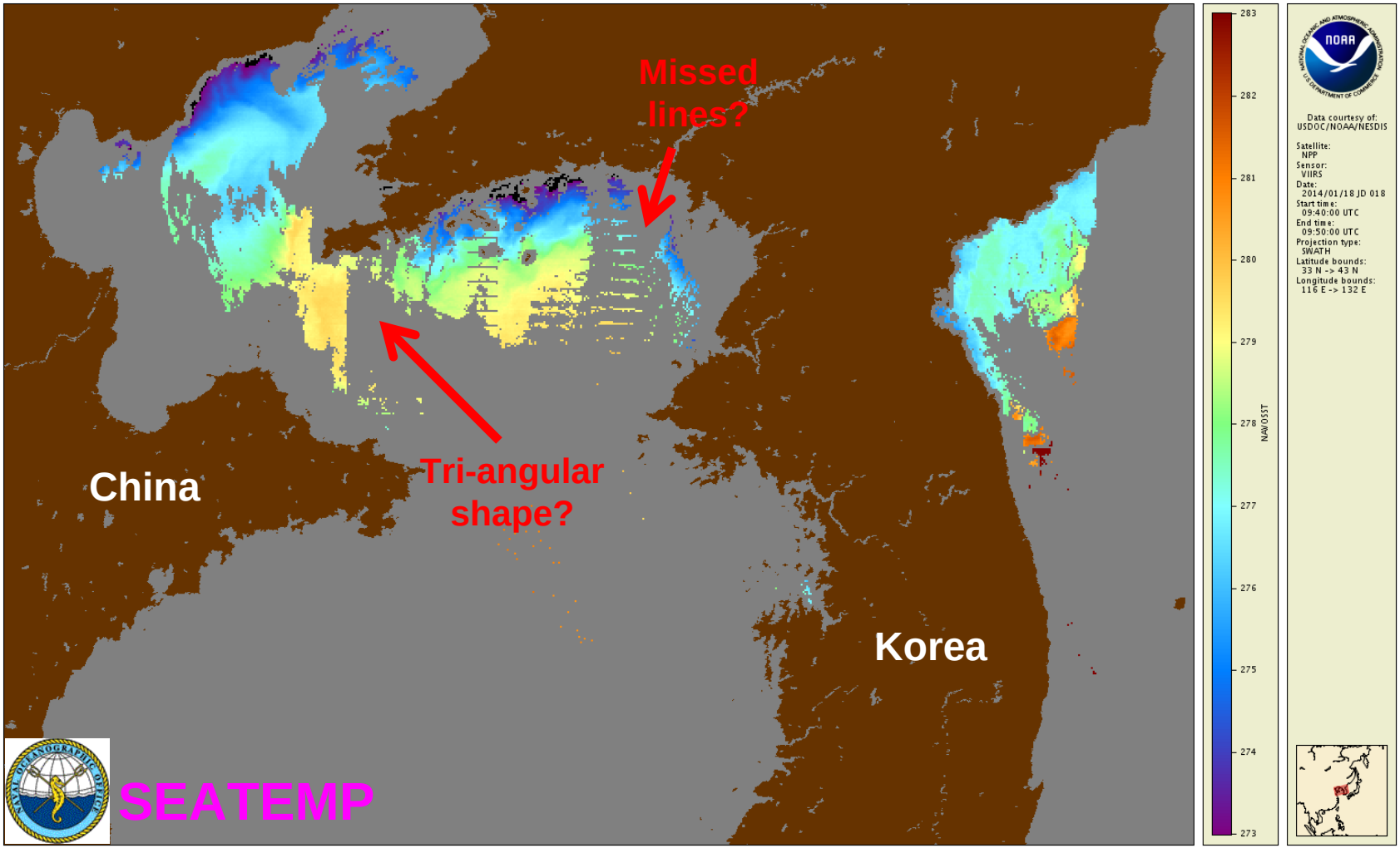

Florida
ACSPO
302
300
298
296
294
292
290
288
286
284
282
SST REGRESSION (K)
Data courtesy of:
USDOC/NOAA/NESDIS
Satellite:
NPP
Sensor:
VIIRS
Date:
2014/01/18 JD 018
Start time:
23:10:00 UTC
End time:
23:19:59 UTC
Projection type:
SWATH
Latitude bounds:
23 N -> 35 N
Longitude bounds:
88 W -> 72 W

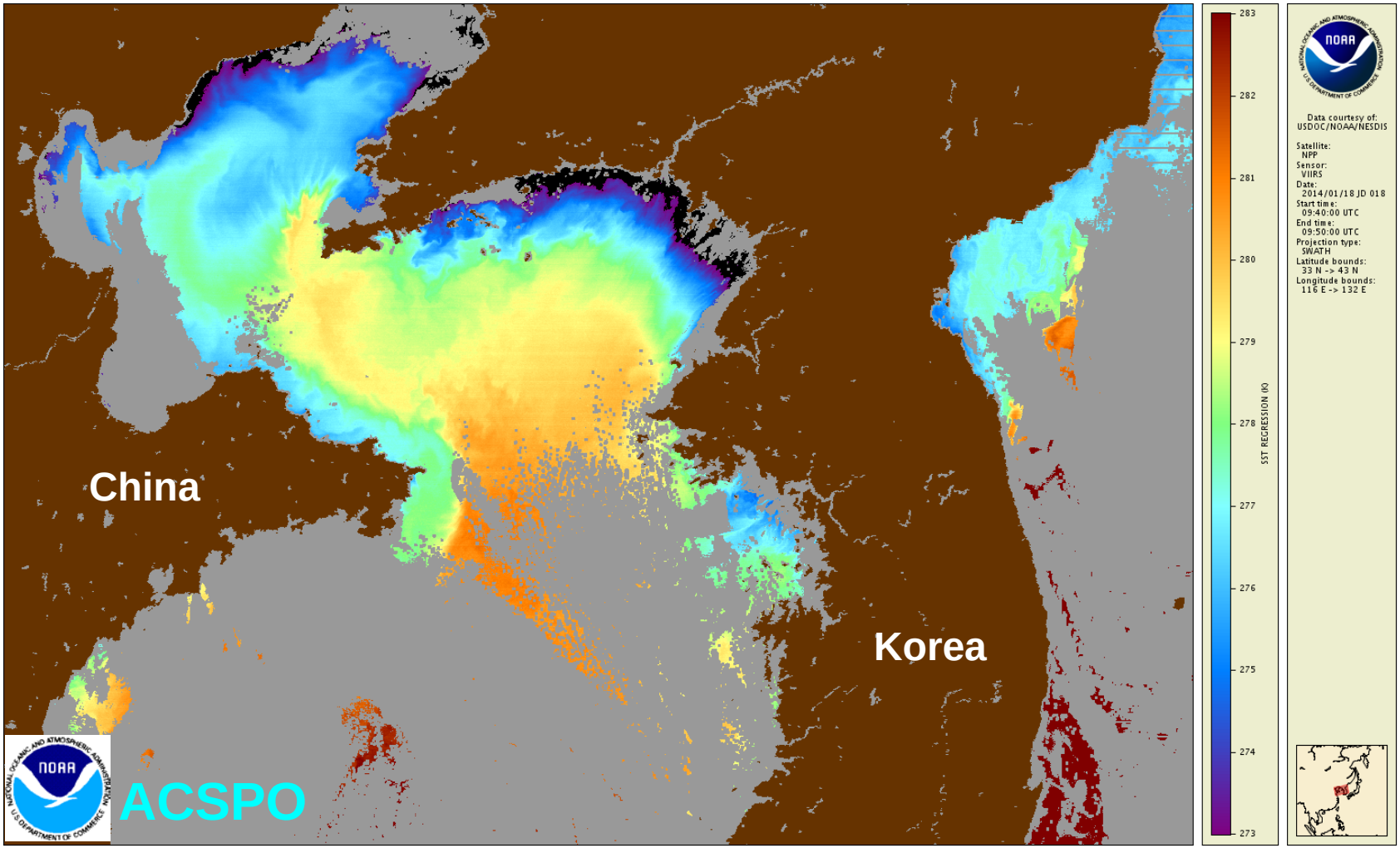
ACSPO_V2.30b01_NPP_VIIRS_2014-01-18_2030-2039_20140314.192134_NAVO




India
ACSPO
303
302
301
300
299
298
297
296
295
294
293
292
291
SST REGRESSION (K)
Data courtesy of:
USDOC/NOAA/NESDIS
Satellite:
NPP
Sensor:
VIIRS
Date:
2014/01/19 JD 019
Start time:
01:30:00 UTC
End time:
01:39:59 UTC
Projection type:
SWATH
Latitude bounds:
3 N -> 26 N
Longitude bounds:
62 E -> 90 E

ACSPO_V2.30b01_NPP_VIIRS_2014-01-18_0440-0450_20140314.145310_NAVO




China
Korea
ACSPO
283
282
281
280
279
278
277
276
275
274
273
SST REGRESSION (K)
Data courtesy of:
USDOC/NOAA/NESDIS
Satellite:
NPP
Sensor:
VIIRS
Date:
2014/01/18 JD 018
Start time:
09:40:00 UTC
End time:
09:50:00 UTC
Projection type:
SWATH
Latitude bounds:
33 N -> 43 N
Longitude bounds:
116 E -> 132 E

Conclusion and Near-Future Work

ACSPO and NAVO are two VIIRS SST choices for users

- ✓ Both are GDS2, available (or shortly to be) via JPL/NODC
- ✓ ACSPO retrieval domain is larger than NAVO, by a factor of ~3, due to NAVO narrow swath VZA<54°, conservative cloud mask
- ✓ NAVO STDs are smaller than ACSPO by a narrow margin

Near-Term ACSPO tasks

- ✓ Work with users, solicit feedback, improve ACSPO
- ✓ Implement destriping operationally (Karlis Mikelsons)
- ✓ Pattern recognition ACSPO Clear-Sky Mask (Irina Gladkova)
- ✓ Focus on high-latitudes
- ✓ Focus on improved Quality Flags and Levels
- ✓ Generate L3 ACSPO product – many users requests
- ✓ Establish reprocessing and back-fill ACSPO VIIRS to Jan'2012