Toward Regional Validation and Potential Enhancements to NOAA Polar SST Products

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Advanced Clear-Sky Processor for Oceans (ACSPO) Sea Surface Temperature (SST) Products

- **ACSPO System and Polar Products**

  i. Advanced Clear-Sky Processor for Oceans (ACSPO) – NOAA SST system

  ii. S-NPP VIIRS; NOAA-18/-19, Metop-A/-B AVHRR; Terra/Aqua MODIS

  iii. Current global monitoring and validation

  SQUAM: www.star.nesdis.noaa.gov/sod/sst/squam/

  iv. Complementing global Validation with Regional was recommended by JPSS Program Office

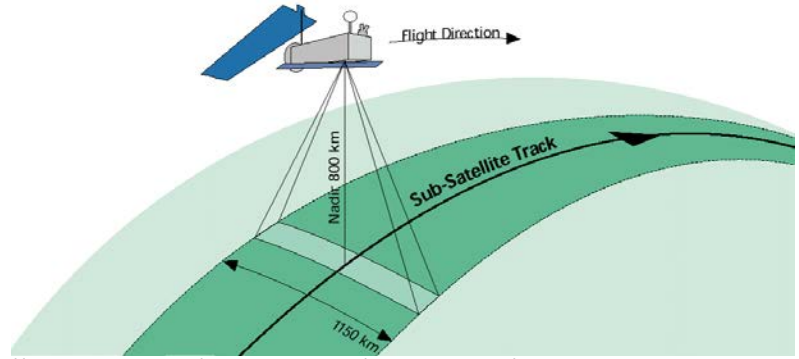
Advanced Clear-Sky Processor for Oceans (ACSPO) Sea Surface Temperature (SST) Products

❖ **Motivation for L3 Products (aggregated/gridded in space and potentially in time)**

i. Main ACSPO product: Level 2 (**L2P**) – in swath projection

ii. **L3U** (Un-Collated) – data from different overpasses are preserved. Requested by ACSPO users, to reduce data volume – implemented (1GB/day vs. 27GB/day for L2P)

iii. **L3C** (Collated; data from different overpasses from the same satellite are fused together) / **L3S** (Super-collated; data from different satellites): Requested by some users to analyze SST imagery (fewer files/images, fewer gaps in imagery, smaller data



http://lms.seos-project.eu/learning_modules/marinepollution/marinepollution-c03-s06-p01.html

Advanced Clear-Sky Processor for Oceans (ACSPO) Sea Surface Temperature (SST) Products

- **New ACSPO Regional Monitor for SST (ARMS) is being developed**

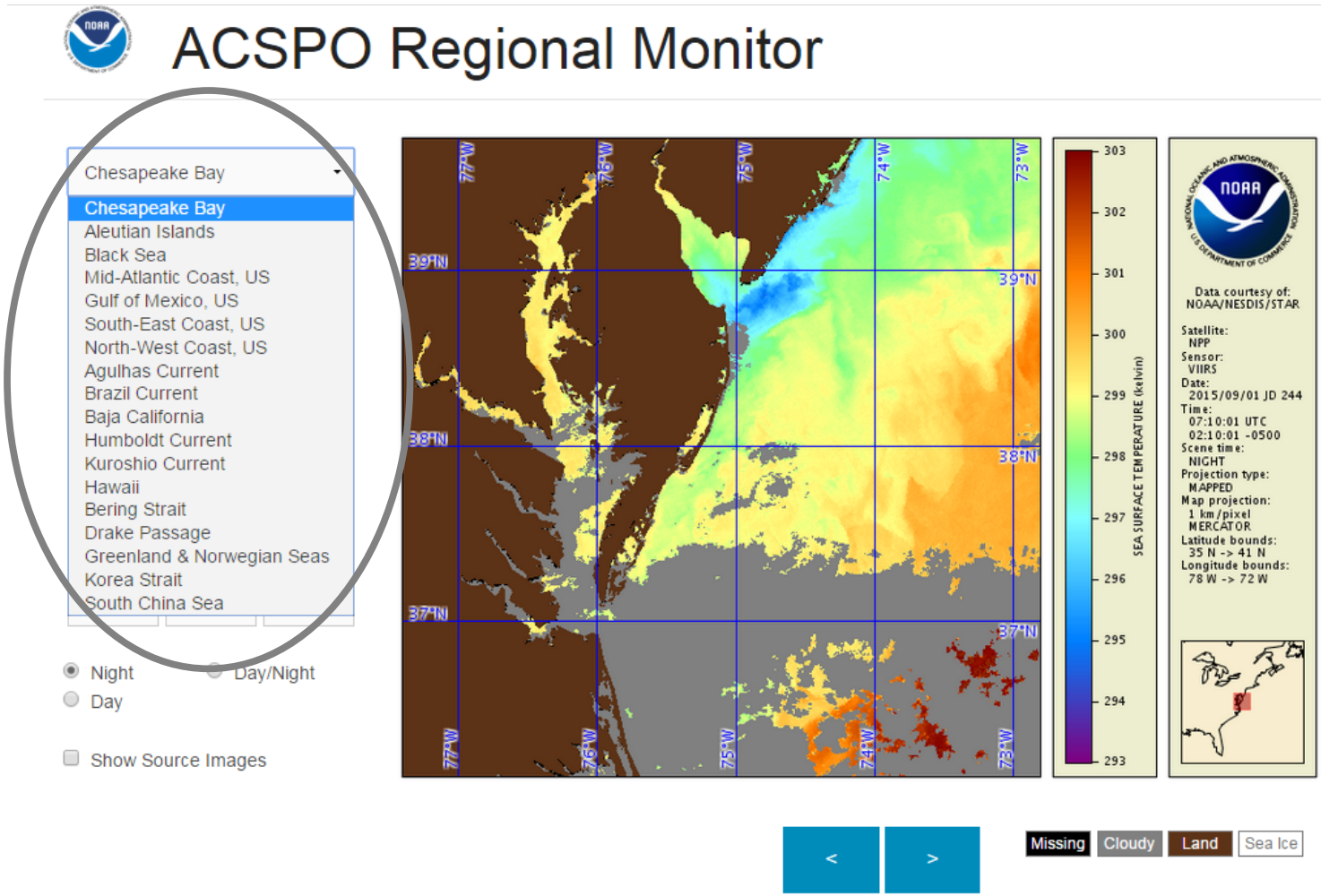
  i. Temporary location www.star.nesdis.noaa.gov/sod/osb/sst/yding/specialregionsfoundation/

  ii. 1st step towards L3C/L3S – How many images over a target area? Is domain/SST consistent?

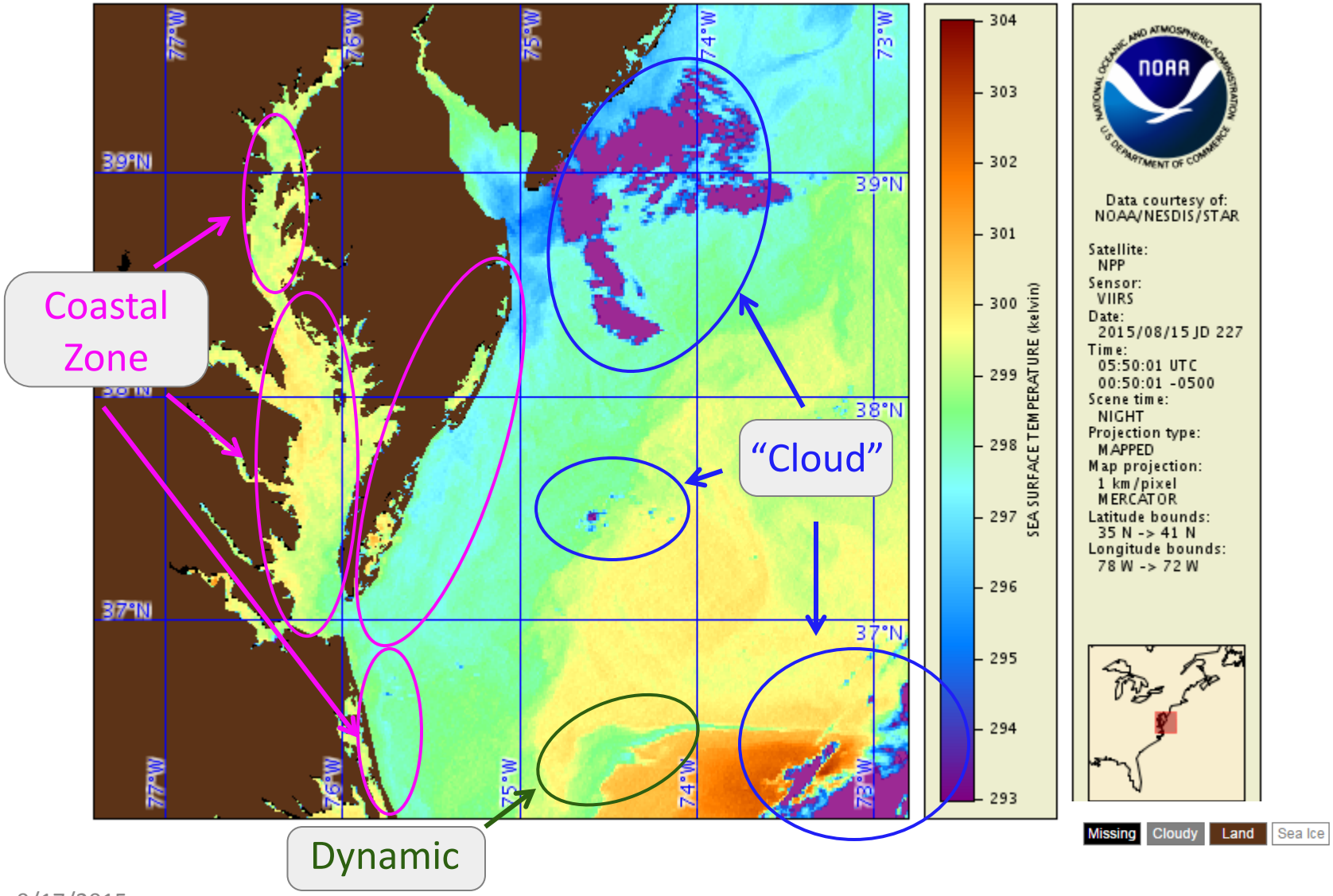
  iii. Focuses on challenging areas: Coastal / Internal waters; High-latitudes; Cloudy regions; Dynamic areas (e.g., Gulf Stream); Other regions of interest to SST users

Interface of the ARMS

- ✓ Currently, monitors only polar satellites (geostationary may be added later)
- ✓ Monitored are: SSTs and ΔSSTs=SST-Ref. SST (CMC L4), Clear-sky and All-sky
- ✓ Currently, includes 18 special regions (can be changed/expanded based on users needs)

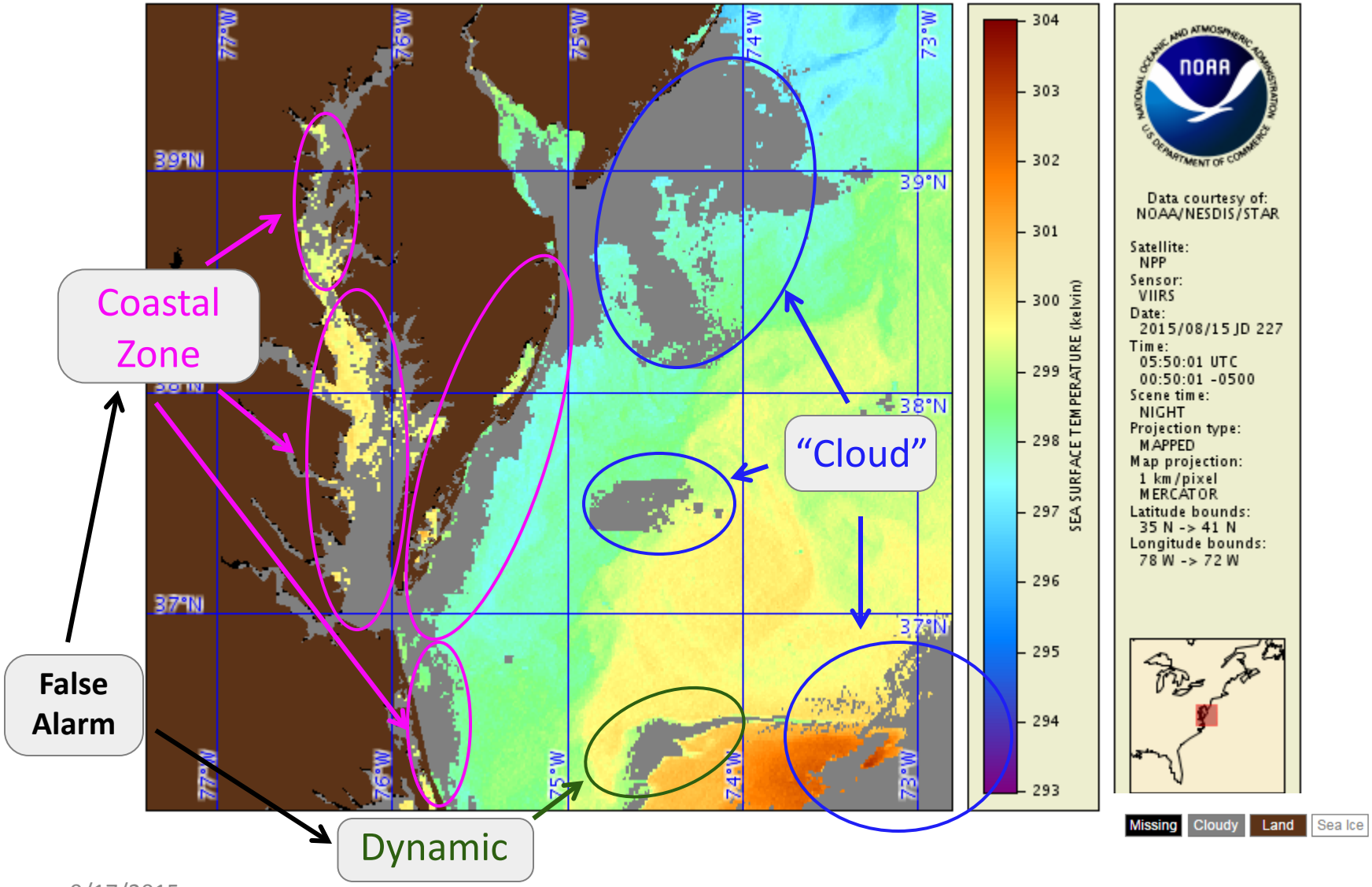


Example #1: Coastal/Dynamic region (Chesapeake Bay)

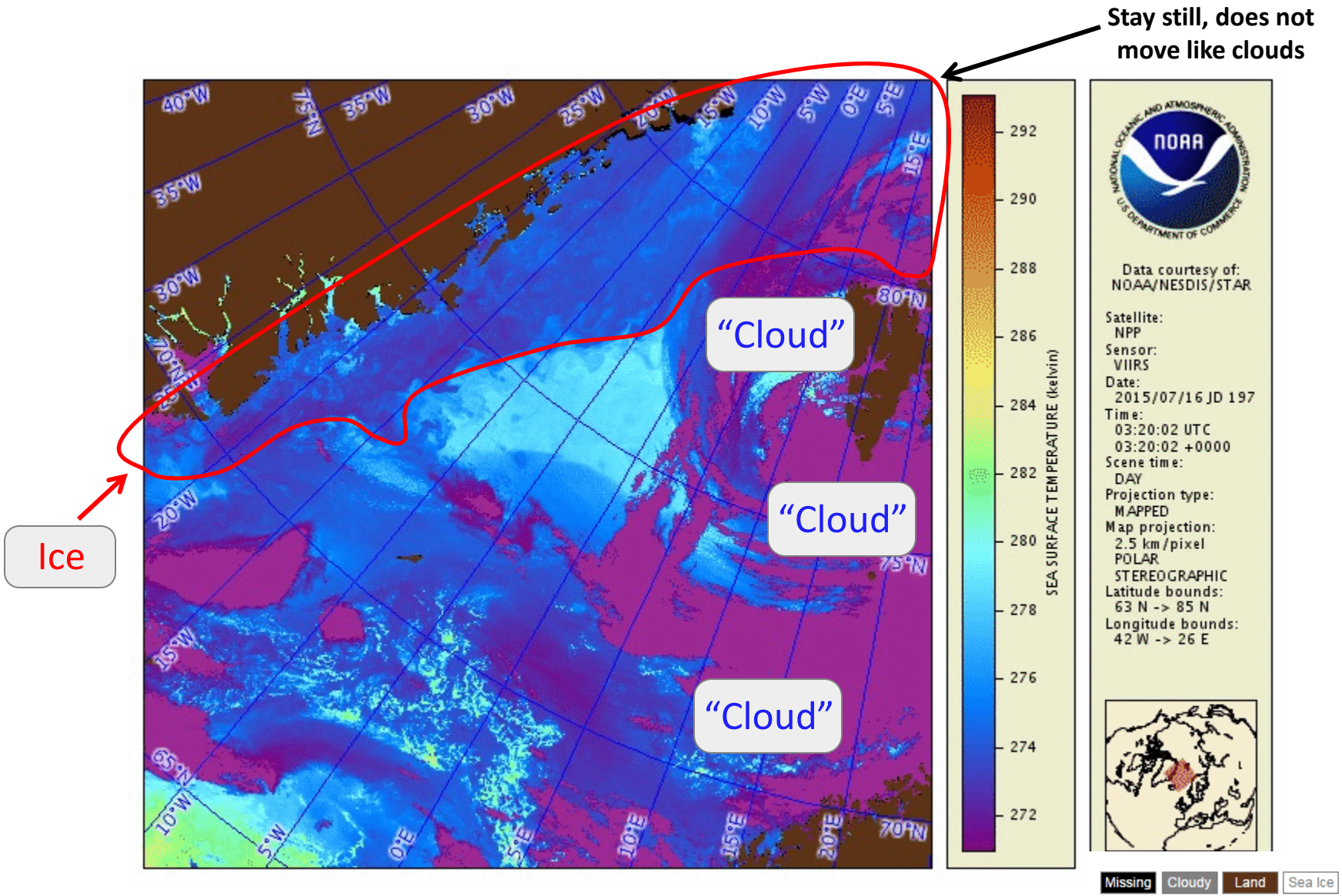


Example #1: Coastal/Dynamic region (Chesapeake Bay)

✓ The cold regions (coastal and dynamic areas) may be identified as "cloud" by ACSPO

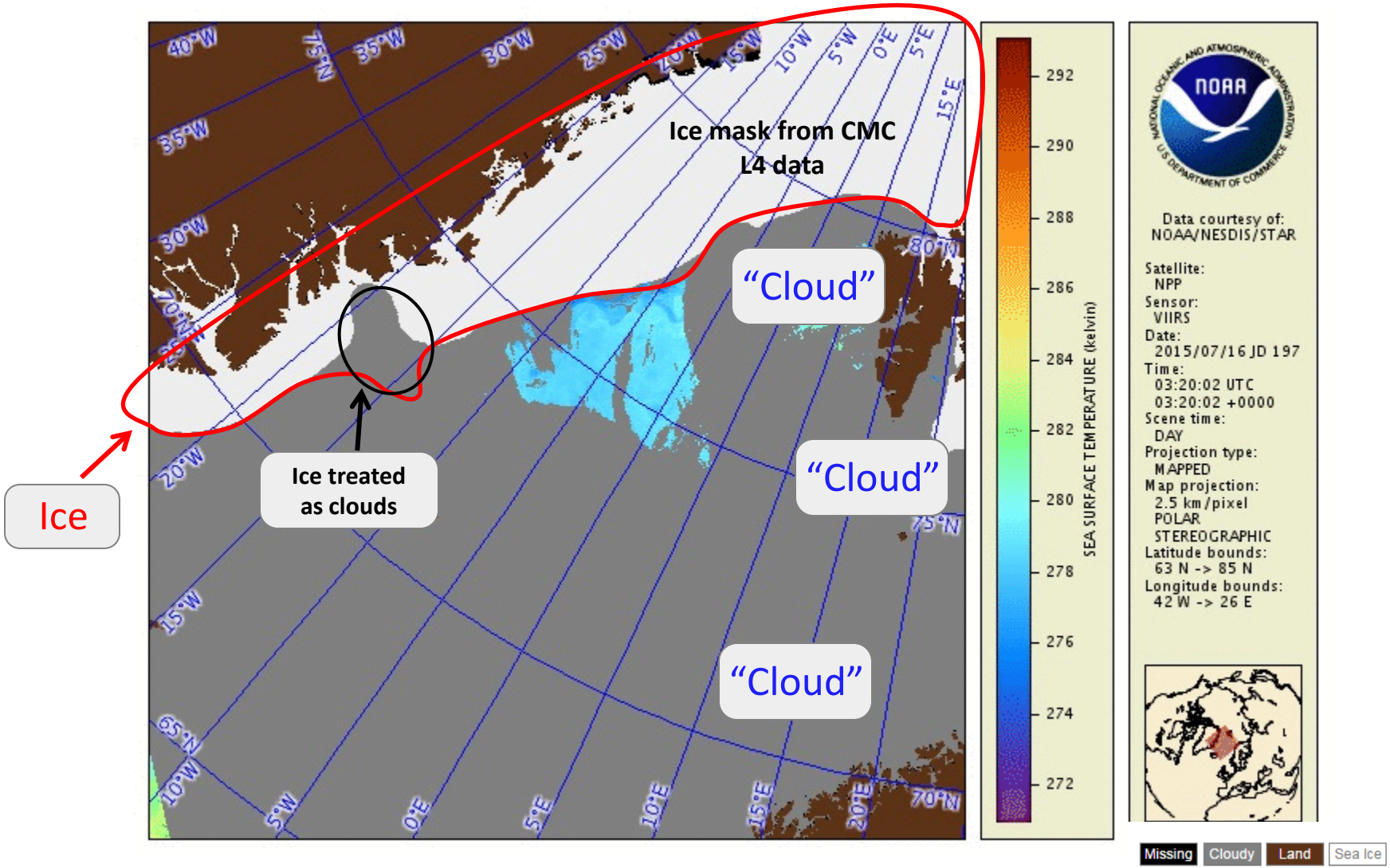


Example #2: High-latitudes (Greenland/Norwegian Seas)



Example #2: High-latitudes (Greenland/Norwegian Seas)

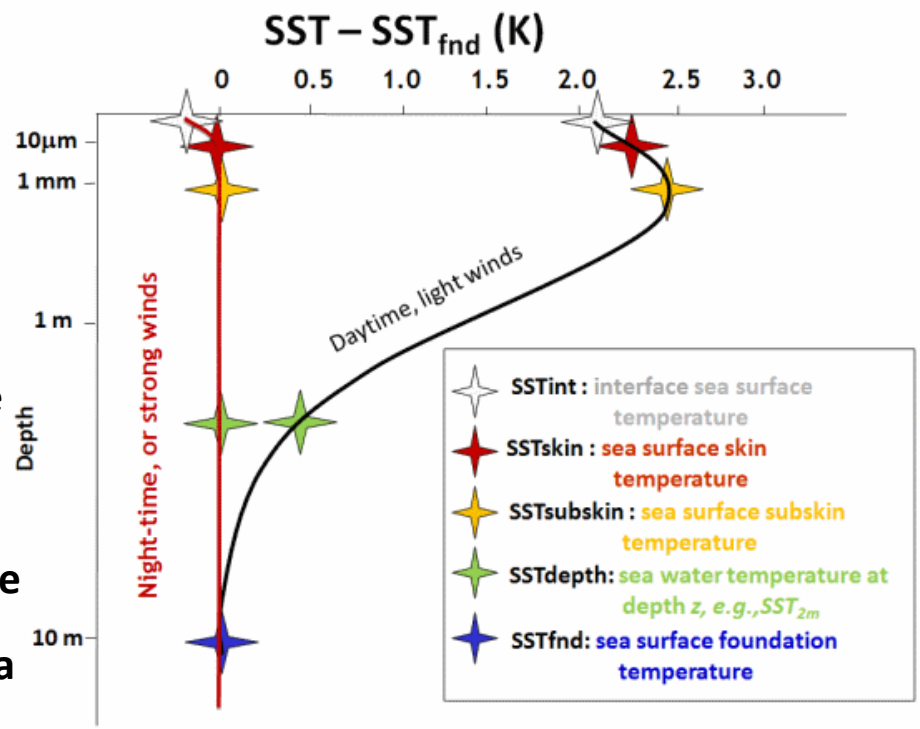
✓ Sea ice and cold water may be identified as "cloud" by ACSPO



Challenges facing L3C/L3S SST products

- **L3C/L3S SSTs**
  - gridded, two data sets per day (daytime & nighttime)
  - aggregate data from different passes of the same satellite / different satellites
  - convenient for users to do image analysis (fisheries, shipping, etc)

- **Difficulties in processing L3C/L3S**
  - **Impact of overpass time**
    - Satellite(s) pass at different times, subject to different phases of diurnal cycle (work is underway to model or measure the diurnal cycle)
    - SST is not static – patterns may move
  - **Impact of variable cloud**
  - **Impact of variable view zenith angle**
  - **Non-uniform quality control of data**



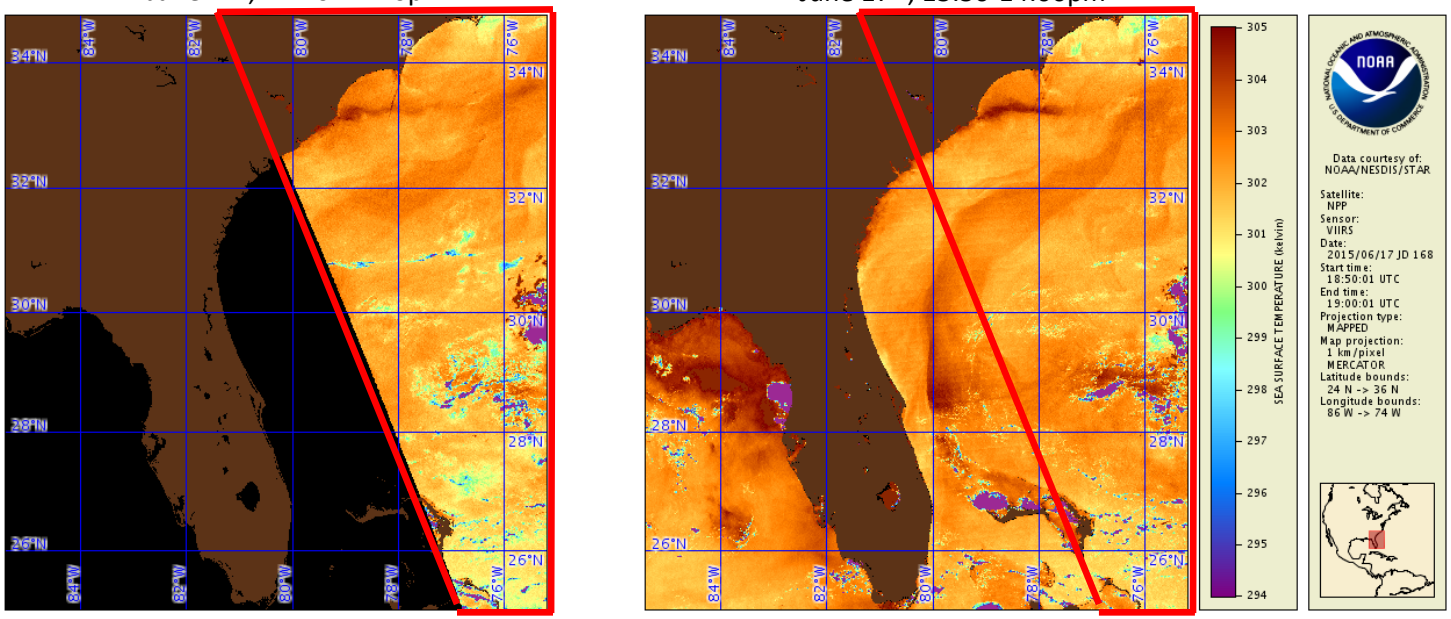
Source: https://www.ghrsst.org/science-and-applications/sst-definitions/

Two VIIRS overpasses over the southeast US coast, daytime

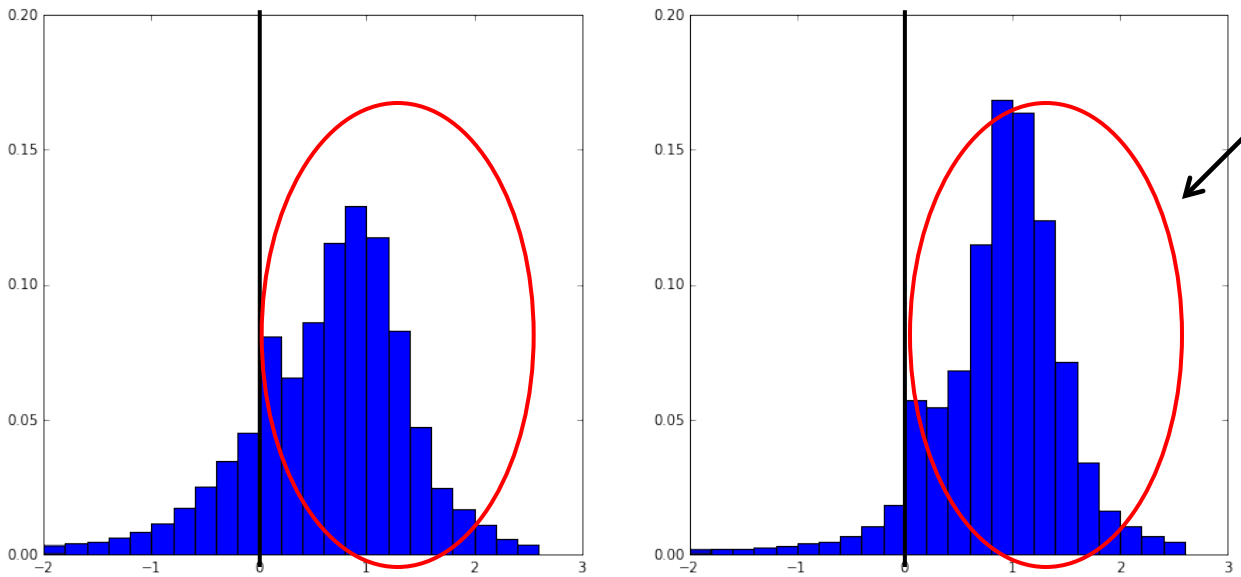
June17th, 12:10-12:20pm

June 17th, 13:50-14:00pm

Very few clouds



Distribution of ΔSST (SST - ref. SST)



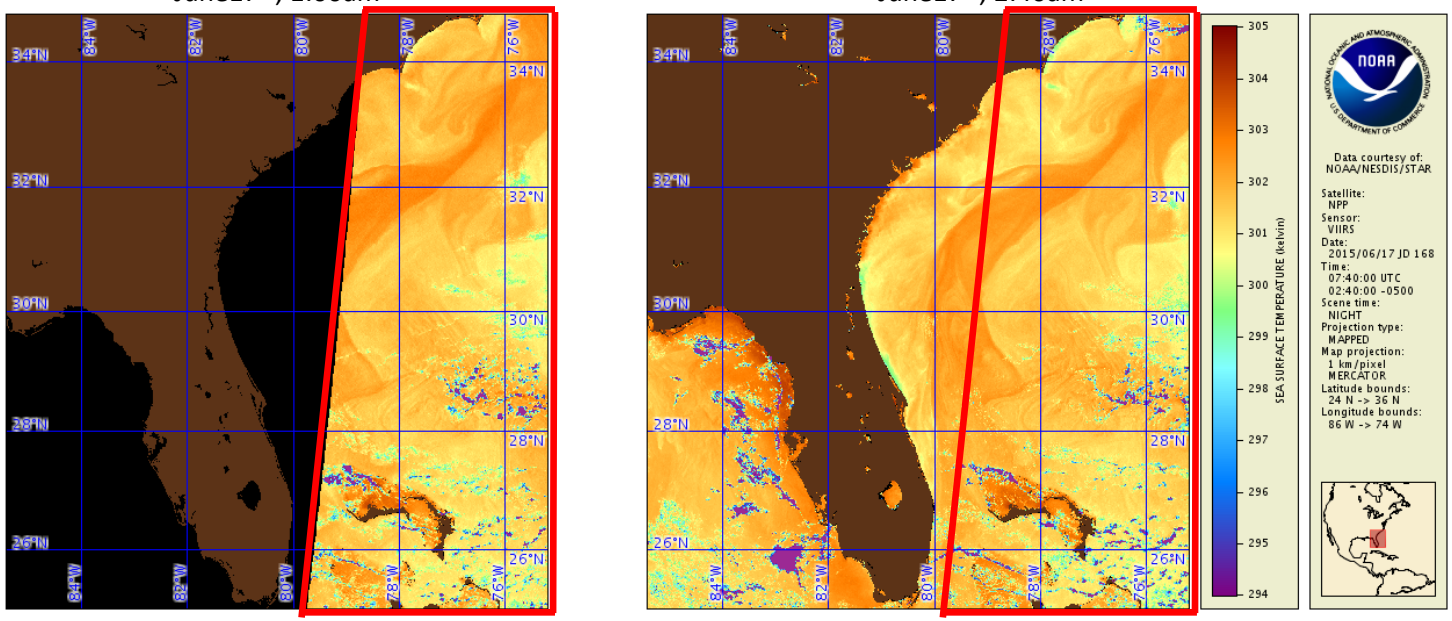
Daytime warming in 1 hour and 40 minutes

Two VIIRS overpasses over the southeast US coast, nighttime

June17th, 1:00am

June17th, 2:40am

Very few clouds



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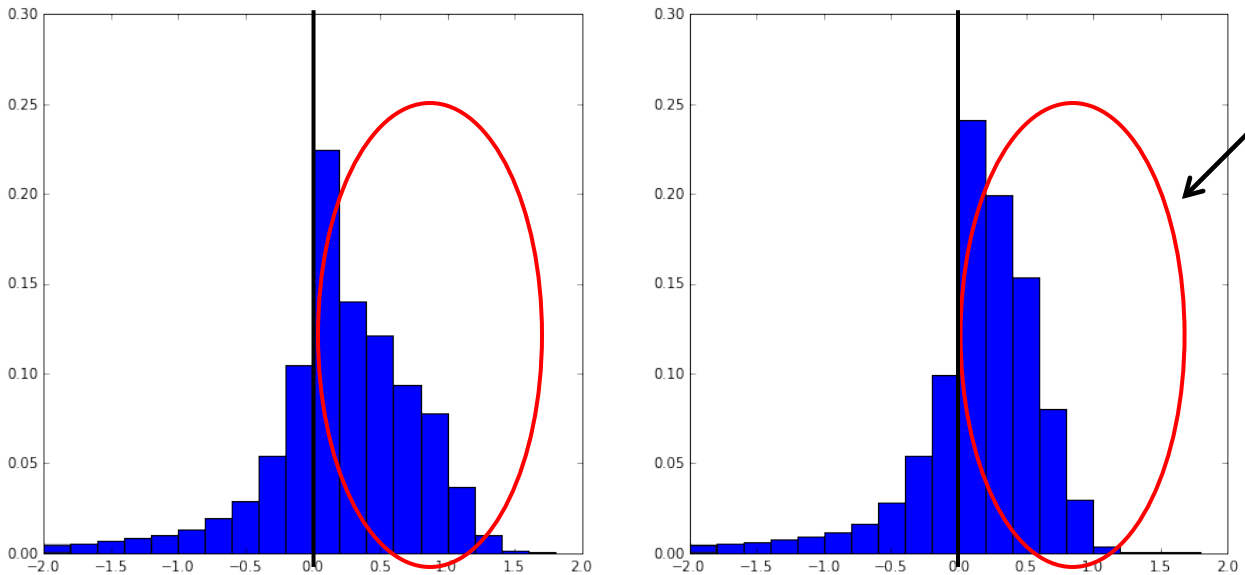


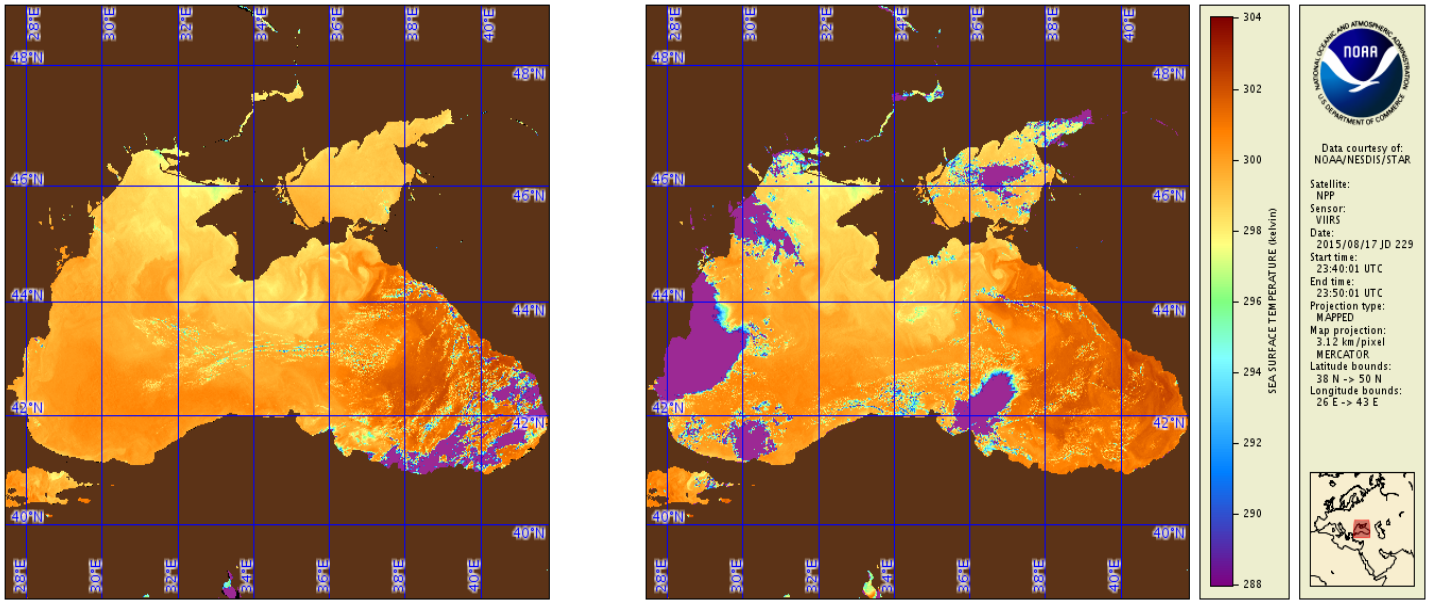
Nighttime cooling in 1 hour and 40 minutes

Two VIIRS passes over the Black Sea, nighttime

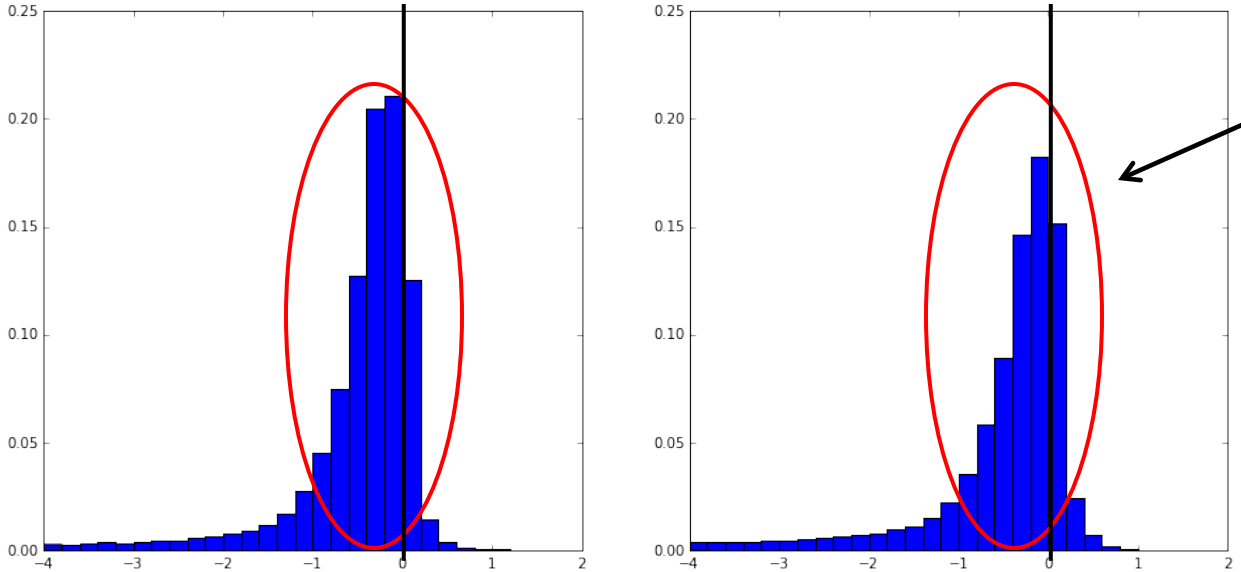
August 17th, 0:00 UTC

August 17th, 23:40-23:50 UTC

23h40m interval, minimum impact of diurnal cooling



Distribution of ΔSST (SST - ref. SST)



Different due to varying cloud distribution

Current Status & Future work

- The ACSPO Regional Monitor website is in advanced stage. It provides a convenient way to monitor and examine the performance of ACSPO SST in various regions of the ocean (e.g., coastal and dynamic ocean, high latitudes, etc). Our experience suggests that the ACSPO clear-sky mask tends to be overly conservative in those regions.
- To obtain a high-quality L3C product, various factors should be considered, including the diurnal cycle, dynamics of SST patterns, cloud distribution and satellite view zenith angle.
- We are considering reconstructing a SST diurnal cycle based on both observations (geostationary satellite, etc) and level 4 products (OSTIA diurnal SST in process, etc).
- Work is underway with the users to decide on the value of L3C/L3S products, as opposed to the approach when high-spatial and temporal resolution L4 analysis is produced, with instantaneous L2/L3U inputs.
- In this case, the current users of L3C/L3S products will use the L4 gap free filed, whereas ARMS system will be used to validate such high-resolution L4 analysis, rather than be directed at creation of various flavors of L3C/L3S products

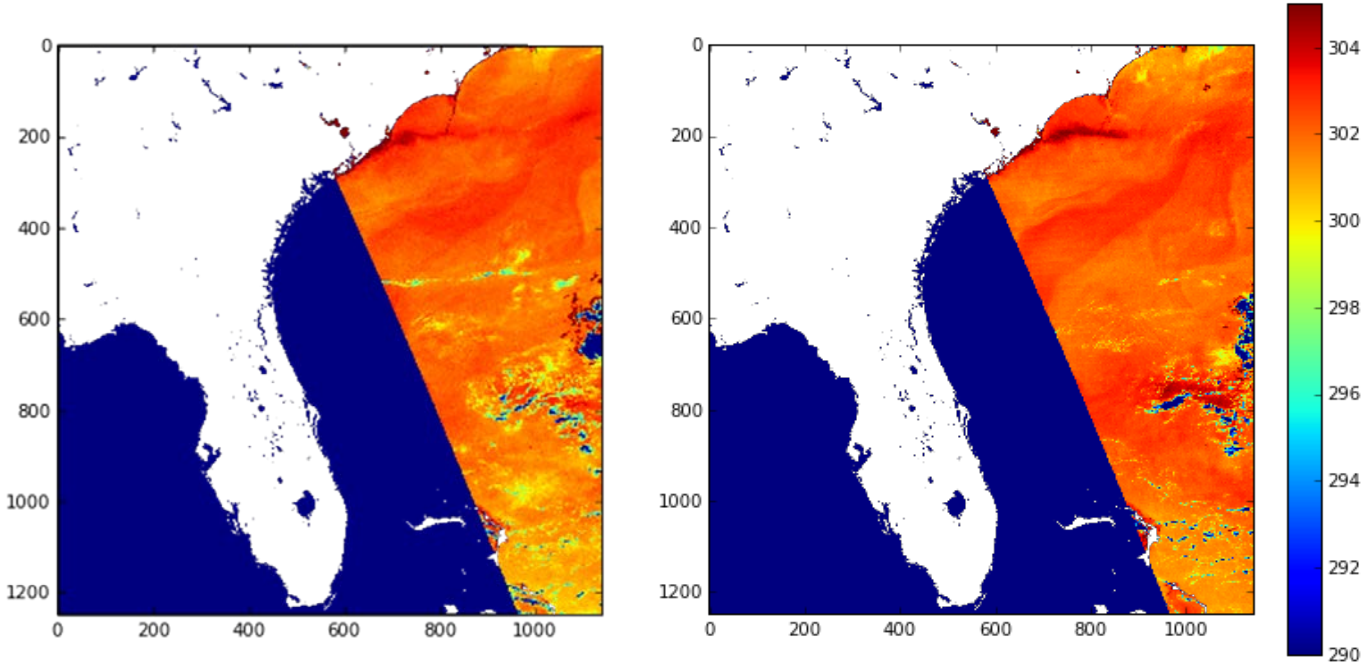
Thanks!

Any questions?

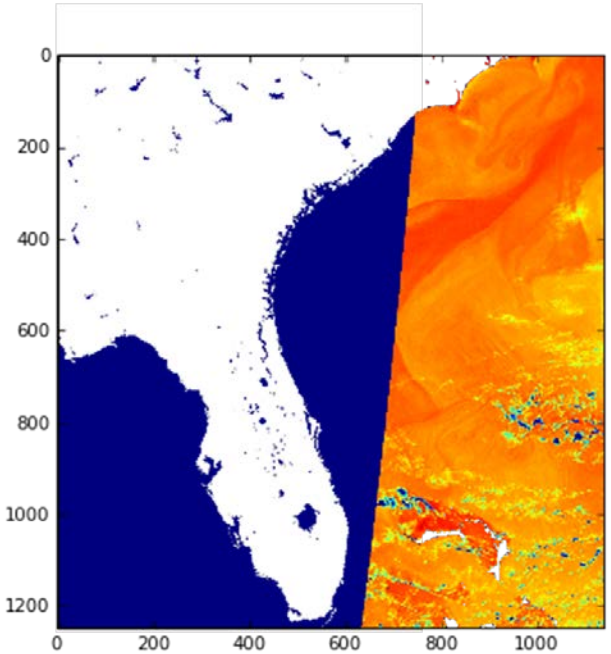
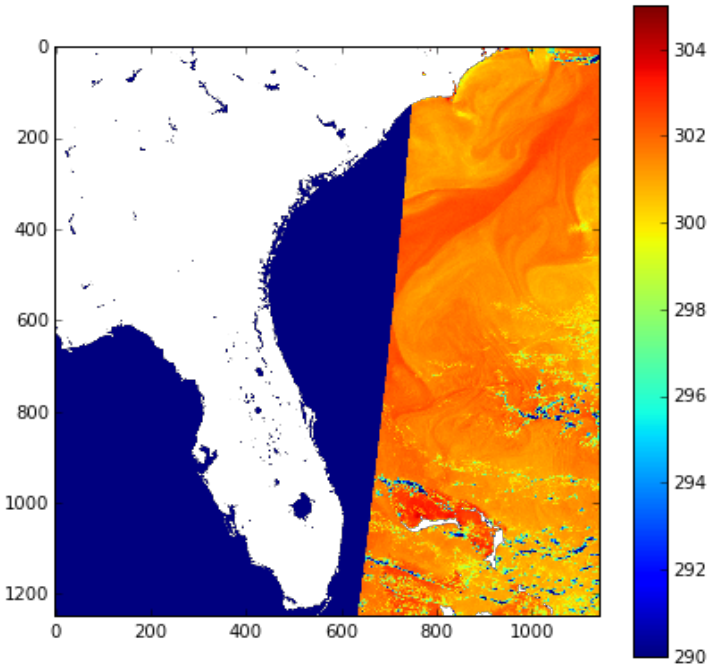
Back-up slides

June17th, 12:10-12:20pm

June 17th, 13:50-14:00pm



June17th, 1:00am



June17th, 2:40am