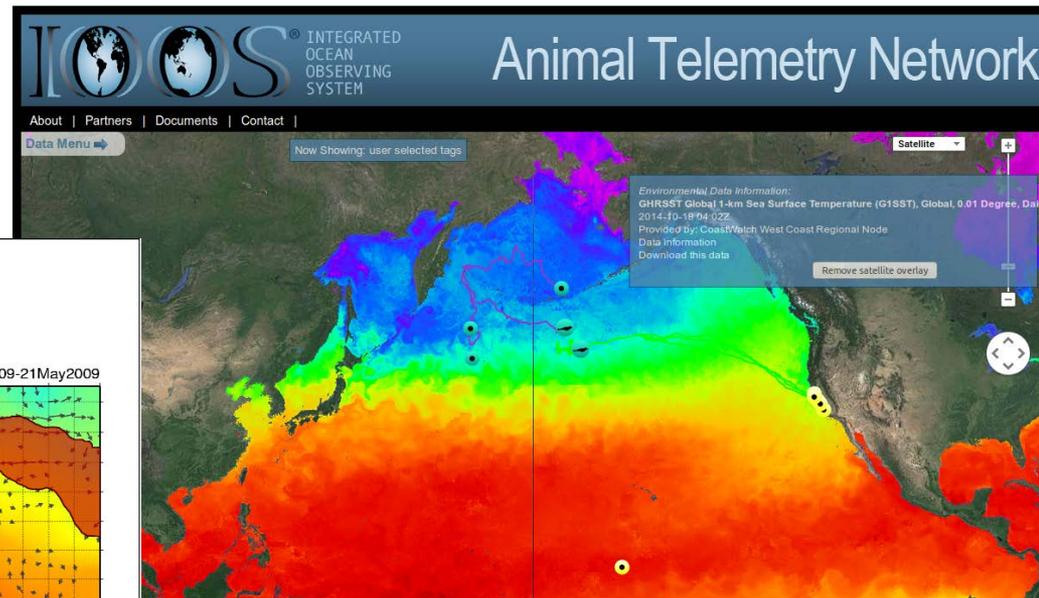


Multi-sensor Improved Sea-Surface Temperature for IOOS

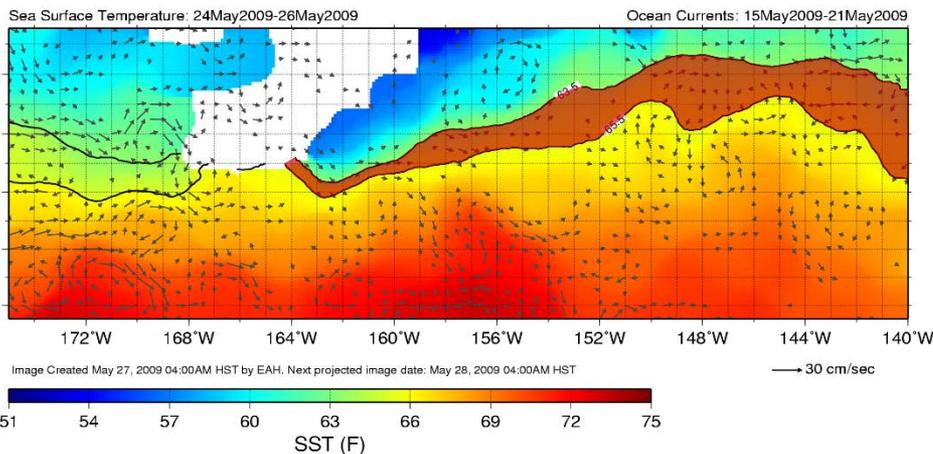
MISST PIs Gentemann, Cornillon, Casey and project partners: 28 scientists from Navy, JPL, NOAA, academia, and private industry. Through international cooperation, MISST is providing 12 satellite SSTs in NRT at their native sampling (L2 data) and gap-free NRT data at 1 km, daily resolution.

The L2 satellite data are used to make daily high resolution gap free analyses of SST that are used operationally. NRT are available from the PO.DAAC and NOAA ERDDAP. Historical archive at NOAA NCEI (NODC).



EXPERIMENTAL PRODUCT

avoid fishing between solid black 63.5°F and 65.5°F lines to reduce turtle interactions



Above shows the ATN's integration of 1 km, daily, gap-free SST with animal telemetry (cetacean, fish, pinniped, seabirds, and turtles) information to gain a better understanding of the ocean ecosystem

To the left shows "Turtlewatch" which uses another MISST gap-free SST analysis to set alerts of areas to avoid loggerhead turtle interactions



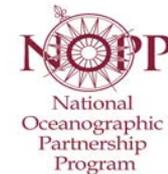


Sea Ice Remnant Svalbard July 17, 2008

Image credit: Camille Seaman



New Project 2018 - 2023



Multi-sensor Improved Sea Surface Temperature: continuing the GHR SST partnership & improving Arctic data

PI: Chelle L. Gentemann, Earth and Space Research

Co-I: Peter Minnett, University of Miami

Co-I: Michael Steele, University of Washington

16 partners in :

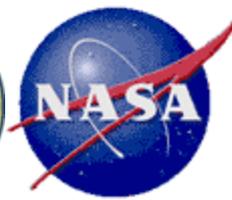
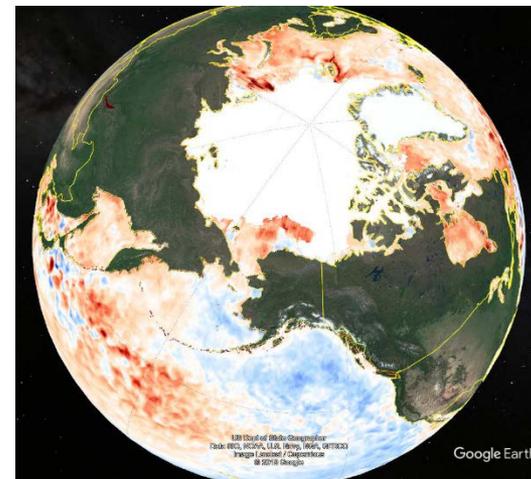
Industry: Richard Jenkins (Saildrone), Jean-Francois Cayula (Vencore)

Academia: Sandra Castro (U.Colorado), Peter Cornillon (U.Rhode Island), Dale Robinson (UC Santa Cruz), Andy Harris (U. Maryland)

Governmental: NASA: Edward M. Armstrong (JPL/Caltech), Toshio Mike Chin (JPL/Caltech), Jorge Vazquez (JPL/Caltech), Vardis Tsontos (JPL/Caltech)

Governmental: NOAA: Kenneth Casey (NCEI), Edward Cokelet (NOAA/PMEL), Eileen Maturi (NOAA/NESDIS/STAR), Gary Wick (NOAA/OAR/ESRL), Cara Wilson (NOAA/NMFS/SWFSC)

Governmental: ONR: Charlie Barron (NRL/SSC)





Project objectives

- 1) Coordinate and integrate new SST observations (e.g. GOES-R, VIIRS); improve data access; management and interoperability; and maintain and strengthen international collaboration.
- 2) Explore improving SST products through improved or expanded in situ SST observations in the Arctic
- 3) Focus on improving accuracy and uncertainty estimates of SSTs at high-latitudes
- 4) Explore improving SST products particularly in marginal ice zones through research into high latitude air-sea-ice interactions and regional ocean-atmosphere-ice feedbacks



Data

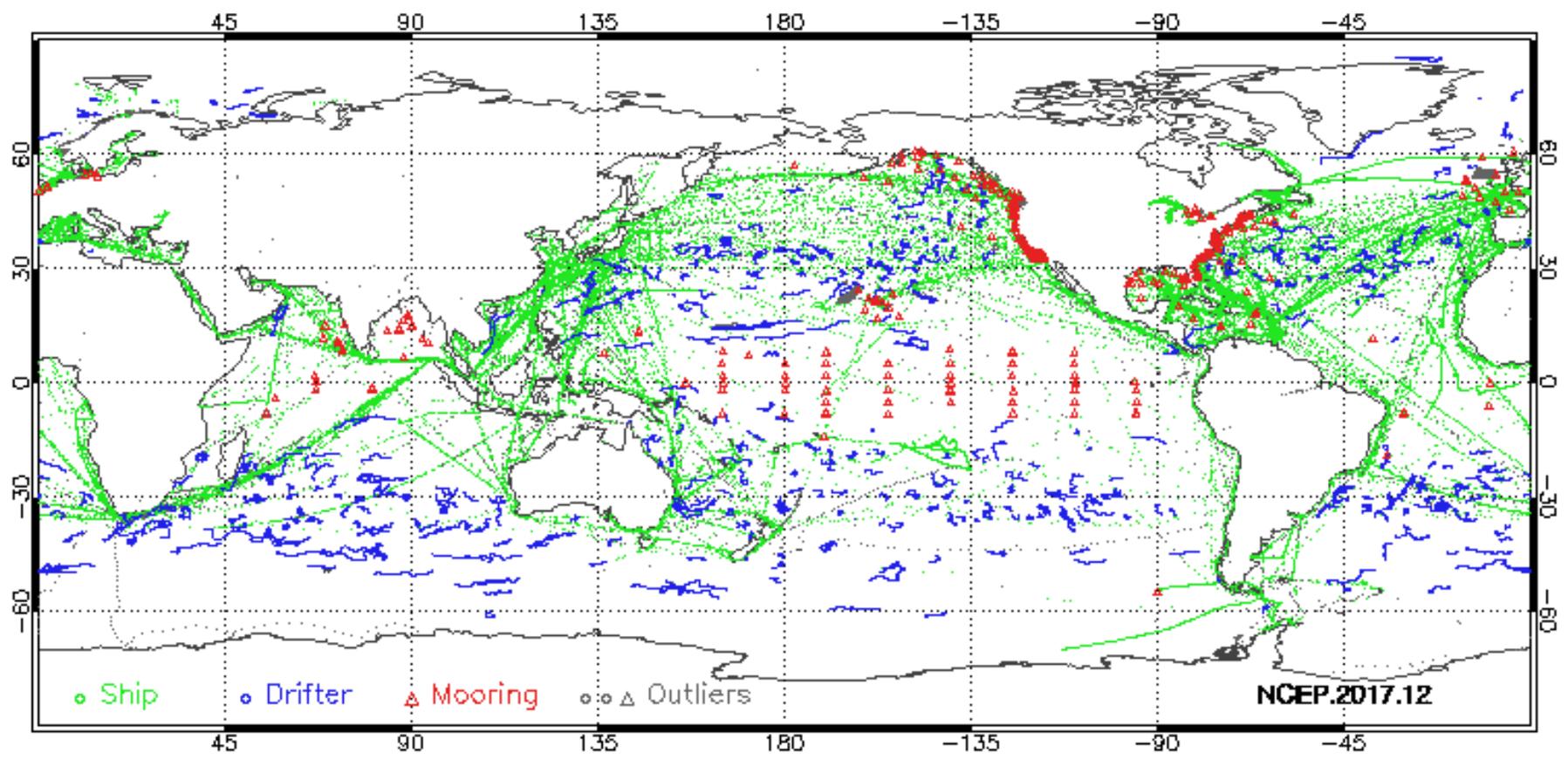
- 1) Coordinate and integrate new SST observations (e.g. GOES-R, VIIRS); improve data access; management and interoperability; and maintain and strengthen international collaboration.

Coordinate with the GHRSSST Project Office (GHRSSST-PO) on the proposed new distributed data system with a single point of entry





2) SST algorithm development



In situ SST observations 12/2017

Image credit: IQUAM NOAA



More in situ data

2) Explore improving SST products through improved or expanded in situ SST observations in the Arctic

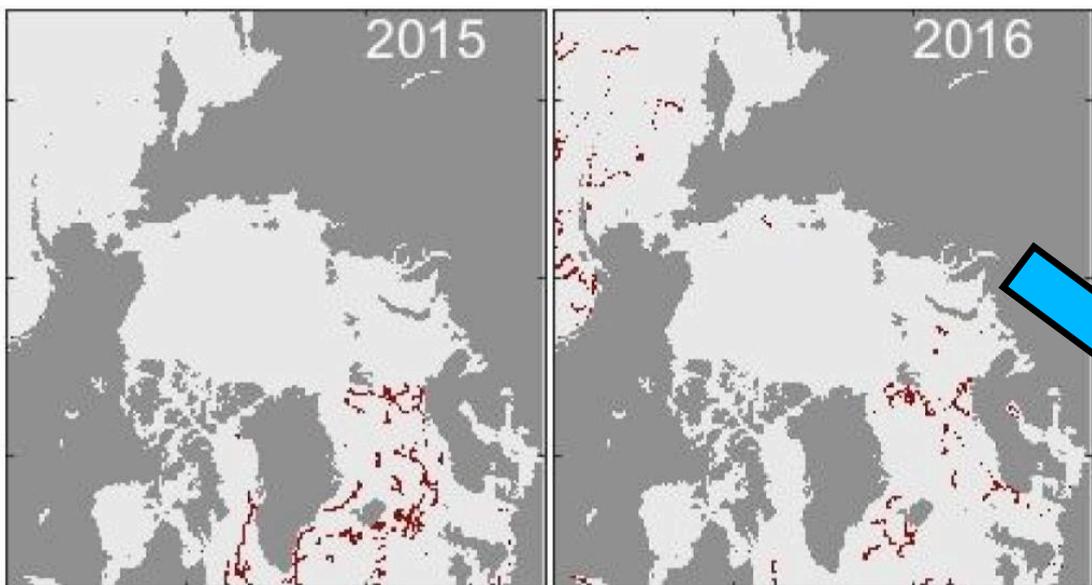


Figure 1. ICOADS Arctic SST observations from 2015 and 2016.

Uptempo buoys, AXCTDs, Glider CTDs, Ship temperature data, Saildrone USVs (existing & future!)

Integrate data into ICOADS & MDB

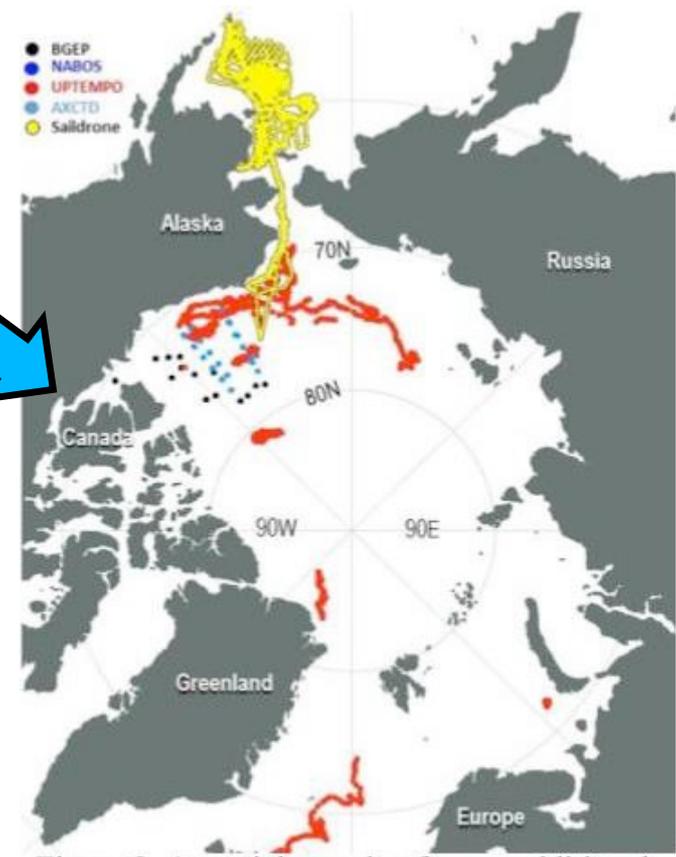


Figure 2. A partial sample of some additional in situ observations available in 2015.



5 Arctic Cruises



Image credit: NOAA PMEL

Five 90-day cruises to Arctic
Additional SST profile obs
Improved SST skin

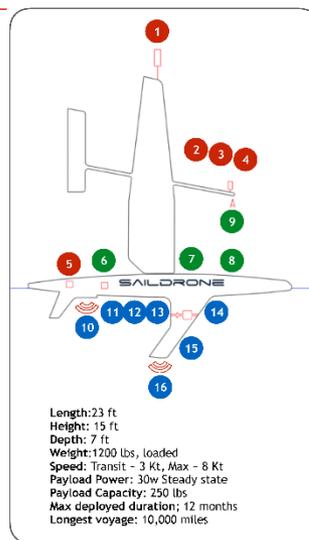
SAILDRONE GEN 4 SPECIFICATIONS AND SENSOR SUITE

Atmospheric Measurements

- Wind Speed
 - Wind Direction
 - Sunlight
 - Air Temperature
 - Humidity
 - Air Pressure
- 1 Anemometer @ +4.5m
Gill Windmaster 3D ultrasonic 20H
 - 2 Sunshine Pyranometer @ +2.2m
Delta-T Devices SPN1
 - 3 Pyranometer @ +2.2m
Eppley PSP & PIR
 - 4 Meteorological Probe @ +2.2m
Rotronic HC2 - S3 with rad shield
 - 5 Digital Barometer @ +0.2m
Vaisala BAROCAP PTB210

Oceanic Surface Measurements

- Wave Height & Period
 - pCO₂
 - Magnetic Field
 - Skin Temperature
- 6 Dual GPS & IMU
Vectornav / KVH
 - 7 CO₂ System @ +0.3m
PMEL ASVCO₂
 - 8 Magnetometer @ 0m
Barrington MAG 648
 - 9 SST IR Pyrometer @ +2.2m
Helitronics KT15 II



Oceanic Sub-Surface Measurements

- Ocean Currents
 - Chla
 - CDOM Concentration
 - Red Backscatter
 - Dissolved Oxygen
 - pCO₂
 - Water Temperature
 - Salinity
 - Marine Mammal Presence
 - Fish Biomass
 - Bathymetry
- 10 ADCP @ -0.2m
Teledyne RDI Workhorse 300 kHz
 - 11 Fluorometer @ -0.2m
Sea-bird Scientific WET labs Eco Triplet
 - 12 Oxygen Optode @ -0.5m
Aanderaa 4831
 - 13 CO₂ System @ -0.5m
PMEL ASVCO₂
Sea-Bird Scientific SBE Prawler Honeywell Durafet
 - 14 Thermosalinograph @ -0.5m
Teledyne RDI Citadel TS-NH
 - 15 Passive Acoustic Recorder
Greenridge Sciences Inc. Acousonde
 - 16 WBAT @ -2.5m
SIMRAD EK 80
Multi-beam Sonar @ -2.5m
Norbit IWBS

Image credit: Saildrone



SST algorithms

3) Focus on improving accuracy and uncertainty estimates of SSTs at high-latitudes

IR

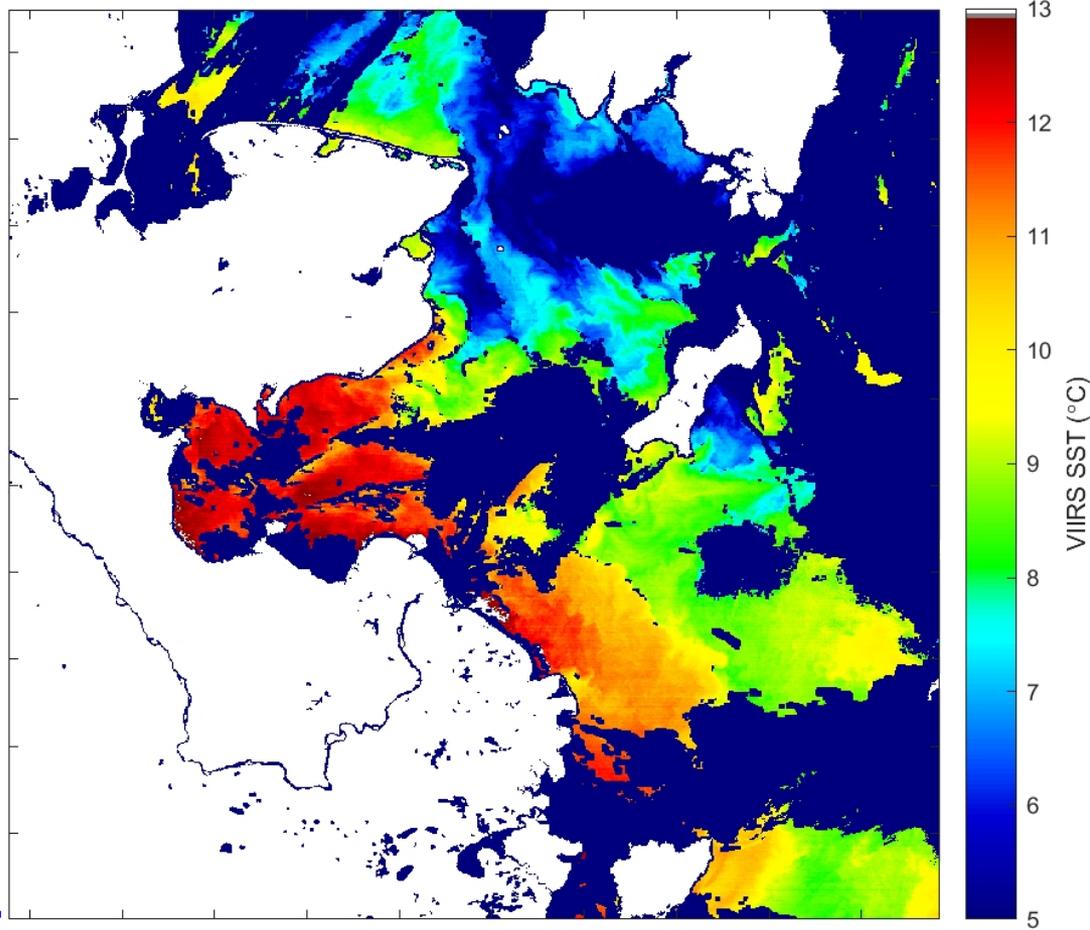
- at high latitudes different algorithm formulations
- very dry atmosphere.
- surface emissivity more important

PMW

- 10.7 channel not good for SST.
- Wind speed and direction errors lead to larger errors.

Algorithm development:

- RTM – simulated TB based on environmental conditions that are not well sampled
- In situ databases – not well sampled at high latitudes





SST algorithms

3) Focus on improving accuracy and uncertainty estimates of SSTs at high-latitudes

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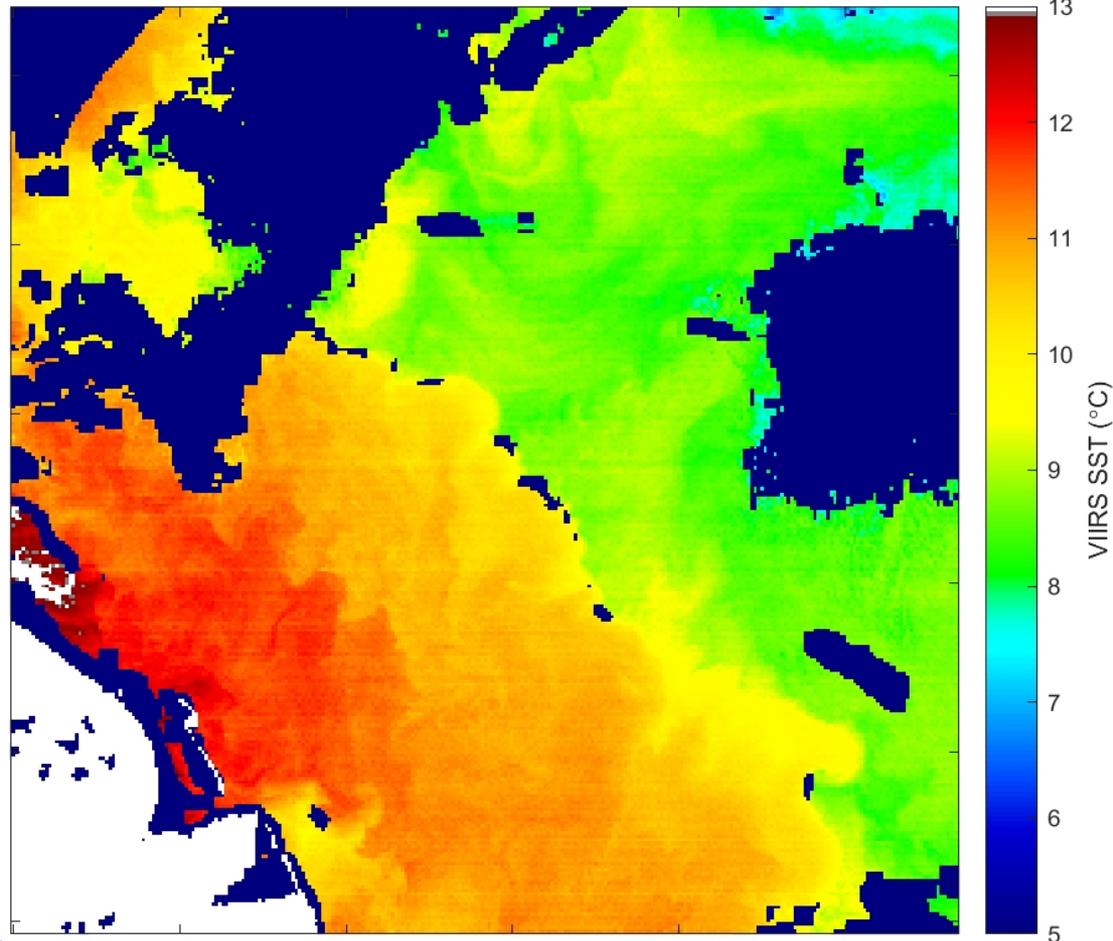
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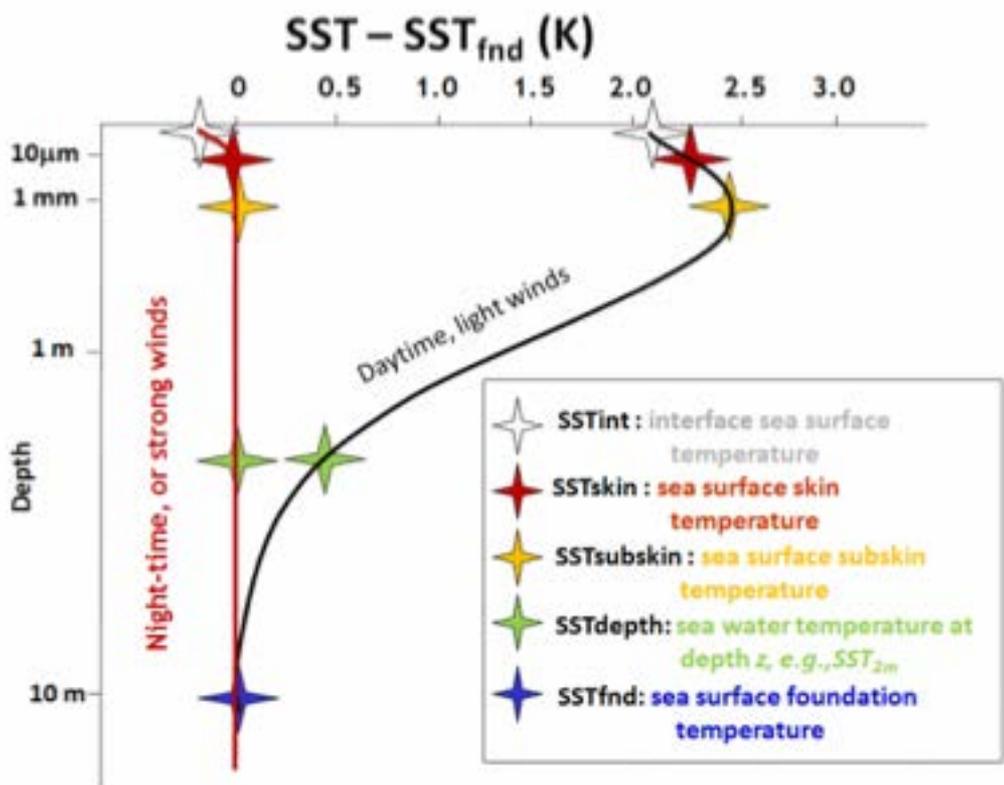
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4) Explore improving SST products particularly in marginal ice zones through research into high latitude air-sea-ice interactions and regional ocean-atmosphere-ice feedbacks



What is a foundation SST?

How do L4 handle SST in the MIZ?

How do salinity layers affect upper ocean heating?

Measure turbulent heat fluxes (in situ) at high latitudes. How does upper ocean stratification affect air-sea interactions?

- Open data policy**
- Encourage open source software policy (OSS)**
- OSS netcdf in situ to ICOADS format converter**
- NEW Arctic data (2015 – 2023) to be put into ICOADS**
- Contact me if you have Arctic research data**



Sea Ice Remnant Svalbard July 17, 2008

Image credit: Camille Seaman