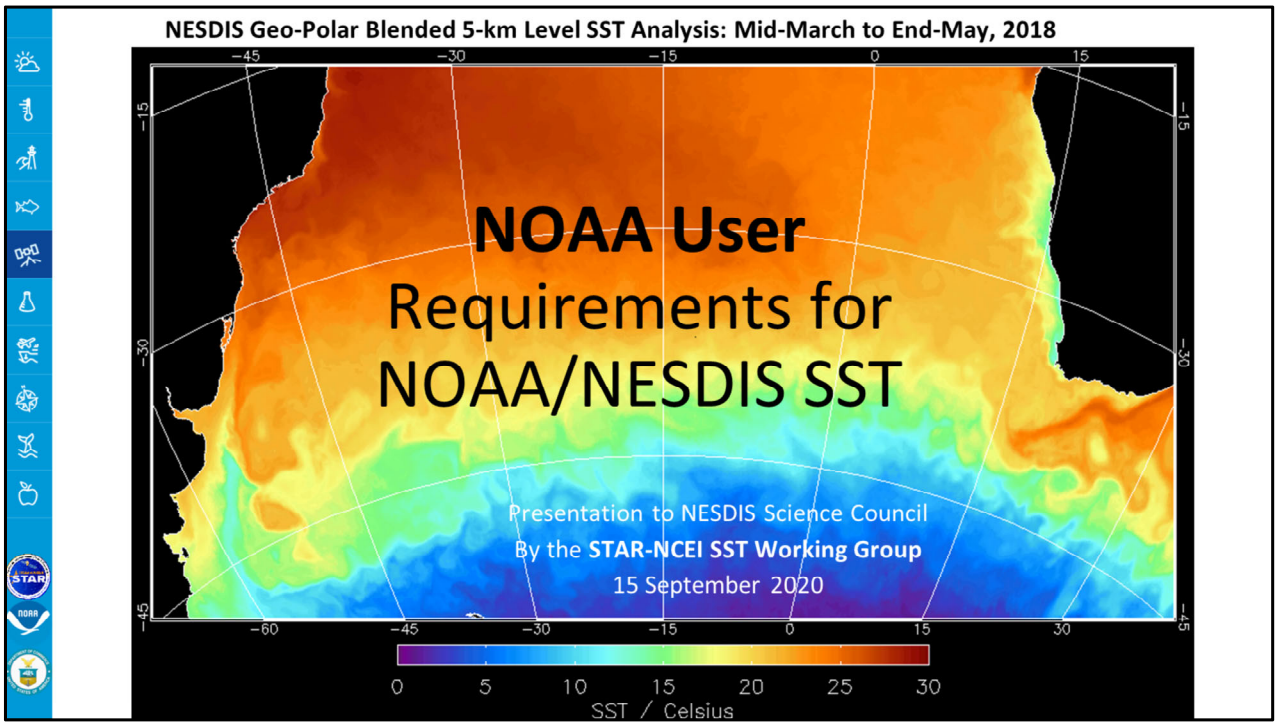


This is state-of-the-art SATELLITE SST (**Jim Carton, oceanography collaborator at UMD, thought it was model data)**

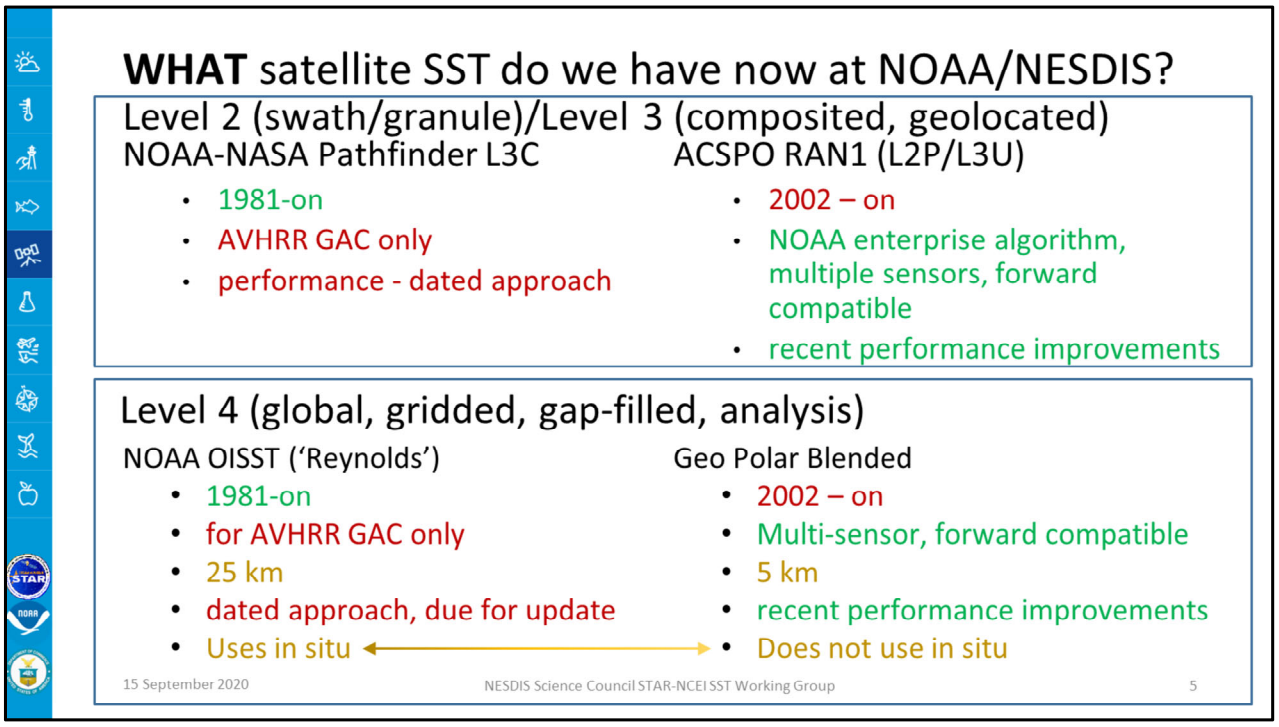
GPB is a state-of-the-art high-resolution modern analysis.
Mesoscale features are resolved.
Forms the basis of the new Coral Reef Watch high-resolution product suite (e.g., heat stress and coral bleaching alerts).
When shown this capability, many end-users understandably do not want to go back to lower resolution products.

Here is an illustration of an active area with lots going on, shows what the accuracy and feature-resolving capability.

Agulhas Retroflection (collision of a major western boundary current with the Antarctic Circumpolar Current
Eddy shedding transporting heat from Indian Ocean into S Atlantic
The Brazil-Malvinas confluence
Benguela current and upwelling from S Aftrican/Namibian coast (nutrient-rich so ocean biology, fisheries, etc.)
Brazil current & Cabo Frio upwelling (cool shelf water)

...and so on

NESDIS operational hi-res SST analysis is very much fit-for-purpose and enables new areas & applications to be explored/developed (CRW 5-km being a prime end-user example). We can do this because NOAA and other agencies provide lots of high-quality satellite data these days, plus we have invested in the technology for multiscale data fusion. The big challenge is tying it together with the earlier record - at the moment there is a disconnect, and not just in terms of resolution, but also regional biases and trends over time.



Level 2 (swath/granule)/Level 3 (composited, geolocated)

NOAA-NASA Pathfinder L3C

1981-on

AVHRR GAC only;

performance approach in need of updating – PF was in it's day the world premier SST but it has not been overhauled and is now demonstrably in need of updating. This is not a critique of the team's abilities, but a reflection of lack of organizational prioritization.

ACSPO RAN1 (L2P/L3U)

2002 – on

produced with NOAA enterprise algorithm from multiple sensors – AVHRR GAC & FRAC, VIIRS, MODIS, ABI, AHI)

Recent performance improvements especially with RAN2 (see backup slides)

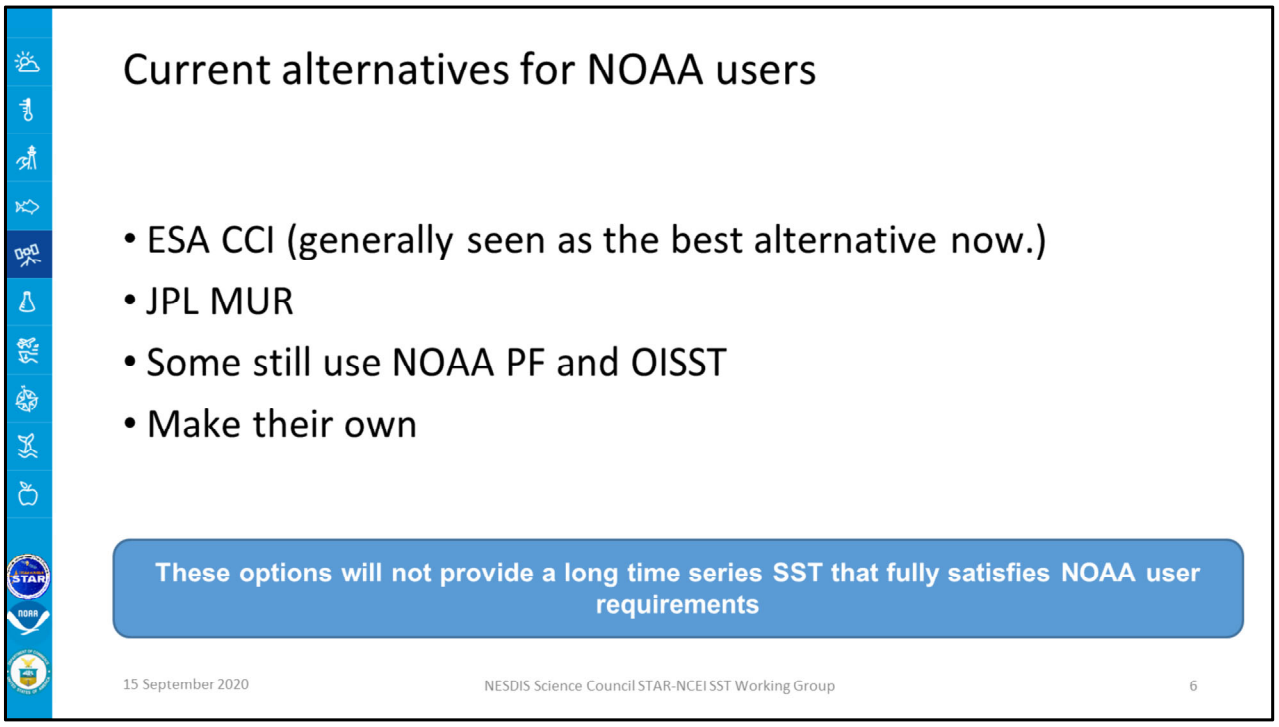
Level 4 (global, gridded, gap-filled, analysis)

NOAA OISST ('Reynolds')

1981-on
for AVHRR GAC only;
25 km spatial grid
Use of in situ
recent reprocessing in April 2020 (v2.1 from 2016 on) addressed the most pressing performance issues *: the degradtion became important since 2016 (not before) when more surface drifters are transmitted in Binary BUFR than tranditional text TAC format*)".**but not entirely updated as it would need to be done. This is not a critique of the team's abilities but a reflection of lack of organizational prioritization.**

Geo Polar Blended
2002 – on;
5 km spatial grid
Multi-sensor; Geo, Leo
recent performance improvements
does not use insitu

Gradient arrows – for early years, in situ is important; for later years, use in situ for bias corrections; vs philosophical approach of "pure" satellite record. We need to evaluate what will best serve NOAA user needs. Ultimately – allow to link NRT satellite data to in situ "all the way" back in time



What are they using now?

SST International Community (predominantly – not an exhaustive list)

- ESA SST-CCI v2.1 L2P/L3U/L4 (currently seen as best alternative climate record; large investment and large dedicated team; sustained ESA support)
- JPL MUR and
- NASA MUR (only available 2002-on; nominally 1 km spatial grid; notably less accurate than GPB); while gridded at 1 km, features are not resolved at a 1 km scale

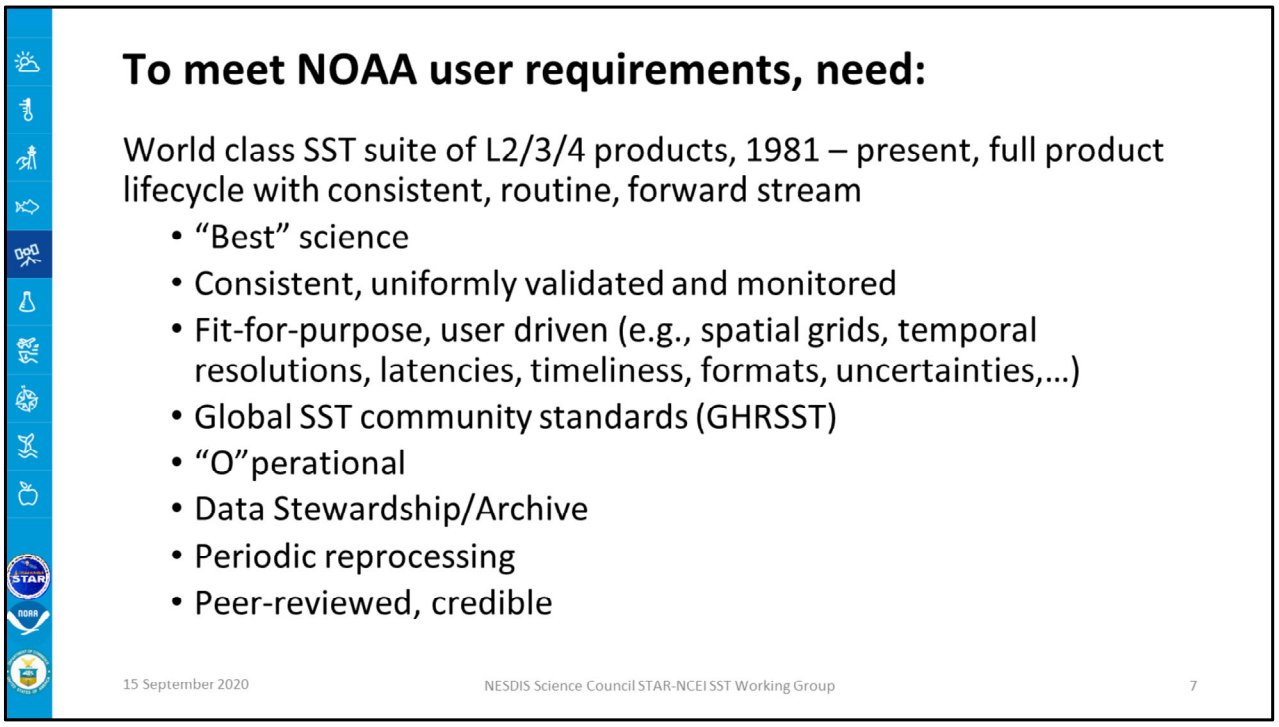
- Some still use NOAA PF and OISST

- Why not use the others

- We can do <u>better</u> (and have done it for 30 years)

- NOAA users PREFER to use a trusted NOAA SST (all else being equal)
- It's the NESDIS remit to be their provider
- We are NOAA and NOAA needs an Operational solution
- Although Coral Reef Watch uses it now, it s not exactly what they (and others) want
- We can link to pre-satellite SST to create even longer time fused time series

CCI does not use all available satellite SST
Their philosophy is "satellite-only", purposely not tied to *in situ* record
The CCI "satellite-only" approach is laudable, but extremely challenging. Judicious use of in situ data allows us to empirically adjust for some "known unknowns" in the early instrumental record.



World class SST suite of L2/3/4 products, 1981 – present, full product lifecycle with consistent, routine forward stream

"Best" science – *still science to be done – challenges remain*

Consistently and Uniformly validated using NOAA premier validation system (SST Quality Monitor, in situ SST Quality Monitor, Advanced Regional Monitoring for SST)

Spatial grids, temporal resolutions, latencies, timeliness, formats, ancillary products, uncertainties, coverage for high latitudes and Great Lakes, as responsive to users

GHRSST (International Group for High Resolution SST) Data Spec formats

Ultimately "O"perational (vice "best effort" or experimental)

Served to users through multiple data access ports

Data Stewardship/Archive by NCEI

Periodic reprocessing for full time series should be expected in future

Peer-reviewed scientific publications and outreach articles, professional community credibility