
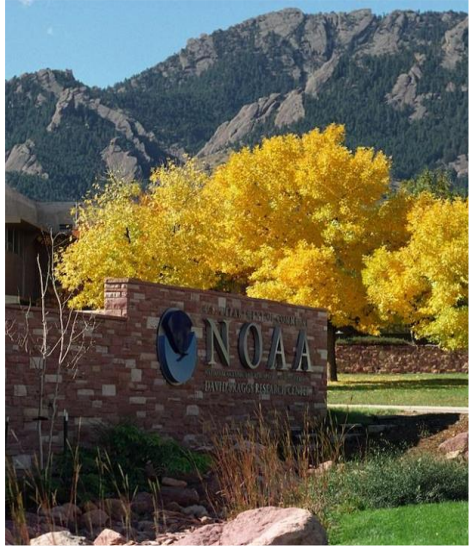


NOAA NCEI's Sea Surface Temperature Portfolio: Foundational Data Sets for Environmental Applications

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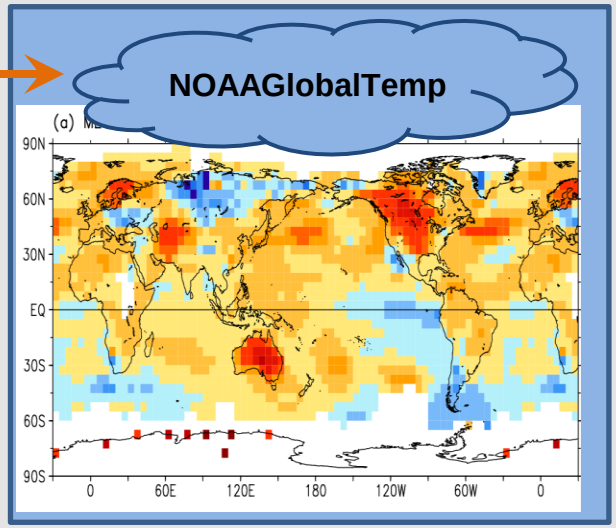
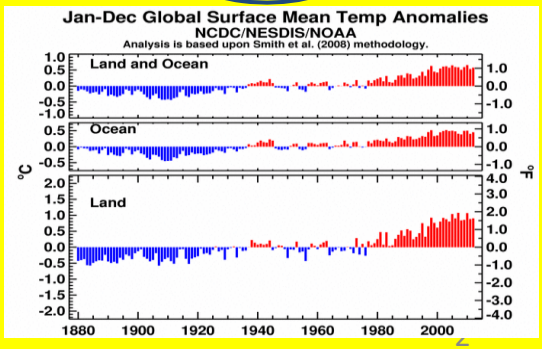
Introduction

- NCEI stewards foundational datasets that serve as the backbones of earth and space science applications
- NCEI's SST portfolio is part of NOAA/NCEI's Global Surface Temperature portfolio
- NCEI's SST portfolio encompasses all of our tiers of stewardship, from basic data archive and preservation to developing quality controlled datasets and authoritative data products
- NCEI works with partners across NOAA and the federal government, as well as with international communities



Use Example: Climate Monitoring & Assessements



NCEI's SST Datasets

in situ Datasets

- International Comprehensive Ocean Atmosphere Data Set (ICOADS); monthly and gridded
- Extended Reconstructed Sea Surface Temperature (ERSST)
- World Ocean Database (WOD)
- World Ocean Atlas (WOA)
- Ocean Heat Content (OHC)
- Global Temperature and Salinity Profile Database (GTSPP)

Satellite Datasets

- Pathfinder SST
- Coral Reef Temperature Anomaly Database (CoRTAD)
- GHRSST Long-term Stewardship and Reanalysis Facility (LTSRF)

Blended Datasets

- Optimally Interpolated SST (OISST)

NCEI continues our involvement in GHRSST as an RDAC for OISST and Pathfinder, and as the LTSRF.

SST Data Processing Levels: satellite and in situ

Level 4+: Additional value-added analysis applied (e.g., CoRTAD, Ocean Heat Content)

Level 4 (L4): Gridded and gap-free (e.g., AVHRR_OI or WOA)

Level 3 (L3): Gridded, but may contain gaps (e.g., Pathfinder V5.2 Level 3C, ICOADS Monthly gridded summaries

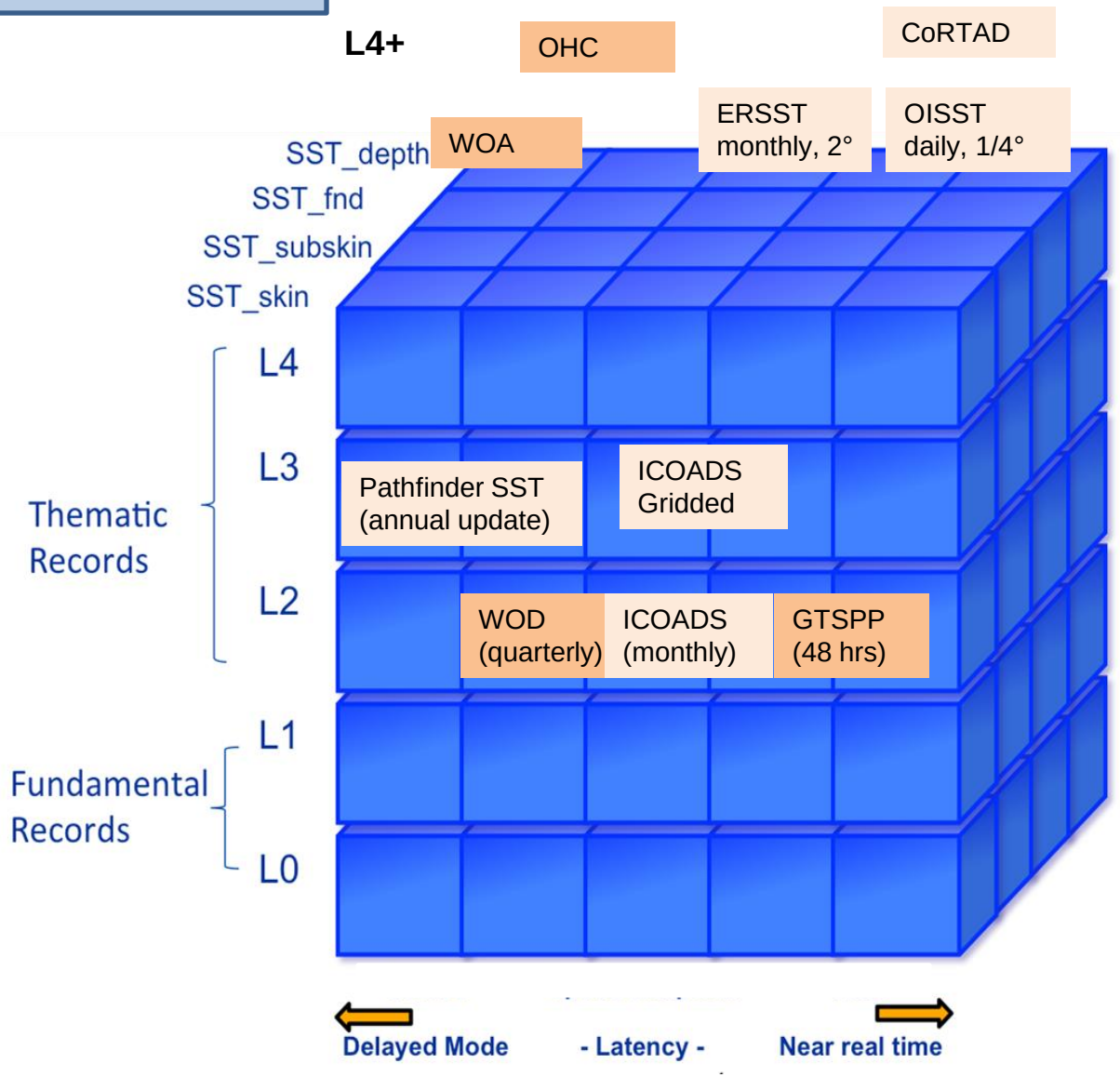
Level 2 (L2): Geophysical variables derived from Level 1 source data at the same resolution and location as the Level 1 data (e.g., GHRSST L2P products, ICOADS IMMA, probably most in situ SST data in the NCEI-MD archive)

Level 1 (L1): Original sensor observations prior to conversion to geophysical units (e.g., AVHRR L1B data stored in CLASS

NCEI's Datasets in SST Cube's time domain

NCEI's SST Datasets are SST depth

NCEI CLASS archives L0/L1 data



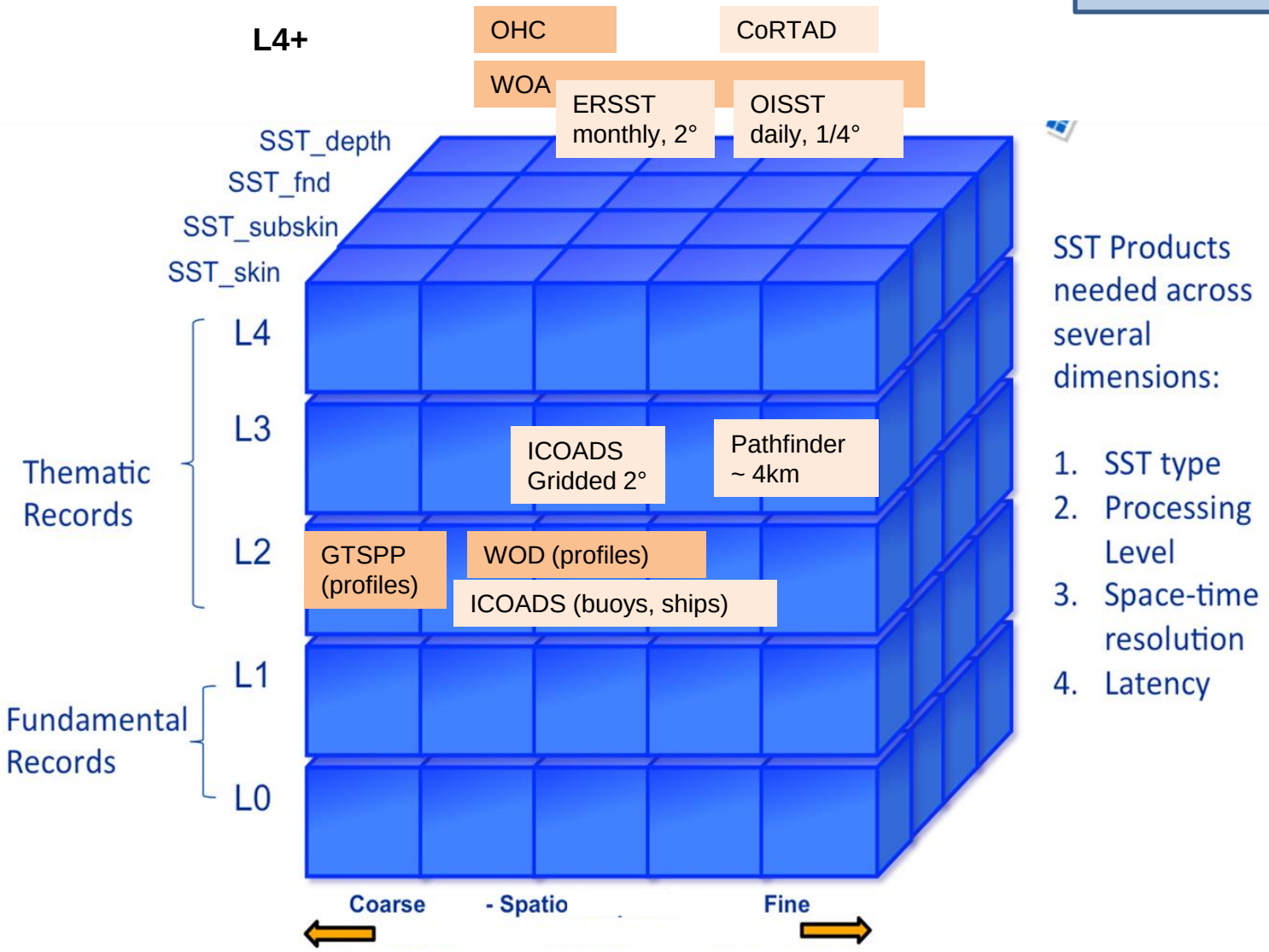
SST Products needed across several dimensions:

1. SST type
2. Processing Level
3. Space-time resolution
4. Latency

CoRTAD = Coral Reef Temperature Anomaly Database
ICOADS = The International Comprehensive Ocean-Atmosphere Data Set
ERSST = Extended Reconstructed SST
OISST = Optimum Interpolation SST

OHC = Ocean Heat Content
WOA = World Ocean Atlas
WOD = World Ocean Database
GTSPP = The Global Temperature and Salinity Profile Programme

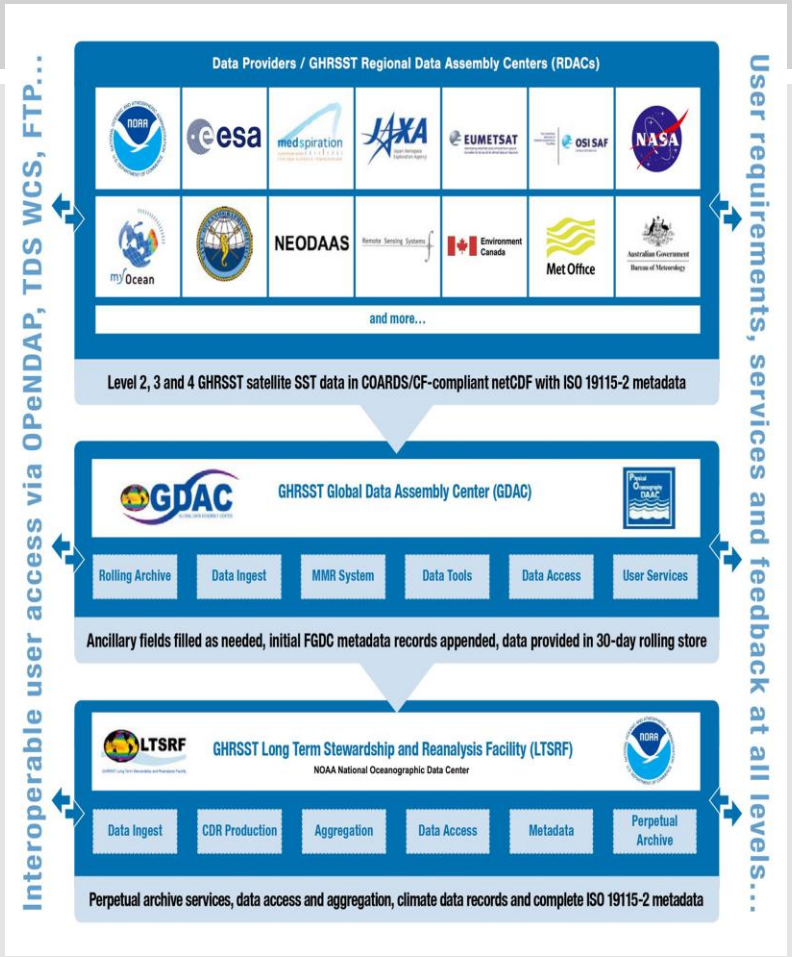
NCEI's Datasets in SST Cube's spatial domain



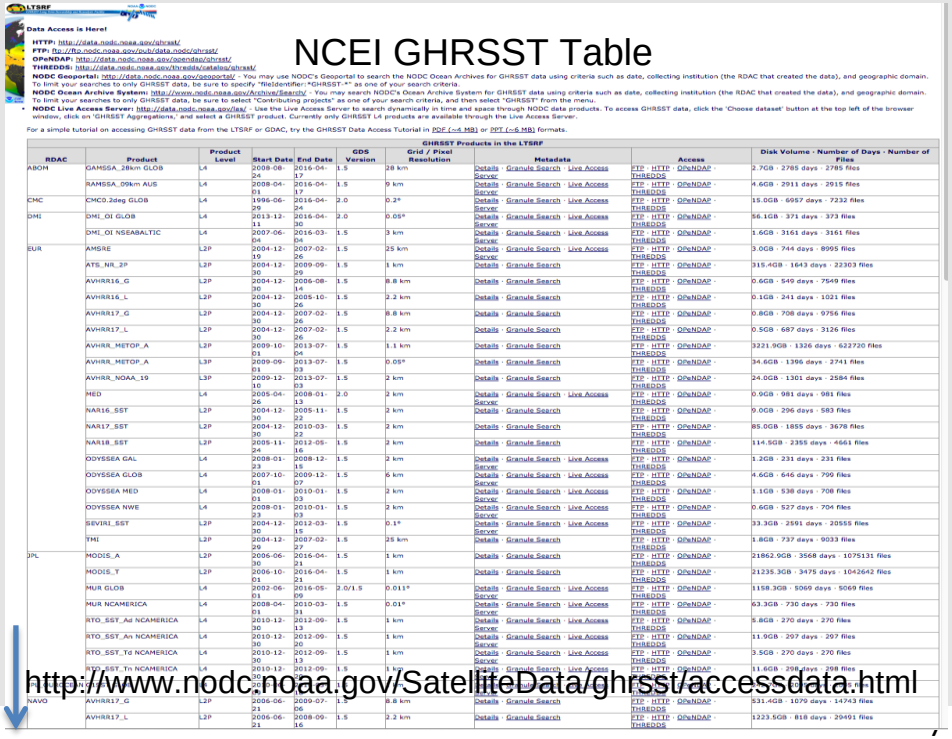
SST Products needed across several dimensions:

1. SST type
2. Processing Level
3. Space-time resolution
4. Latency

NCEI's GHRSST LTSRF



- All "official" data flow from RDAC to GDAC to LTSRF
  - Data is accessible at all levels
  - LTSRF publishes collection metadata to CEOS IDN, and supports CWIC granule searches via CSW and OpenSearch


NCEI GHRSST Table

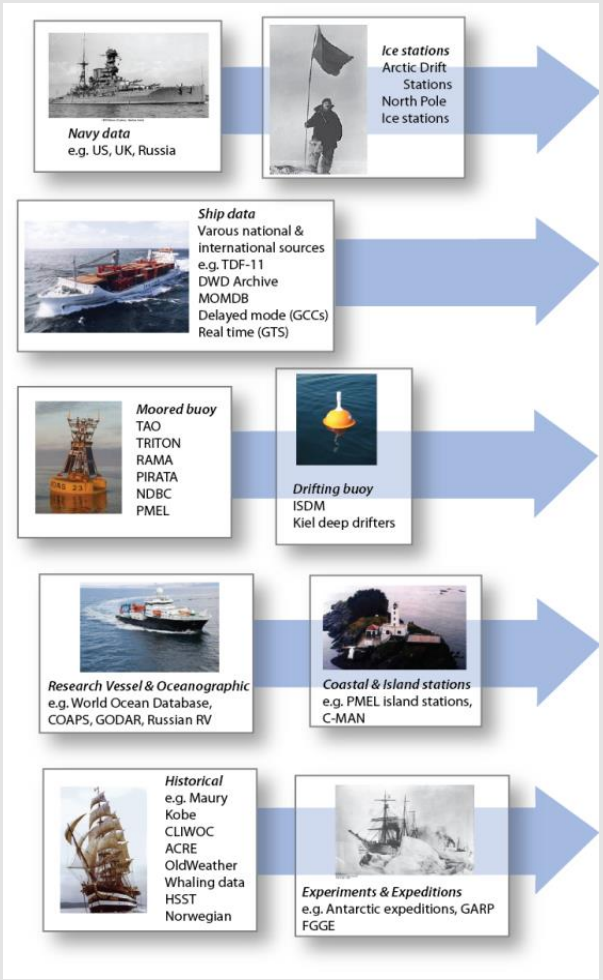
http://www.nodc.noaa.gov/SatelliteData/ghrsst/accessdata.html

Committee on Earth Observation Satellites

ICOADS:

The International Comprehensive Ocean-Atmosphere Data Set

William Angel, Eric Freeman, Scott Woodruff, Sandy Lubker



Scope: The world's most extensive surface marine & meteorological data collection (akin to GHCN over land); a foundational dataset for climate monitoring & studies (e.g. ERSST …)

Objective: Stewardship, archive & service of ICOADS

ICOADS – A Foundational Database

Vital for Global climate change estimates

Air-Sea Fluxes

Gridded Products

Global and Regional Analysis

Atmospheric and Ocean Reanalysis

Marine and Coastal Humidity

Satellite Calibration/Validation

Global Surface Products

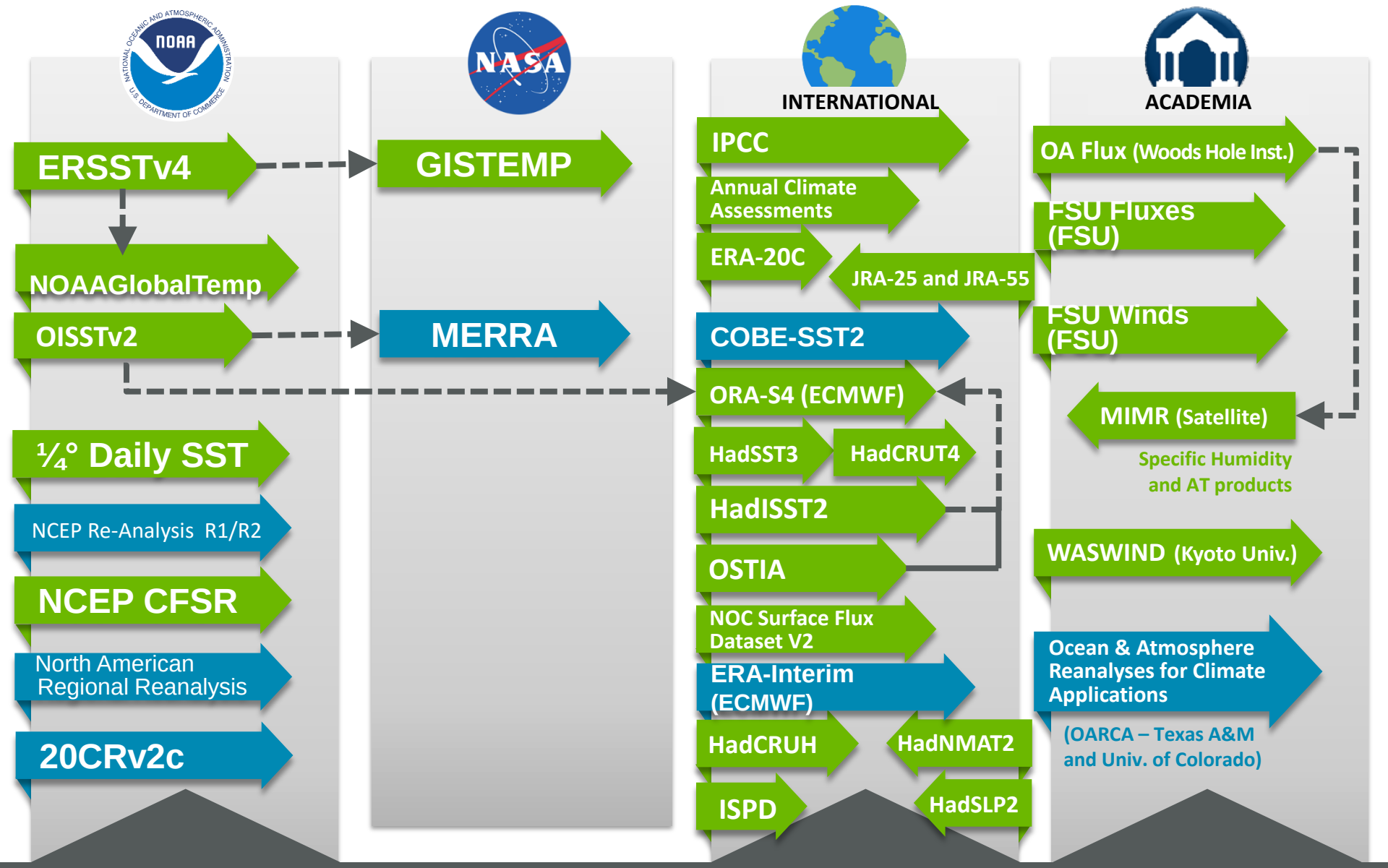
Climatologies

Marine Winds

Derived Datasets

ICOADS – A Critical Marine Foundation for All-Types of Products and Services

Who are the users of ICOADS?



ICOADS – A Foundational Database

ELEMENTS MAIN

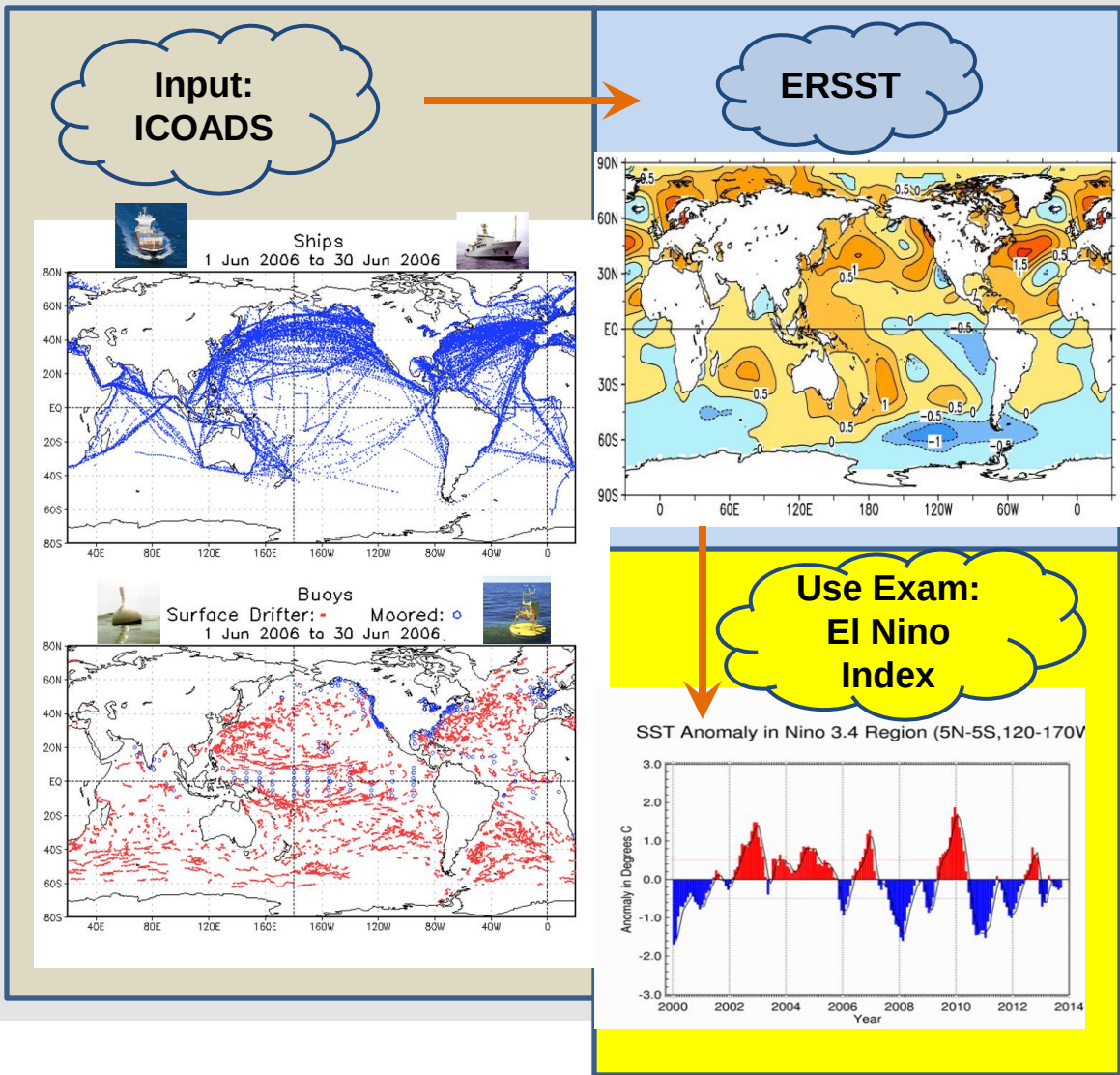
Centennial-Scale Extended Reconstructed Sea Surface Temperature (ERSST)

Scope: Authoritative centennial global sea surface temperature dataset for climate change research, assessment & monitoring

Objective: Monthly production & dissemination; development to remain state-of-the-science & authoritative

Major Ongoing Improvements:

- Updated SST bias corrections
- Methods to include data from Argo floats
- Using ICOADS R3.0
- Comprehensive data error estimates
- Updated SST corrections using new sea ice datasets



Who are the users of ERSST?

- NCEI Climate Monitoring
- NOAAGlobalTemp
- CPC ENSO monitoring
- EMC ocean color monitoring
- GISTemp
- Climate Pilot Indicator
- National Academy of Sciences (NAS)

ENVIRONMENT

- Hurricane
- Storm surge
- Sea level trend
- Saharan dust
- River inflow
- Fishery
- Wildlife
- Coral reef
- Ocean acidification
- Drought

INDUSTRY & INTERNATIONAL

- Air conditioning
- tempsensornews.com
- temperatures.com
- ofsoptics.com climate prediction
- thomsonreuters.com agriculture & weather research and forecast
- prescientweather.com
- Power outrage modeling
- Index insurance

Users from:

Australia, Brazil, Canada, China, Columbia, France, Fiji, Germany, Hong Kong, India, Indonesia, Italia, Japan, Kenya, Martinique, Mexico, New Zealand, Nigeria, Norway, Peru, Russia, South Africa, Spain, Switzerland, Toulouse, UK

RESEARCH & EDUCATION

- Climate impact on coasts
- ENSO, SIOD study
- Cyclone development
- Hiatus study
- Neural-network forecast
- PDO
- Analog in seasonal forecast
- Caribbean climate
- Climate forcing mechanism
- Rainfall
- Humidity & air temperature
- SST variability
- Model prediction skill
- Model performance
- Geology, Geography & Biology study
- CMIP5 validation

In situ SST from 1854, updated monthly

Pathfinder SST

Characteristics:

- High resolution (4 km), long-term, climate data record (CDR) of global satellite sea surface temperature (SST).
- Used for climate change research, assessment, monitoring, and general applications (e.g., project focused research).
- Base product for other derived products (e.g., OISST, CoRTAD, reanalysis data set for Japanese Meteorological Agency).

Types:

- Unique full AVHRR long temporal product, processed under a consistent algorithm.
- Uses NOAA -7, -9, -11, -14, -16, -17, -18, -19 AVHRR sensors.

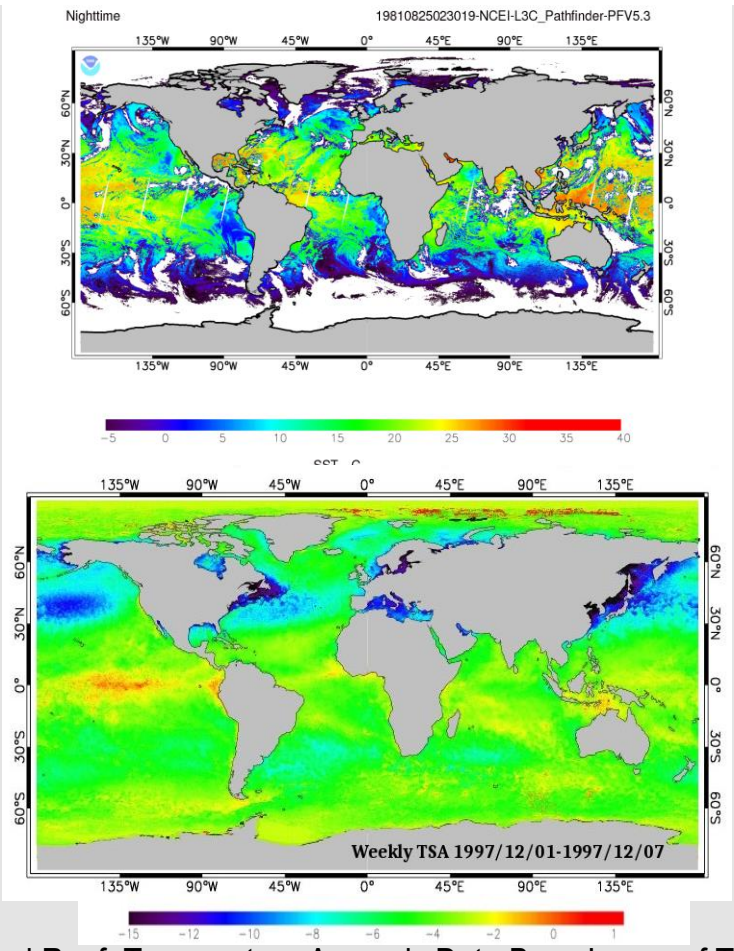
Production schedule:

- A one time release full dataset, annually
- Quarterly updates to be made available in 2017

Status:

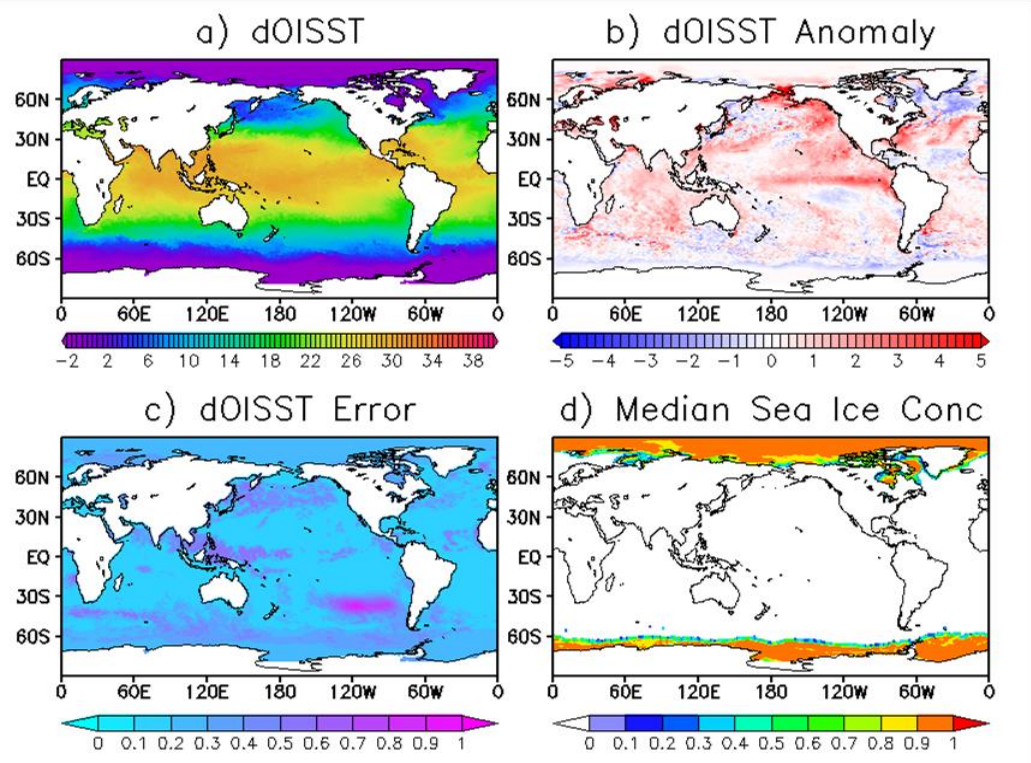
- Version 5.2 currently available (L3)
- Version 5.3 to be released in July 2016 (L3, L3U, L2P)

Pathfinder L3 Sea Surface Temperature Image



Coral Reef Temperature Anomaly Data Base Image of Thermal Stress Anomaly (derived from PFSST)

dOISST



Characteristics:

- Complete (gap-free) SST, ice and error fields
- Blend of *in situ* + satellite data daily global coverage on a ¼° grid

Types:

- AVHRR-only (from,1981; CDR support)
- AVHRR+AMSR (from 2002; inactive)

Production schedule

- Preliminary produced every day in near real time (1-day delay)
- Replaced by final (science quality) after 2 weeks

Status:

Version 2 released was Nov 2008
AVHRR+AMSR inactive
Code rejuvenation longer than expected

Supports Operations, Modelling, Research and Management

NOAA 1/4° dOISST

Global climate forecasting	Unusual phenomena (warm blob)	Ecological and population models
1/4° Blended SST Climatology	Hurricane development	Phytoplankton primary production
Data quality control	Oceanic CO2 processes	Resource management
Ancillary Data for Satellite Algorithms	Diurnal SST and fluxes	Research

dOISST- A Foundational Dataset for Operations, Modelling, Research and Management

Who are the users of dOISST?

NATIONAL & INTERNATIONAL

RESEARCH

- VIIRS/NPP SST
  - Official Dynamic Ancillary Data
- NCEP Climate Forecast System Model
  - Operational use of code copy
- Coral Reef Watch
- NESDIS SST Quality Monitor (SQUAM)
- National Marine Fisheries Service ecological /population models
- Pathfinder AVHRR SST (CCOG/U. Miami)

- Homeland Security
- American Shipping Bureau
- NCAR North American MultiModel Ensemble
- VIIRS SST
- MODIS SST
- TRMM Rain Rate
- Aquarius Salinity bias correction
- Phytoplankton primary production

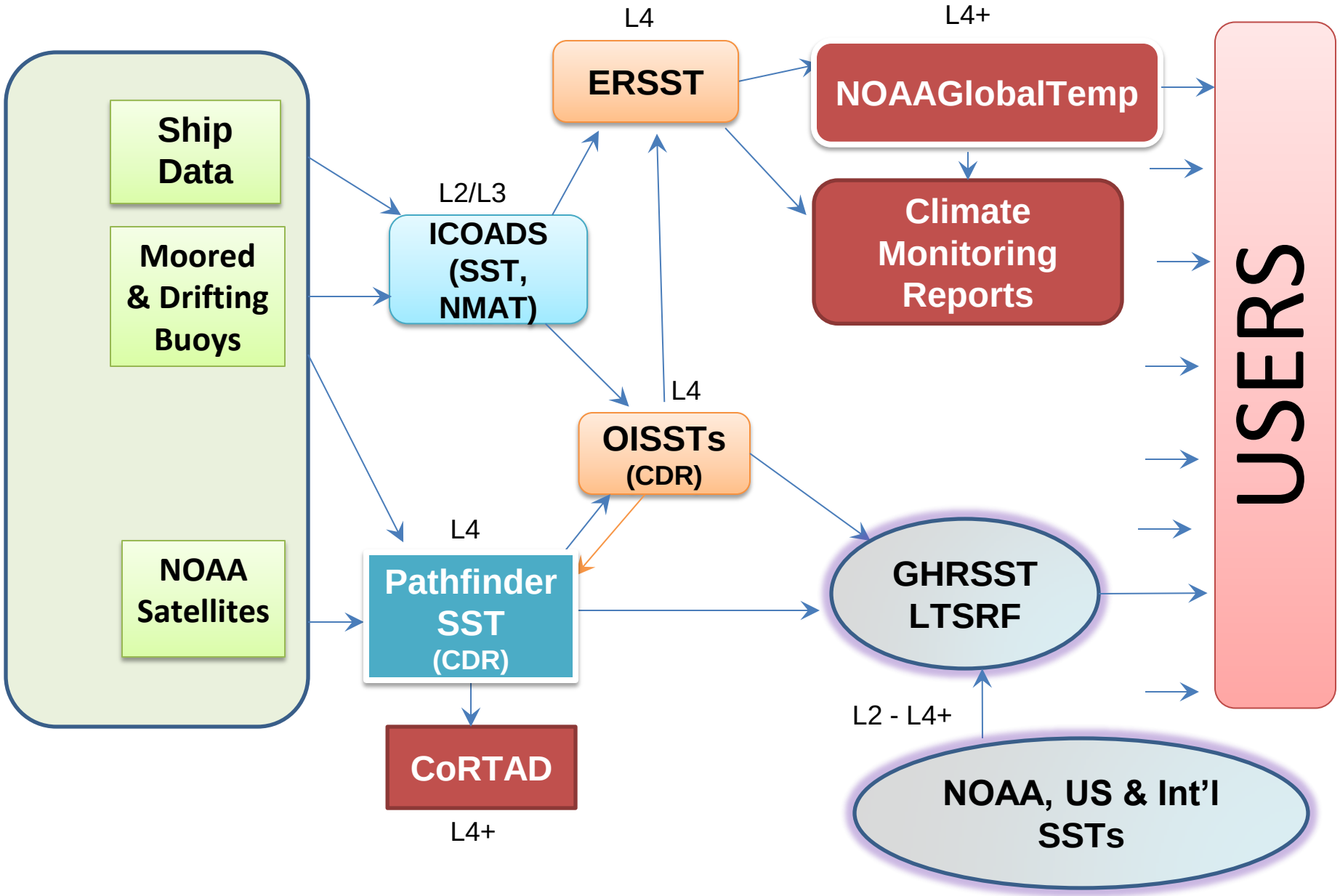
- IPCC
- BAMS State of Climate
- Group for High Resolution SST (GHRSST)
  - The SST Virtual constellation for Committee on Earth Observation Satellites (CEOS)
- UK MetOffice
  - GHRSST Multi-Product Ensemble (GMPE)
- Tropical cyclogenesis forecast
- Ocean acidification and carbonate dynamics
- Non-US climate models and data assimilation

- Response to climate change
  - Fisheries, species invasion, biogeography
- Ocean Fluxes/ Diurnal SST CDR
  - Woods Hole Inst
- Fisheries stock assessments and models in non-US basins
- Acoustics; Geolocation models of tagged animals
- Atmospheric Rivers
- Regional physical oceanography

In situ and satellite SST blend from 1981, updated daily

ELEMENTS MAIN

Sea Surface Temperature DPS (*Satellite & in-situ)*



Conclusions

- NCEI stewards and produces a broad range of foundational SST datasets, both *in situ* and satellite derived.
- Each of these data sets has been developed to serve distinct user communities.
- Several products are interdependent on each other, adding value along the way for the designated user communities they serve.

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