

In-situ Sea Surface Salinity and Temperature Observations from the NCEI Global Thermosalinograph Dataset

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Introduction

The newly-developed NCEI Thermosalinograph Dataset (NCEI-TSG) is the world's most extensive collection of global thermosalinograph (TSG) data available without restriction. This dataset provides a comprehensive set of uniformly quality-controlled *in situ* sea-surface salinity (SSS) and temperature (SST) measurements collected from over 300 vessels during the period 1989 to the present.

Goal of the project: to provide a well-organized, uniformly quality-controlled TSG dataset for the user community with granule search capability.

Why TSG data?

Thermosalinograph: an instrument mounted near the water intake of ships to continuously measure sea surface temperature and conductivity while the ship is in motion.

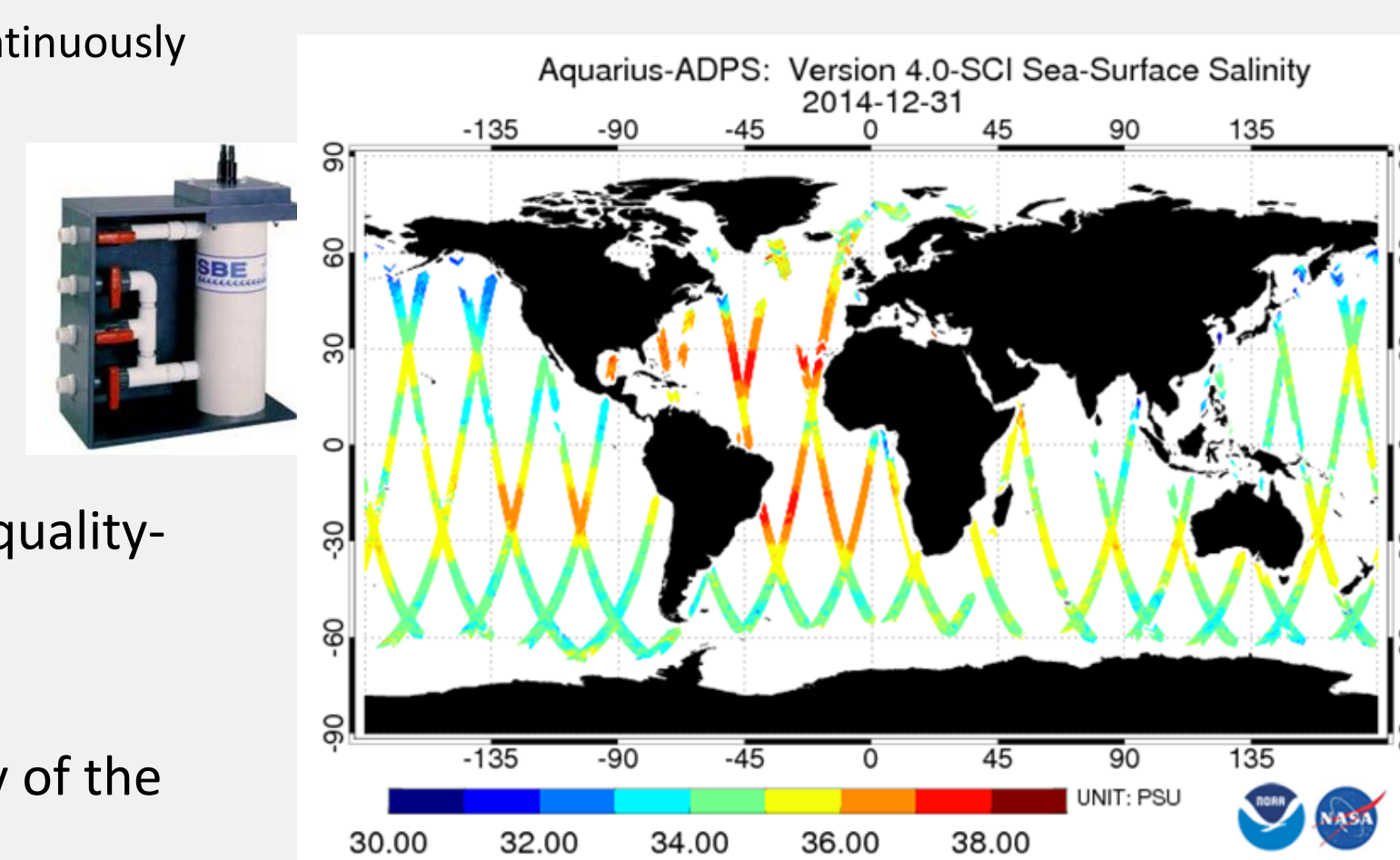
✓ Supports the Satellite SSS Quality Monitor (4SQM) project.

- Satellites: ESA's SMOS, NASA's SMAP
- In situ: TSG, drifters, buoys, moorings, ARGO etc.
- A well-organized TSG dataset is needed for matchup and comparison

✓ Different data assembly centers use different format and different quality-control procedures for different collections of data

- GOSUD (IODE), SAMOS, and AOML etc (see below).

✓ NCEI has a large amount of raw TSG data that is not available at any of the TSG data assembly centers (~1351 accessions)



TSG dataset overview

Temporal coverage: 1989-present

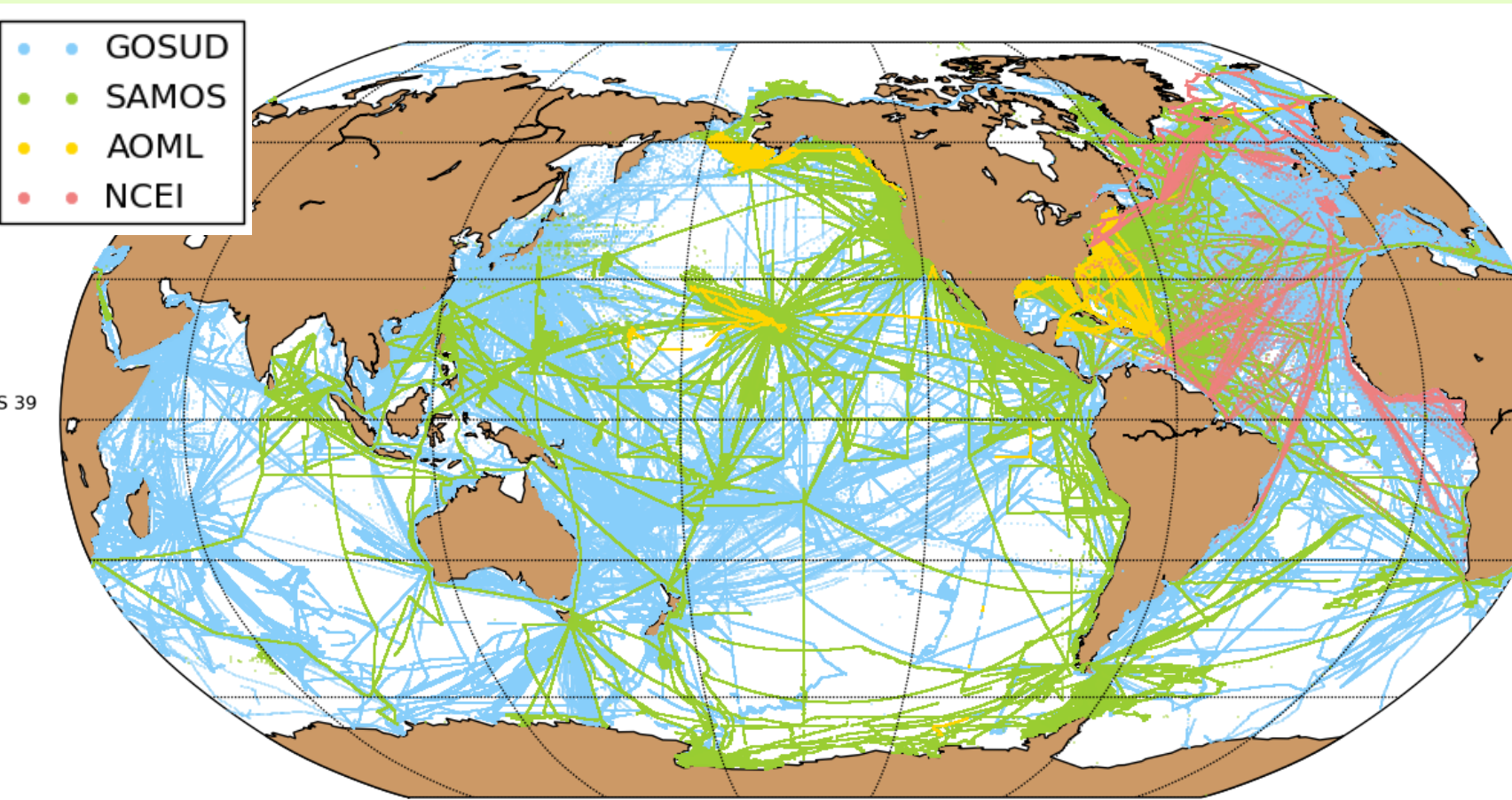
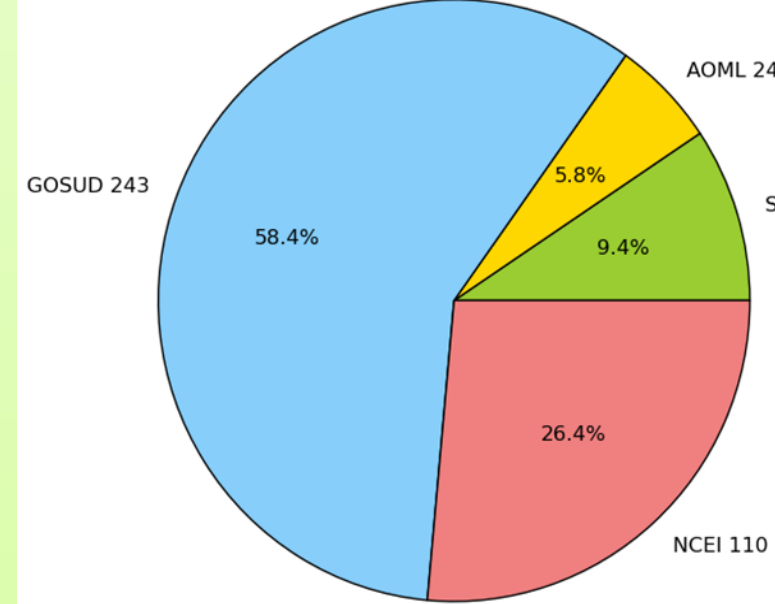
Sample resolution: varying from 1s to 1hr

Platforms: 300+

Variables: sea surface temperature measured near the intake, sea surface salinity, conductivity, internal temperature (as measured in TSG cell)

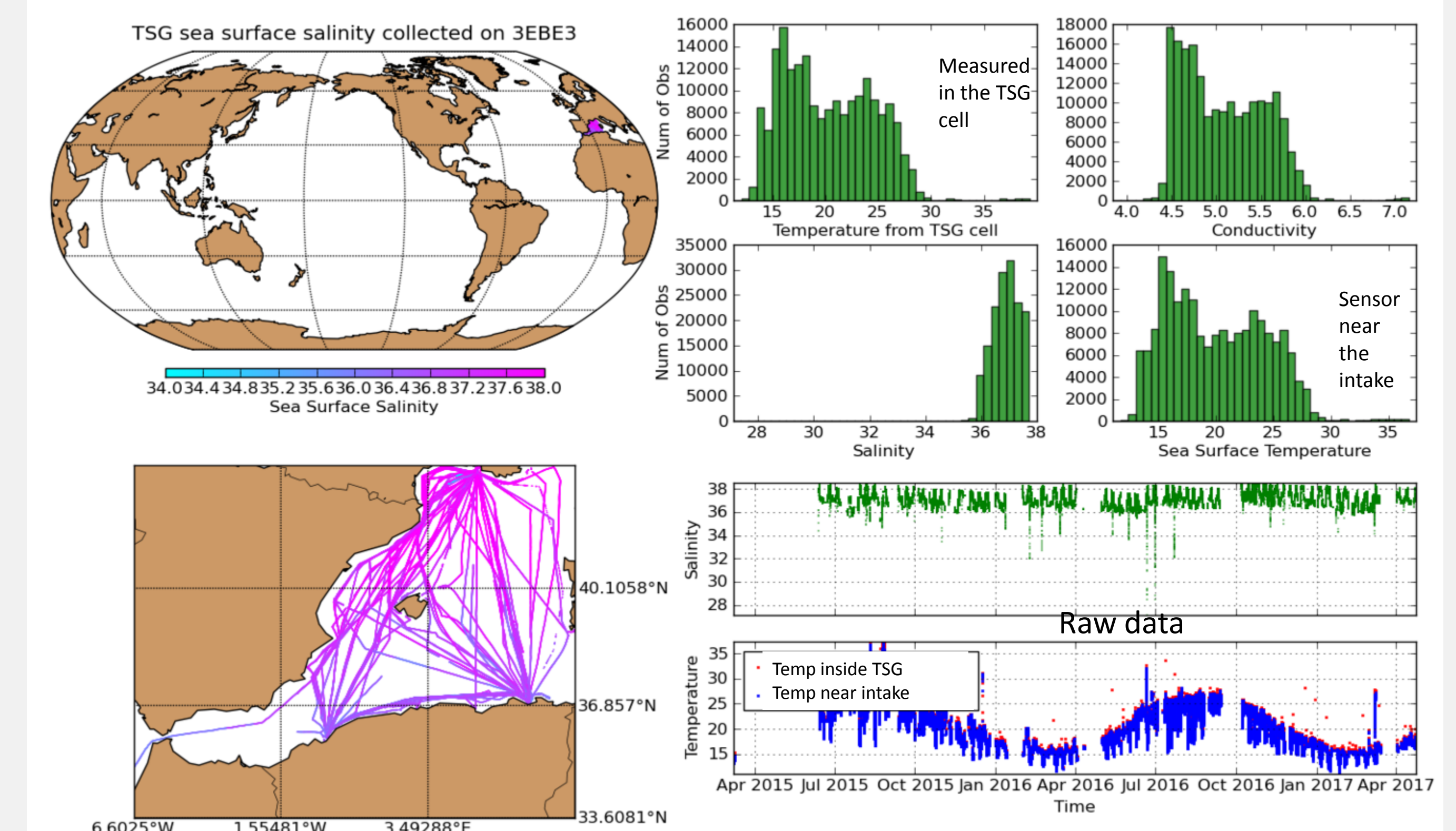
Note: only a small portion of the NCEI historical data have been processed and included in this dataset.

Platform distribution



Data visualization

Python TSG visualization modules – quickly overview the data by platforms, e.g. data from cargo ship CAP CARMRAT (callsign 3EBE3)



Note the similarities and differences between temperature measured in the TSG and near the water intake. For some ships, temperature was only measured inside the TSG. It is more accurate to measure the sea surface temperature using a remote temperature sensor near the water intake.

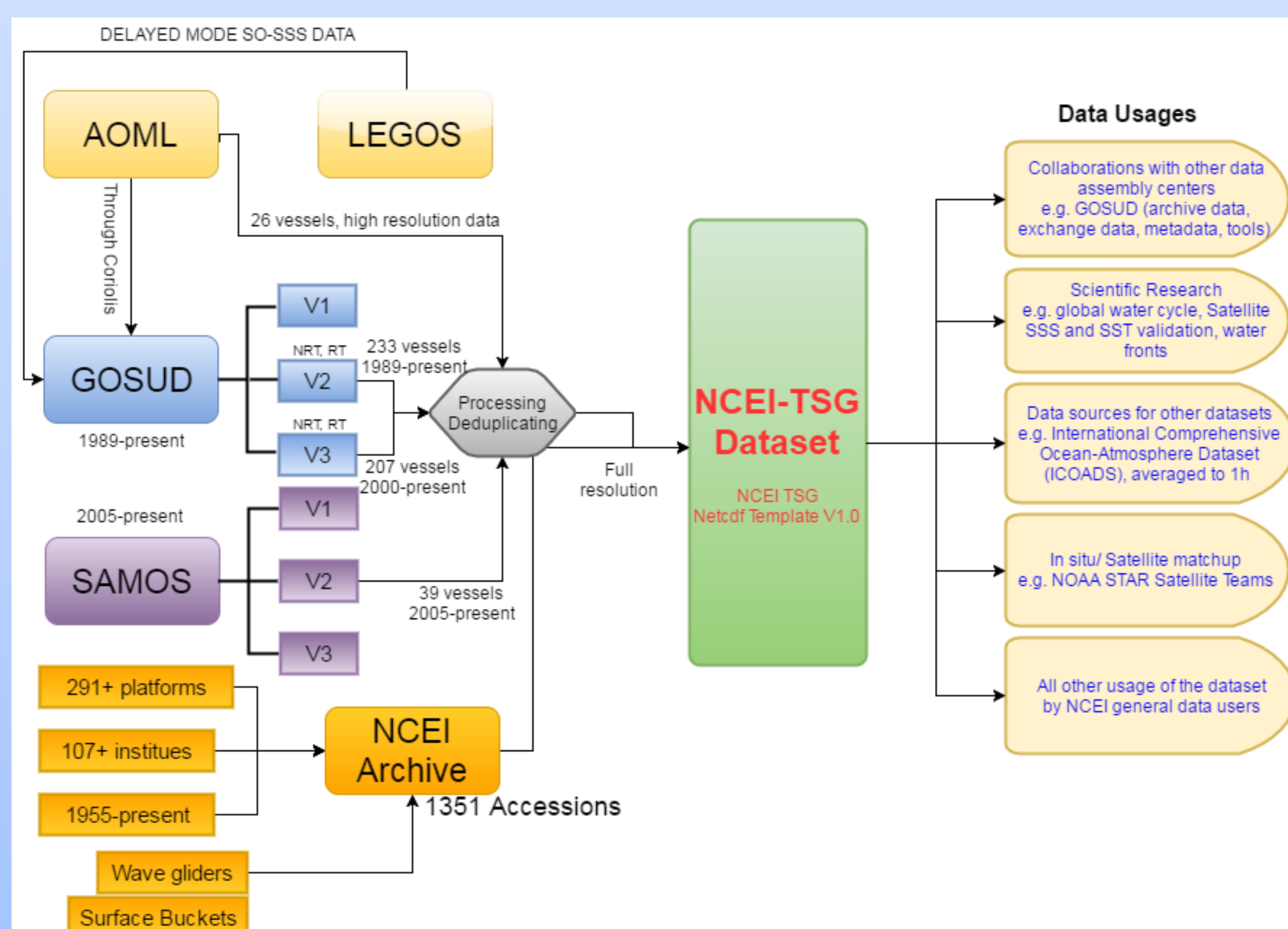
Data sources and data processing

Four main data sources for the NCEI-TSG dataset:

- NOAA/NESDIS NCEI Archiving Management System, over 1300 accessions
- International Oceanographic Data and Information Exchange (IODE) Global Ocean Surface Underway Data (GOSUD). (note: LEGOS (Laboratoire d'Etudes en Géophysique et Océanographie Spatiales) data has been included in the GOSUD).
- NOAA/OAR Atlantic Oceanographic & Meteorological Laboratory (AOML) TSG data
- Shipboard Automated Meteorological and Oceanographic System (SAMOS), Florida State University

Other data could be included:

- Wave glider data
- Unmanned Surface Vehicle (USV) data
- Ferrybox data
- Surface bucket data



- ❖ Dataset is updated daily
- ❖ 11-step Quality Control (QC) Procedures
- ❖ Two-level QC flag system
- ❖ Common netCDF format following Climate and Forecast (CF) and Attribute Convention for Data Discovery (ACDD) conventions
- ❖ Automatic processing of new accessions into the dataset
- ❖ Granule search capability (one file per vessel per month per WMO square)

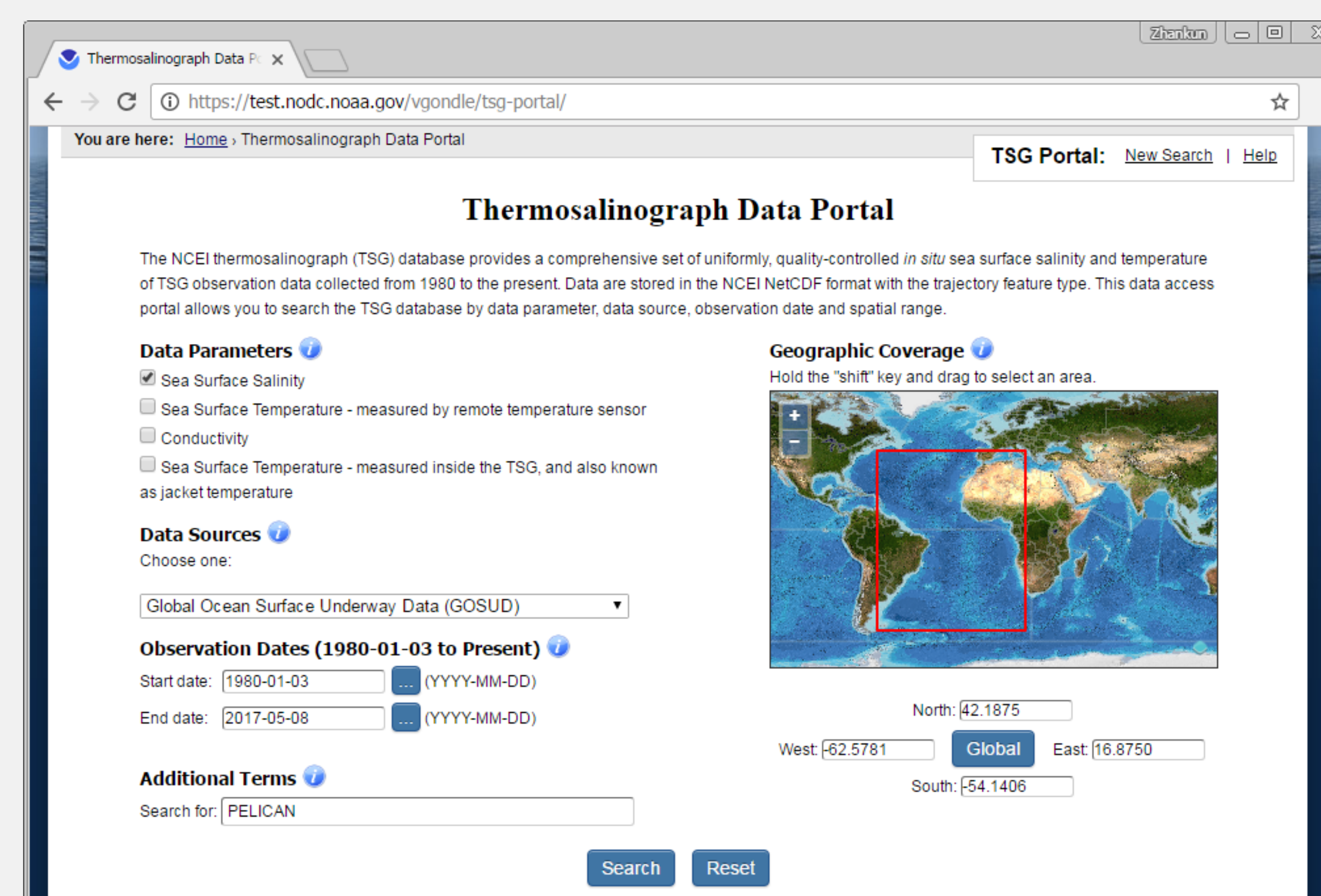
Access to the data

The NCEI-TSG dataset is freely accessible:

- **Landing page** – <https://data.nodc.noaa.gov/cgi-bin/iso?id=gov.noaa.nodc:NCEI-TSG>
- **HTTP** – <http://data.nodc.noaa.gov/ncei/tsg/>
- **FTP** – <ftp://ftp.nodc.noaa.gov/pub/data.nodc/ncei/tsg/>
- **OPeNDAP** – <http://data.nodc.noaa.gov/opendap/ncei/tsg/>
- **THREDDS** – <http://data.nodc.noaa.gov/thredds/catalog/ncei/tsg/>

TSG data portal

Granule search and data selection – in testing



Advantages of TSG dataset

1. The world's most complete TSG dataset, containing uniformly formatted and quality-controlled data from the different data assembly centers, e.g. SAMOS, GOSUD, and AOML, with more historical data from NCEI's archive to be added.
2. When different versions of a dataset are available, the dataset with the highest resolution is always chosen.
3. All data are converted to a common NetCDF format, employing enhanced metadata, following ACDD and CF conventions to increase overall quality and searchability.
4. All data are processed using the same 11-step quality-control procedures and flagged using a two-level flag system.

Future work

- Dataset update/maintenance
- Expand the dataset
 1. Add more historical data from NCEI archive (1300+ accessions)
 2. Add biochemical data concurrently collected, e.g. Chl-a, Dissolved Oxygen, pCO₂, etc.
 3. Replace averaged low-resolution data with raw high-resolution data when found
 4. Add surface data from other instruments/platforms, e.g., data from wave gliders, sail gliders, drifters, water bucket, etc.
- Metadata enhancement, e.g. water intake depth, instrument setup, etc.
- QC updates/improvements
- Scientific research, e.g. in-situ/satellite match-up, fronts in the ocean, global water cycle, etc.

Acknowledgement: This project is funded by NOAA/NESDIS NCEI and STAR.

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2017 Salinity Workshop
Woods Hole Oceanographic Institution, MA
22-26 May 2017

Cooperative Institute for Climate & Satellites-Maryland
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