NCEI Surface Underway Marine Database (SUMD) Initiative

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Introduction

The NCEI Surface Underway Marine Database (SUMD, formerly the NCEI TSG Database) is one of the world's most extensive collection of thermosalinograph (TSG) data available without restriction. Data collected from over 500 ships and uncrewed surface vehicles during the period 1986 to the present. All data are converted to a common NetCDF format, employing enhanced metadata.

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

Why SUMD?

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

Uncreaed Surface Vehicles (USV): Saildrones and Wave Gliders

✓Supports Satellite SSS and SST match up and quality assurance/quality control

✓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

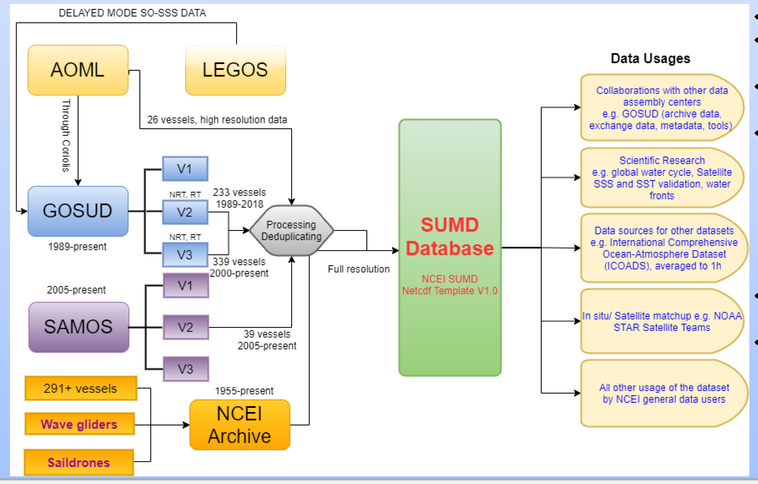
Data sources and data processing

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
- Wave gliders and Saildrones

Other data could be included:

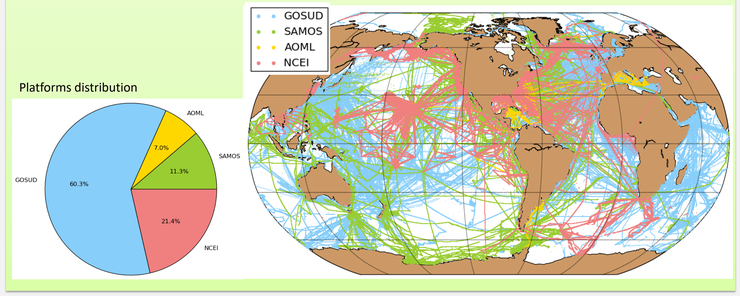
- Ferrybox data
- Surface bucket data



- ❖ **Daily update**
- ❖ **11-step Quality Control (QC)**
- ❖ **Two-level QC flag system**
- ❖ **Common netCDF format following Climate and Forecast (CF) and Attribute Convention for Data Discovery (ACDD) conventions**
- ❖ **Automatic processing**
- ❖ **Granule search capability (one file per vessel per month per WMO square)**

SUMD dataset overview

Temporal coverage: 1986-present
Sample resolution: varying from 1s to 1hr
Platforms: 500+
Variables: Surface Temperature, Salinity, Conductivity, Air Temperature, Wind speed and direction, Chlorophyll a, microplastics etc.



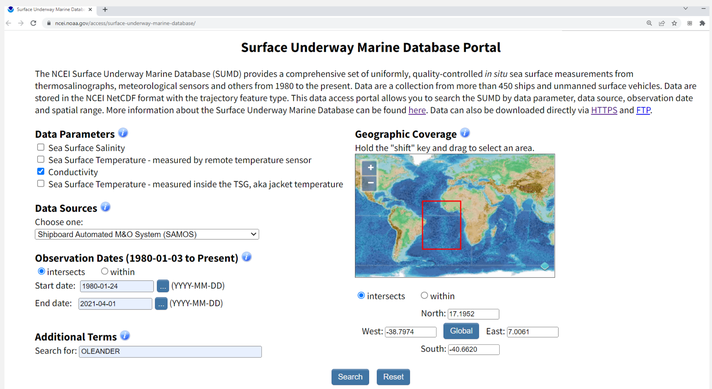
Access to the data

The NCEI-SUMD dataset is freely accessible:

- **Landing page –** https://www.ncei.noaa.gov/access/metadata/landing-page/bin/iso?id=gov.noaa.nodc:NCEI-SUMD
- **HTTP –** https://www.ncei.noaa.gov/data/oceans/ncei/sumd/
- **THREDDS –** https://www.ncei.noaa.gov/thredds-ocean/catalog/ncei/sumd/catalog.html

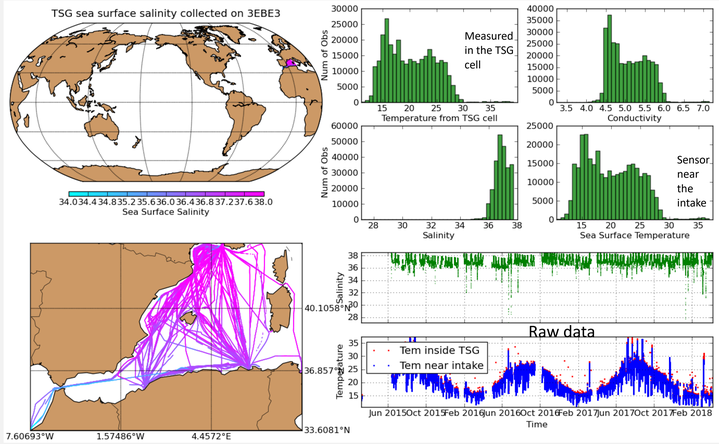
SUMD data portal

Find data you need at https://www.ncei.noaa.gov/access/surface-underway-marine-database/



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.

Advantages of SUMD

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, and more historical data from NCEI's archive. Also contains data from USV.
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
- 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.
- Moving to Cloud (Development of SUMD-Cloud)

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