



TRUSTED Project Overview

Marc Lucas, CLS
& the TRUSTED Consortium



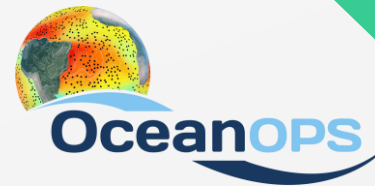
22nd April 2024



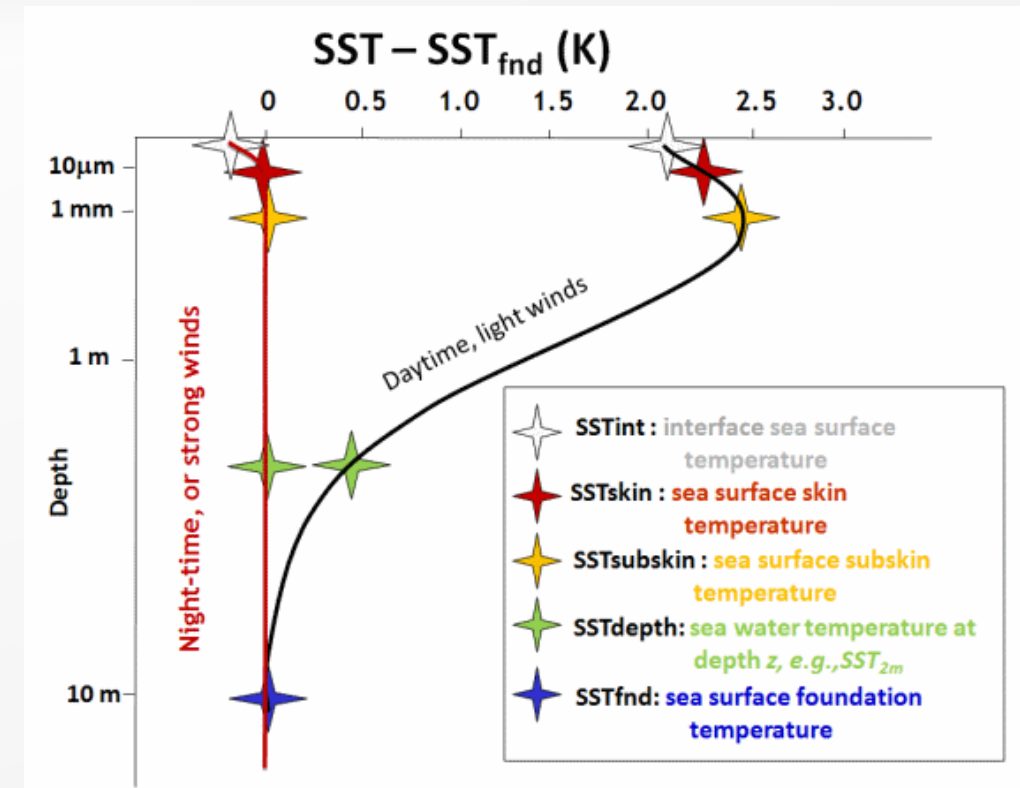
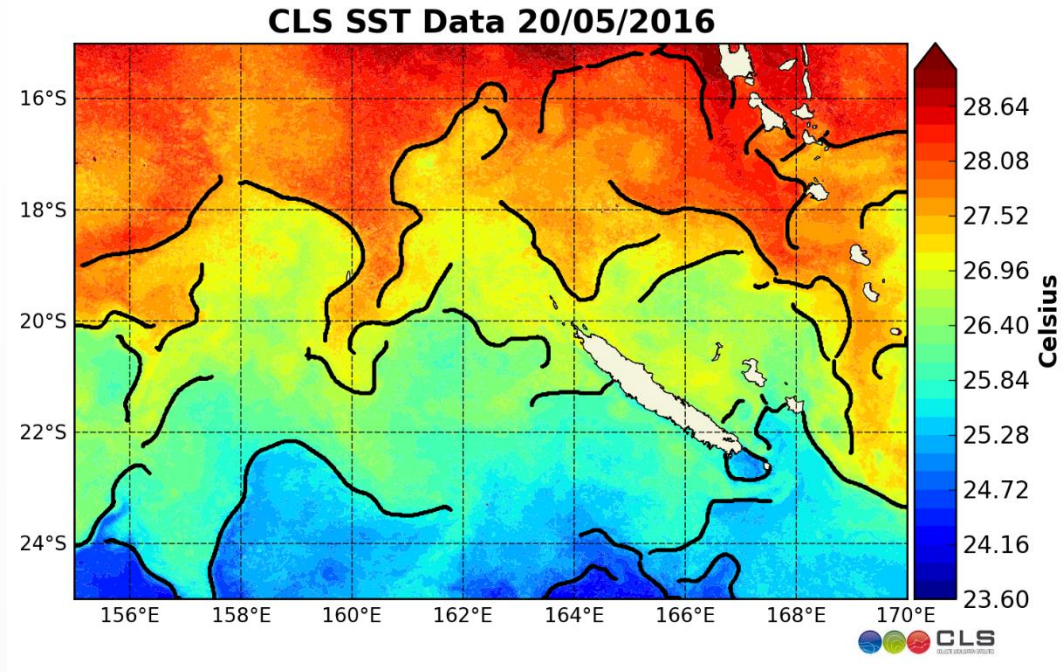
Rationale: towards FRM



- Higher quality data needed to enable finer scientific investigations
- To improve satellite data quality:
 - Better instruments
 - Higher quality in situ data for calibration and validation purposes
- Copernicus: set up the TRUSTED project overseen by Eumetsat to get higher quality in situ data for the calibration/validation of the sentinel 3 radiometers

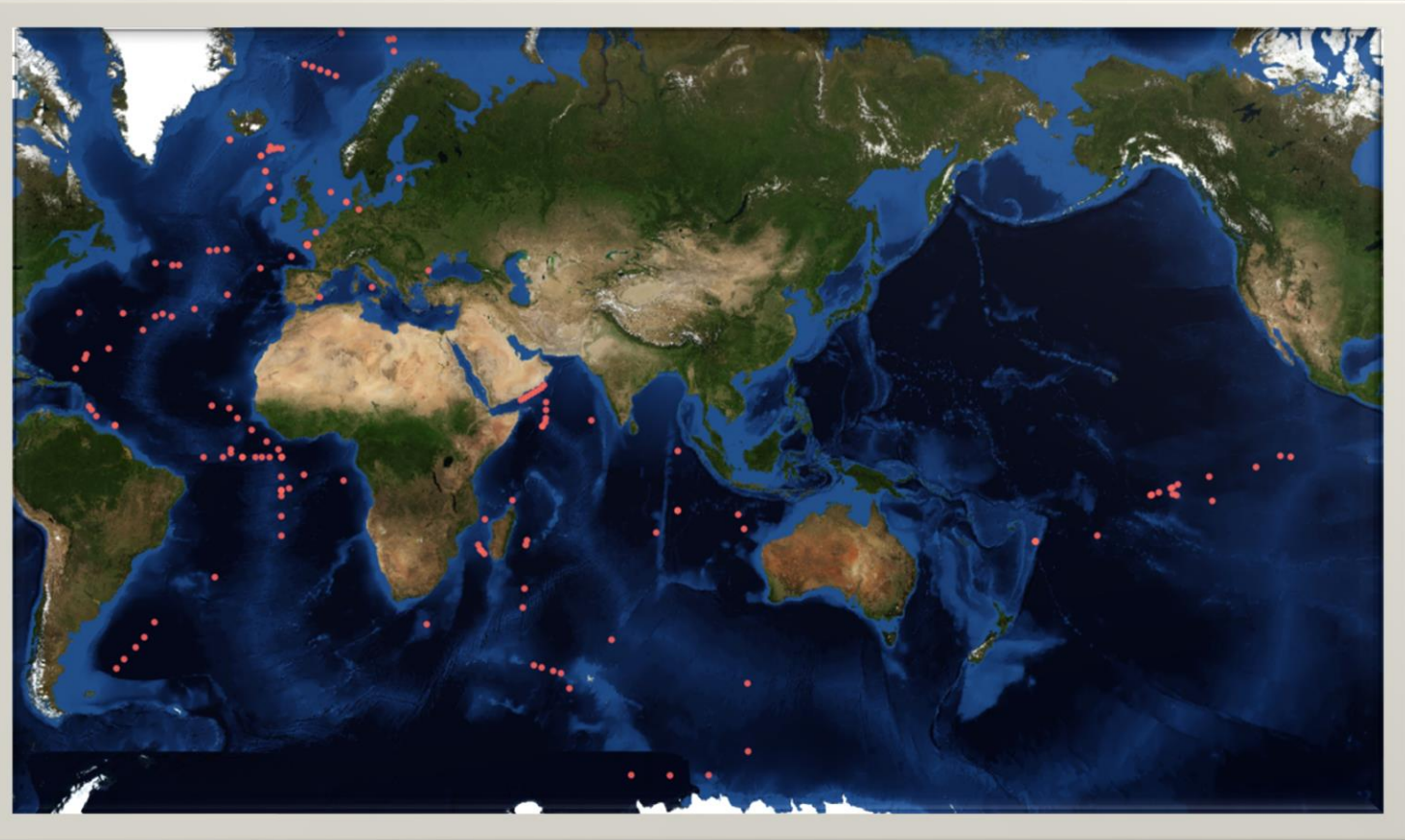


The Sea Surface Temperature: Remote Vs In Situ



The TRUSTED Project

- Began in 2018
- New sensor by nke: mosens
- New buoy designs: SVP-BRST
- 227 Buoys built
- 183 buoys deployed, 28 active
- Data available on Coriolis
 - <https://www.coriolis.eu.org/Data-Products/Data-selection>



Trusted Buoy Deployment Locations



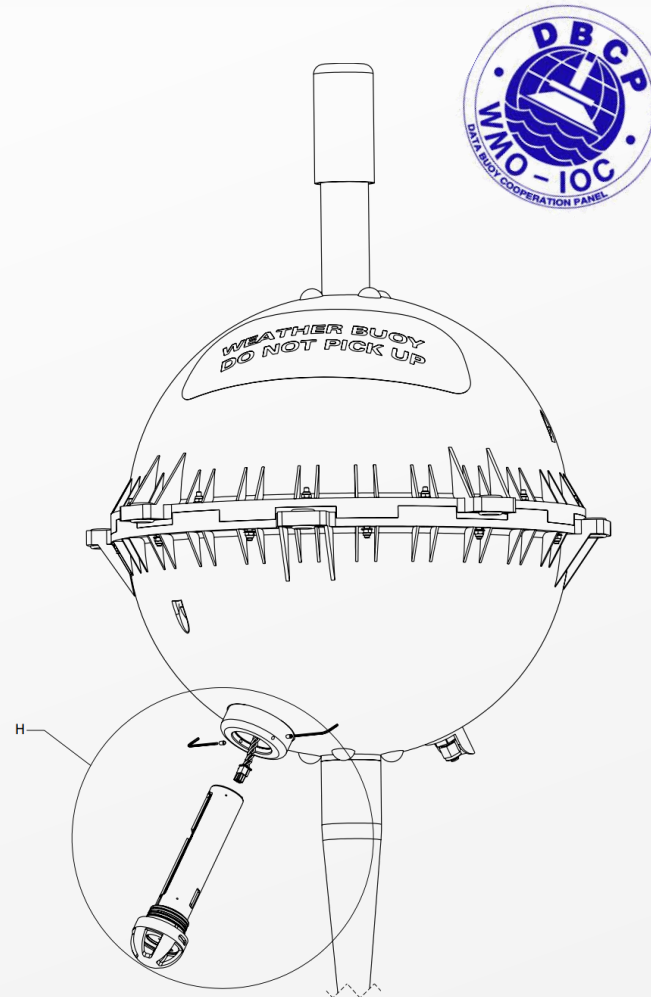
Metrology friendly instrument

Sensor: nke instrumentation mosens :

- removable
- Self-contained (with own electronics)
- Choice of conversion function
- User interface to adjust coefficient
- Temperature & Hydrostatic pressure

Platform: nke SVP-BRST drifting buoy :

- 4 sensors:
- P, SST, TRST, HP
- GNSS module for HR localisation
- Iridium modem

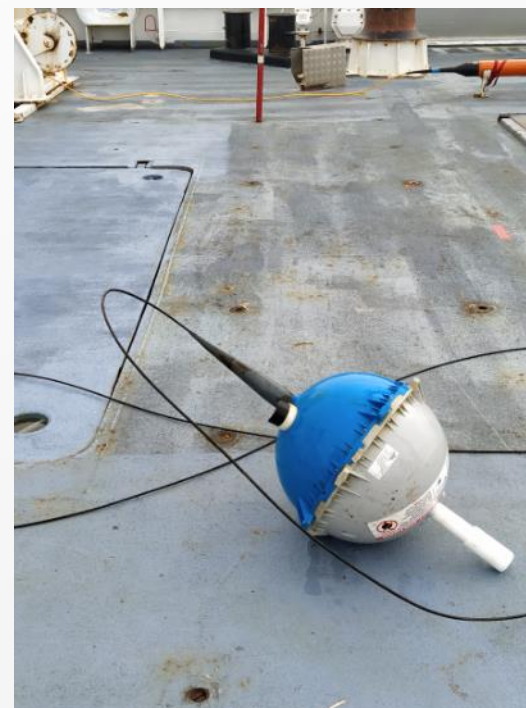


Metrology procedure

- A calibration in 3 steps:
 - MoSens TRST Sensors Calibration with an uncertainty budget.
 - Verification within the buoys with a final uncertainty budget.
 - Post deployment calibration

Estimated drift \approx 4-6 mK/year

Uncertainty budget of HRSST measurements	N° Y17-07 (mK)	N° Y18-24 (mK)
Reference temperature (u_{tref})	0.9	0.9
Bath stability (u_{Bath})	0.3	0.3
Buoy HRSST reproducibility (S)	2.5	3.4
Buoy HRSST repeatability (S_{rep})	0.5	0.5
Expanded uncertainty (U_C)	5.5	7.2



AMT 29 Comparison

Tank on scientific flow through system (3 l/s)

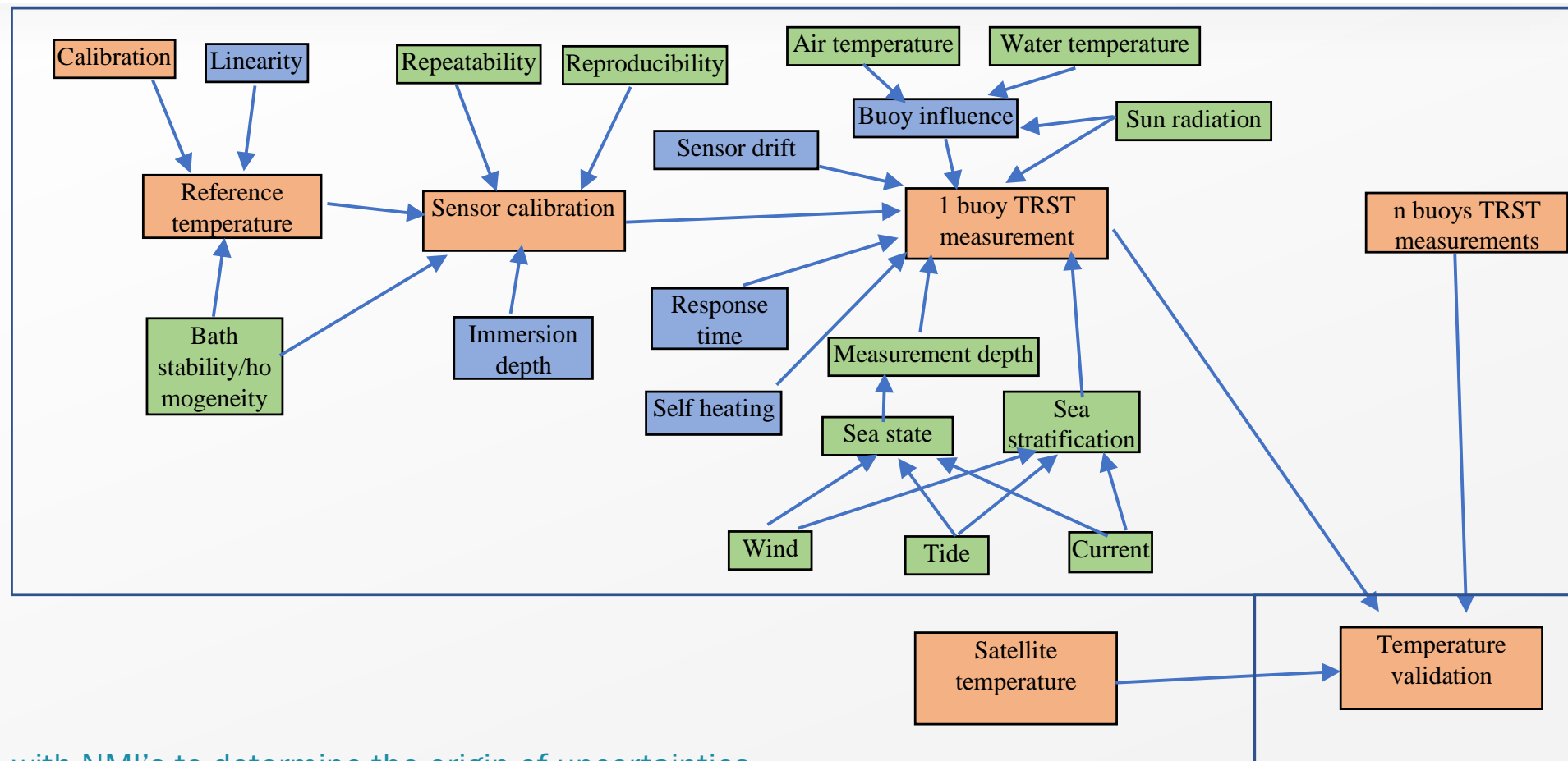
- HART 1504 with Thermometrics 225
- HRSST drifter probe 1
- HRSST drifter probe 2
- NOSS sensor
- Thermistor

Data logged every second

18/10 – 22/11/2019



FOM: Improving Procedures: Uncertainty Diagram



Blue : systematic effects,
 Green : random effects
 Salmon: measurements results.

Collaboration with NMI's to determine the origin of uncertainties
 Diagram elaborated with the help of Emma Woolliams, (NPL, UK) as well as
 Carmen Garcia Izquierdo (CEM, ES) & Andrea Merlone (INRM, IT)



Data Quality Control S. Pere presentation

DATA QC performed by Meteo France:

- In real time
- Multi model
- Data sent to GTS for use by NWP centers
- Archived via Oceanops

OBSERVATION MONITORING

Surface Marine Data and QC Plots

Use this form to consult surface marine data plots (received on GTS) for the past 30 days of an observation system with Call Sign or WMO Number

Enter Call Sign or WMO Number :

Parameter selection : (select in the list the parameter to monitor...)

- Data Plot
- Data Plot (scaled)
- Quality Control Plot

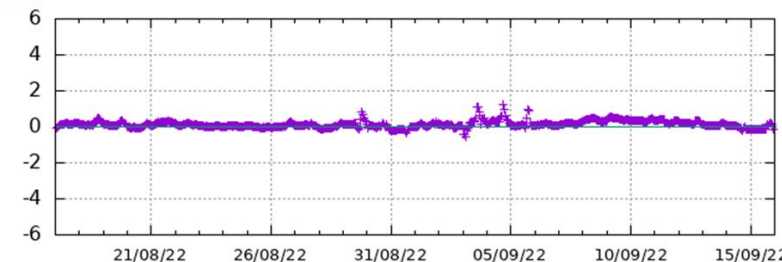
Type of plot to generate :

From this form, you will have access to statistical information and graphs of the data provided by databuys and Voluntary Observing Ships received on the GTS for the past 30 days. The procedure to fill the form is :

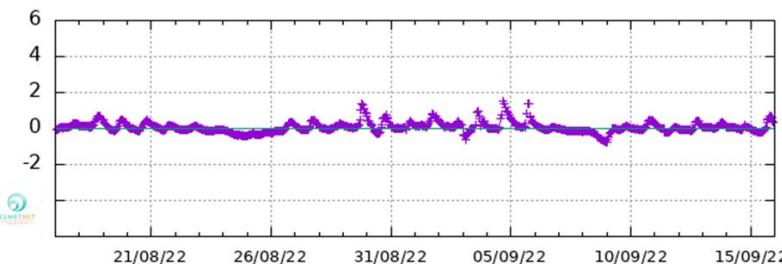
1. You must exactly know either the Call Sign or the WMO Number of the station : fill in the "Enter call sign or WMO Number" field.
2. You can enter the period in days over which graphs are plotted, default is last 16 days (30 days is the maximum length).
3. Surface marine data received on GTS for the past weeks or days may be viewed, in this case select either the type of plot to generate - data Plot or Data Plot Scaled (which will adjust better the scale of the value displayed according to the min and max values found for parameter selected...). If you need to view the Comparisons with model outputs select the type of plot to generate - Quality Control Plot.
4. Then, select the observation parameter you need to monitor, and confirm with the "OK" button : you will access to the plot selected.

Dissemination : Meteo France - Centre de Météorologie Marine, Quality Control Tools, VOS Observation Counters, Met Office Monitoring in research.metoffice.gov.uk, NOAA - National Data Buoy Center, Network Status JCOMM in-situ Observing Platform Support centre (real-time maps and statistics), WEB Designed by Jean-Pierre KERBERHO - Meteo France - Jul 2011 Any comments

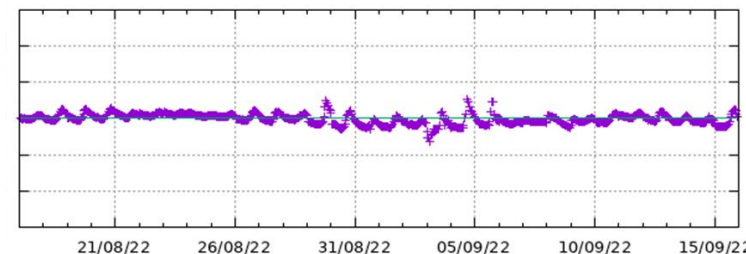
Meteo-France Station WMO 6204563 - SST differences in Celsius deg.



ECMWF Station WMO 6204563 - SST differences in Celsius deg.



Mercator Station WMO 6204563 - SST differences in Celsius deg.



Black list on 30 days monitoring

MARINE OBSERVATION MONITORING

Quality Control Tools : blacklists

QC Statistics - Platforms providing dubious AP values

List of platforms for which over the past 30 days

- the number of gross errors is higher than 2 and higher than 5%
- standard deviation is higher than 3 nPa
- or bias is higher than 5 nPa in absolute value.

Last update : Fri Sep 16 12:37:02 2022

WMO	Argos/DHEI	Prgrs	Own	End Date	Lat	Lon	Hobs	GE	Bias	Std	Data	Comp	Map
1501741	300234067002430	COPERNIC		20220831	-38.2	157.8	348	235	-5.3	4.4	●	●	●
2301740				20220823	-12.1	96.9	153	94	1.8	3.5	●	●	●
2302618				20220817	6.4	100.1	12				●	●	●
2302628				20220915	11.8	79.8	627	104	-0.2	4.4	●	●	●
3301607				20220915	-37.4	-19.1	253	82	-0.3	2.1	●	●	●
3401545	64023010	AOH	National Oc	20220915	-39.6	-68.2	300	21	-0.1	1.8	●	●	●
4201647				20220915	31.2	-89.3	75	30	0.5	1.4	●	●	●
4401848	66292540	AOH	National Oc	20220913	53.8	-9.6	594	337	-5.7	2.7	●	●	●
4401866				20220824	18.6	-68.7	163	23	-0.1	0.6	●	●	●
4500012				20220915	43.6	-77.4	4250	1043	-9.6	0.3	●	●	●
4500208				20220906	41.9	-80.7	1472	1472			●	●	●
4601592	63321480	SIO-DB		20220915	-26.1	-113.1	710	81	0.1	1.9	●	●	●
4601783				20220915	59.0	-139.1	267	267			●	●	●
4701730				20220915	69.8	-67.2	520	520			●	●	●
4701744				20220915	79.2	-106.8	540	540			●	●	●
4701747				20220915	78.1	-117.2	541	203	0.5	4.6	●	●	●
4801670				20220915	86.3	-66.1	600	282	4.4	2.2	●	●	●
4802091				20220915	77.4	-105.6	662	518	7.1	2.1	●	●	●
4802655	300234066791780	EC DB	ENVIRONMENT	20220915	80.5	-121.6	543	206	-1.1	2.7	●	●	●
5107723	300234066512780	COPERNIC		20220915	-30.3	56.3	718	106	-0.9	2.7	●	●	●
5102009				20220915	3.3	-112.4	707	0	-5.4	0.7	●	●	●
5102011				20220822	-1.7	-91.7	343	32	-0.3	5.5	●	●	●
5401576	64023290	AOH	National Oc	20220819	-54.1	173.2	49	30	0.6	0.9	●	●	●
5601623	300534060381710	BOI DB	Bureau of H	20220915	-35.2	137.1	526	35	-0.4	1.9	●	●	●
5601093				20220915	-60.1	116.9	705	583	-4.0	5.2	●	●	●
6102797				20220915	36.7	-3.0	679	0	-5.2	0.7	●	●	●
6102804				20220915	39.6	2.6	707	0	-6.6	0.5	●	●	●
6204567	4.000	40	COPERNIC	20220831	5.8	0.4	346	224	-0.5	4.7	●	●	●
6301670	300234067204900	COPERNIC		20220915	-36.5	120.3	719	227	-0.8	2.6	●	●	●
6301846				20220906	81.3	35.6	904	517	-0.5	5.0	●	●	●
6401588				20220915	79.0	28.1	400	41	-0.3	2.2	●	●	●
6402587				20220915	54.3	-51.5	661	396	7.9	1.6	●	●	●
6402654				20220915	62.7	1.7	445	169	0.6	1.8	●	●	●



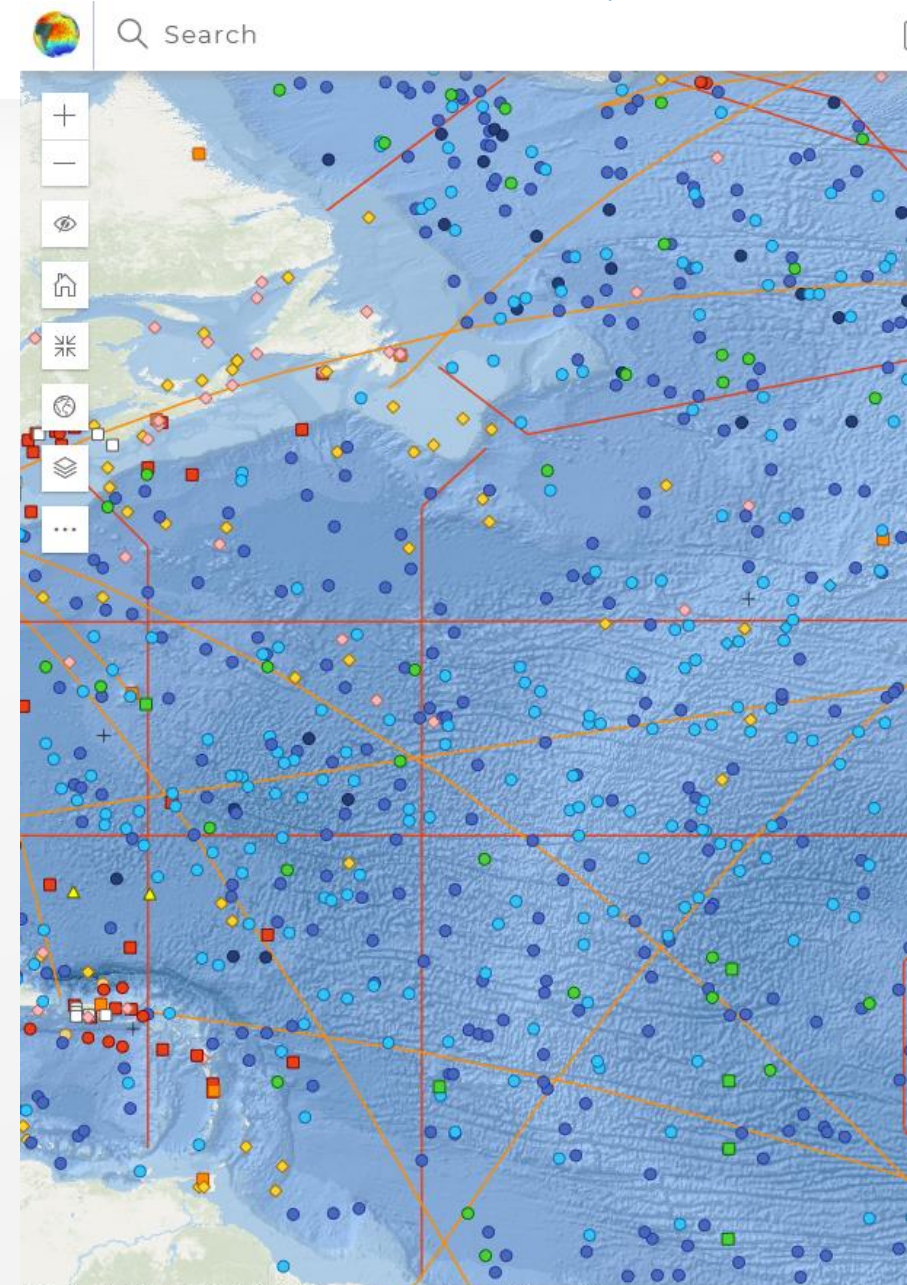
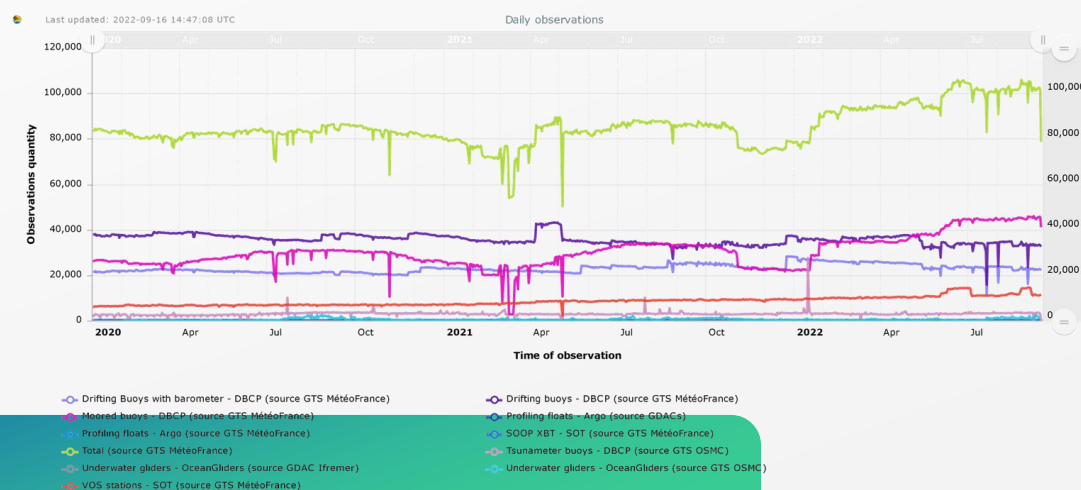
Metadata Archiving

Centralised WMO accredited management centre : Oceanops

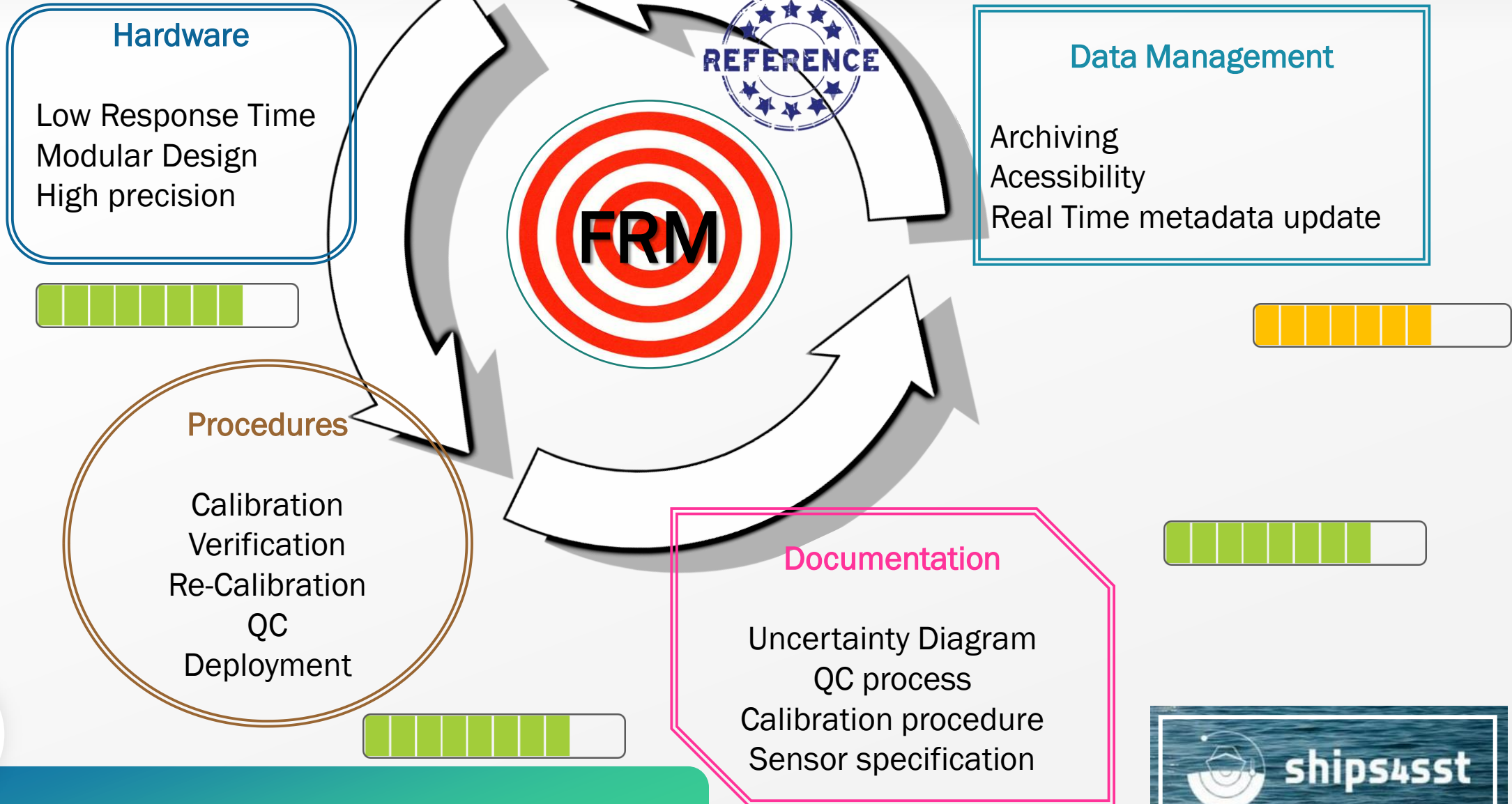
Record all event in buoys life cycle:

- Manufacturer, batch etc
- Deployment location, vessel
- Sensor info (calibration doc)
- QC information: automatic
- Program info (owner etc)

And share with community and Coriolis GDAC



SST FRM in TRUSTED



IST data Gap

- Lack of observation in sea-ice
- Harsh condition
- sea-ice in situ measurements critical for developing and validating new operational Copernicus Sentinel-3 sea-ice Surface Temperature products
- Snow effect is a big obstacle (1m thermistor pole)
- What can be done to bring down the cost to increase sampling



Ice Surface Temperature Sensor

- specifications drawn up in 2022
- finalized early 2023
- mechanical housing defined in July 2023
- electronics hardware ready in September 2023
- Delivery in December 2023

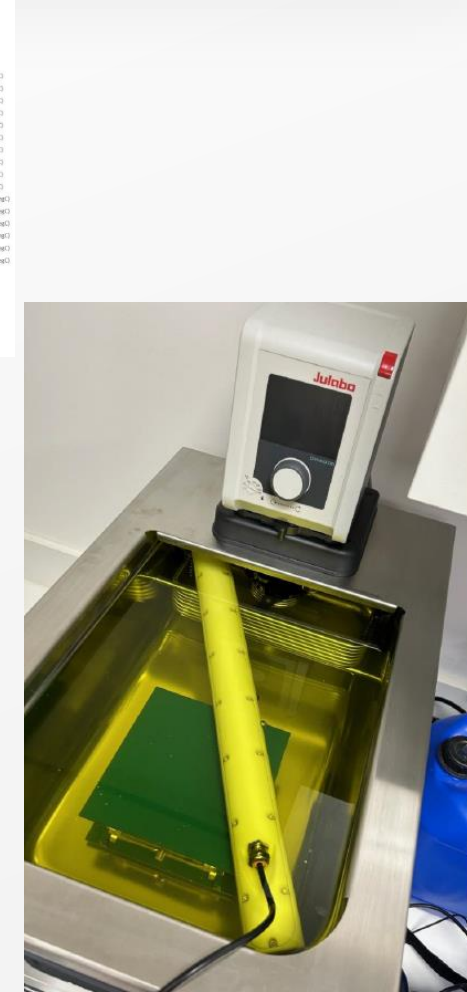
Very challenging (down to -50°C)

issue of snow accumulation.

16 independent sensors (3 cm) which can be independently calibrated

Platform based on the SVP-BRST to be developed this year

Production in 2025 (if funding secured)



Thank You

Contacts:

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