# TRUSTED

## **Project Overview**









http://www.ifremer.fr/cerweb/sentinel-3/mdb-slstr/



# "Towards Fiducial Reference Measurements from high resolution sea surface temperature drifting buoys "

The main objectives of this Eumetsat funded Project are:

- to provide a service of SST and other drifting buoy measurements from 100 drifting buoys with improved calibration capability;
- to improve the SST uncertainties from the use of additional digital SST probes and reporting position and timeliness improvements, and thus providing a service of improved SST observations to the GTS;
- to improve on the standard SVP-B drifting buoy coordinated by the Data Buoy Cooperation Panel (DCBP), retaining the original SST sensor for inter-comparison.

In effect: Design Manufacture and Deploy 100 HR SST buoys whilst insuring high quality and high traceability: new source of wet measurements





#### Meet the Team



#### nke Instrumentation



- Design of Floats, Drifters, Probes and Sensors for oceanographic uses and environmental monitoring
- Production and commercialization worldwide
- Participation in national and international collaborative research projects
- TO 2017 7.1 M€ 33 people
- 1993 : marketing of the first autonomous datalogger
- 2001 : Creation of the instrumentation department
- 2009 : integration of Floats & Drifters activity
- 2010 : new metrology laboratory
- 2012 : nke instrumentation becomes subdidiary of nke SA (FdK)

•ENGINEERING





METROLOGY





•CUSTOMER SERVICE







• PRODUCTION

201

## **Products and Services**





## **TRUSTED NKE SVP Design**





- Two NKE activities (Drifter and Sensors) merged in TRUSTED Project.
- On top of HRSST measurements, technological developments (addition of Barometer and drogue loss detection compliant with SVP-B Design recommendation).
- NKE is the only European SVP-B Drifter manufacturer.





## THE METROLOGY LAB AT THE SHOM

The metrology is a chain of institutes certified to perform calibrations to given level of uncertainty.



The BIPM is responsible for the organization of the metrology at the international level. It is helped at the national level by NMI's: NIST, NPL ...



SH

## **TEMPERATURE SI CALIBRATION**

Temperature is **an intensive quantity**: the only way to make it measurable is to built a scale with reference fixed points, interpolation curves and reference instruments.

The Shom metrology laboratory is equipped with 2 fixed points of the 1990 International Temperature Scale (**ITS-90**):

- a triple point of water at 0.01 °C
- and a melting point of Gallium at 29.7646 °C.

In order to answer oceanographic requirements, they are calibrated directly to the CNAM-INM or to the NPL, to an expended uncertainty of 0.1 mK for the tpH2O and 0.25 mK for the pfGa.







## **TEMPERATURE SI CALIBRATION**

These fixed points are used to calibrate the Platinum reference thermometers (25  $\Omega$  and 100  $\Omega$ ) and the SBE 35 of the laboratory, to an expended uncertainty inferior to 1 mK.



Oceanographic instruments are **calibrated per comparison** to reference thermometers in a thermo-regulated tank of 800 l.

The temperature of this tank can be stabilized to better than 1 mK pp from 0 to 25 °C (S. D.  $\approx$  0.2 mK) and to about 1 mK (S.D.  $\approx$  0.5 mK) from 25 to 35 °C.

The expended uncertainty on reference temperatures is less than 2 mK (DUT excluded).







## **TEMPERATURE SI CALIBRATION**

The Shom SBE 911 CTD profilers and Sound Velocity Profilers (SVP) are calibrated in this bath.



Valeport SVP 1000. Doc. Shom.

SBE 911 CTD profiler. Doc. Sea Bird Instruments

Examples of calibration results for a SVP with the deviations after correction, and for a SBE 911 with a graph showing the drift history of this sensor.





SH





## TRUSTED SI CALIBRATION

**During the phase 1**, the 2 cylinders constituted by the sensor associated to its electronics card will be calibrated at first

When integrated into the buoys at NKE, the buoys will come back to the Shom to assess the thermal effect of the integration.

Different measurements are foreseen in order to assess the amplitude of the systematic error, if it is not negligible.

If it can be compensated, corrections will be added to the linearization coefficients.

If it can't be compensated, this error will be added to the uncertainty budget of the HRSST sensor.





The conclusion of this study will say if the required uncertainty of  $\pm 0.05$  °C can be respected, concerning the instrumental error.

It will say also if the calibration procedure needs changes or not for the phase 2.



## The Meteorological Marine Centre (MMC)

Created in 1971 in Brest (Brittany – France), located since 1996

in the SHOM site in Brest.

•The Meteorological Marine Centre (CMM) is connected with the DSO since 01/01/2016.

•The aim:

 Instrumentation at sea to the operational and scientific needs (buoys and vessels).

Location

Management data flows and software development related









#### Atmospheric and sea state observations



Two parts

**E-SURFMAR** 



Automatic stations on board =

Conventional vessels





Anchored buoys 🛛 🗕

= Drifting buoys





The buoys

The

vessels



## International cooperation





#### Regional Action Groups:

E-SURFMAR: EUCOS Surface Marine Programme IABP: International Arctic Buoy Programme IBPIO: International Buoy Programme for the Indian Ocean Global Action Groups (not shown on the map): GDP: Global Drifter Programme OceanSITES: Global deep ocean time-series reference stations IPAB: WCRP-SCAR International Programme for Antarctic Buoys ISABP: International South Atlantic Buoy Programme NPDBAP: DBCP-PICES North Pacific Data Buoy Advisory Panel (North 30\*N) TIP: Tropical Moored Buoy Implementation Panel (includes PIRATA and TAO/TRITON Arrays)





#### **BSH: Data and Facts**





Hamburg



Rostock



Sülldorf Lab (Hamburg)

- Maritime authority of the Federal Republic of Germany
- Maritime government research agency in the Federal Ministry of Transport
- Budget: approx €76.000.000
- Positions: approx. 850
- Largest specialist maritime library in Germany
- Printing house: approx. 450 orders
- ISO 9001 certification





## **BSH: Contribution**



GROUP







- Jcommops: established in 2001 (2 years after jcomm: joint technical commission for Oceanography and marine meteorology: WMO and IOC)
- Ops stands for:

observing platform support (centre)

Mission:

- Assist the implementation of the observing network
- Establish, maintain, and verify the mechanism for data exchange
- Develop the tools to monitor the status of the observing system
- Improve the overall effectiveness





#### jcommops

•

- Collect the Metadata: platform, sensor, program etc
- Enhance the Metadata: harmonize, checks
- Manage the Metadata: store, organize, back up
- Distribute the Metadata: end users, KPI





jcomm





۸.





## Who does what:



- CLS management and data transmission (telemetry)
- NKE: Design & manufacturing
- SHOM: calibration and quality checks
- Météo France: deployement
- BSH: cross validation deployement
- JCOMMOPS: metadata definition to insure data traceability





## A few numbers



- 2 phases:
  - Developping and testing the protoptypes
  - Manufacturing and deployement
- 3 options
- 5 sensors: HRSST ASST, Barometer, Hydrostatic pressure, drogue loss
- 6 participants in consortium
- 47 months: Total duration of the project
- 100 floats to be deployed









- 010: GPS error : already taken up, requires new GPS module from manufacturers, on going
- 020: High Frequency sampling:
  - Standard message every hour: 300 samples but only percentile information (PN with N = {10, 30, 50, 70, 90}) due to message size constraint (240 bytes)
  - HF: 5 minutes samples taken under the satellite: 300 samples sent back of T and HP in 4 messages on average 5 times a day (dependent on buoy distribution)
- 030: 50 extra buoys





## Thank you





# **Trusted For CLS**





