RÉPUBLIQUE FRANÇAISE
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SHOM
300 ans d'hydrographie

TRANSNATIONAL ACCESS TO METROLOGICAL LABS AND VALIDATION FACILITIES: THE EXAMPLE OF SHOM IN THE MINKE PROJECT

MARC LE MENN

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Introduction

Networking and cooperation in oceanography concern observing, modeling, data management, ocean services to society.

It was missing the European marine metrology research infrastructures.

MINKE, or Metrology for Integrated marine maNagement and Knowledge-transfer nEtwork, is a recent UE project.

It aims to integrate key European marine metrology research infrastructures, to coordinate their use and development and to propose an innovative framework of “quality of oceanographic data”.

Sentinel-2 satellite. Image credit: EUMETSAT.

Oceanographic vessel Beautemps Beaupré. Image Credit: © Shom

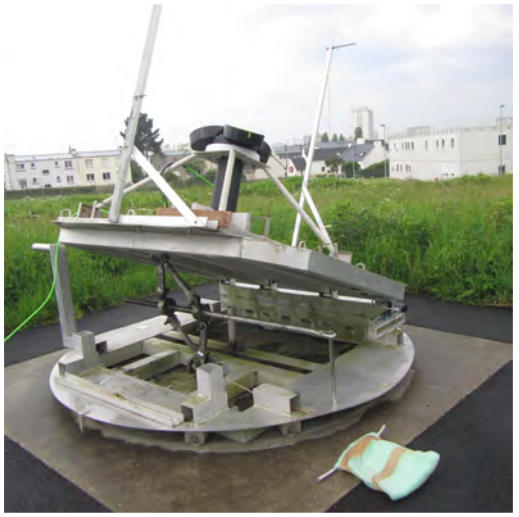
Introduction

Data quality is the key element in Ocean & Coastal Observing Systems to provide reliable measurements for developing evidence-based environmental policies.

Improvements in data quality involves particularly accuracy improvement, which means measurements to be metrologically referenced with the lower uncertainty.

One of MINKE's tasks consists in providing access to metrological laboratories and validation facilities through well-established EC Trans National Access instruments.

Shom decided to open its facilities concerning the calibration of current-meters, the calibration in temperature/salinity/pressure and the dosage of Pigments.



THE CALIBRATION OF CURRENTMETERS

Marine currents are one of the ECV or Essential Climate Variable defined by the Global Climate Observing System (GCOS).

In the last years, the calibration or simply the test of stand alone Doppler effect acoustic current-meters and profilers has been an untreated problem in oceanographic institutions.

At Shom, a platform was built and brought into service in 2012, to calibrate in their instrumental configuration of using, the electronic compasses and the tilt sensors they are equipped with.

This platform is in an area where the magnetic field has been mapped and it presents very low anomalies.

Current profilers can be placed in instrumented mooring cages during their calibration, to consider the errors led by the instrumental configuration.

THE CALIBRATION OF CURRENTMETERS

Researchers had yet to find a method to determine the trueness of velocity measurements.

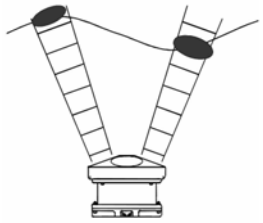
For rotor current-meters, this calibration was made in test open tanks or hydrodynamic channels, but generally to a maximum velocity of 1 m/s.

For Doppler current-meters, the low concentration in particles of these facilities is a problem, and taking into account the profiling range of profilers, this method can't be applied no more.

It remains the possibility of inter-comparisons at sea, but these inter-comparisons are expensive, difficult to organize and they allow the test of only one part of the velocity range of the instruments.

To solve this issue, a test using an acoustic transducer put down successively on the transducers of the profiler, has been settled in Shom.

The exploitation of the Doppler effect formula and of the speeds sensed by the instrument, allowed the perfecting of a test method of the device's measurement channels and of a calibration bed.



Doc. Teledyne R.D. Instruments

Photos © Ifremer

THE CALIBRATION IN TEMPERATURE, CONDUCTIVITY AND PRESSURE

Shom is equipped with a made-home calibration bath of a big volume (800 l) which allows the calibration of different kinds of instruments in temperature and conductivity, with the uncertainties required by oceanographic standards.

It can be stabilized in temperature under less than 10 min to reach the programmed temperature to better than 1 mK. This stability can be kept for a long time period.

Reference thermometers are calibrated to the reference points of the ITS-90, a triple point of water cell and a fusion point of gallium cell, regularly linked to the French primary standards.

Samples of seawater can be taken from the tank thanks to a pump and measured up with Guildline or Optimare salinometers, to retrieve the conductivity of the bath at the time of temperature measurements, with a calculated uncertainty. Optimare salinometers have been developed in Germany by the Alfred Wegener Institute.

Shom's calibration bath and one salinometer

THE CALIBRATION IN TEMPERATURE, CONDUCTIVITY AND PRESSURE

These salinometers are also used to test salinity samples collected during oceanographic cruises, in the frame of the French consortium Coriolis.

This equipment can be used to calibrate all kinds of CTD profilers, but also speed of sound profilers or devices.

It has been used recently to calibrate the high resolution sensors of surface buoys in the frame of a EUMETSAT/Copernicus project whose goal consists in filling the gap in satellite sea surface temperature validation.

In order to calibrate pressure sensors in the range 1 - 600 bar, Shom is equipped with an automated mass handling piston gauges. This dead weight tester can be remotely programmed to generate stable pressure plateaus with an uncertainty of 0.04 bar at 600 bar.

For lower pressure ranges, it is equipped also with a pressure-controlled calibrator CPC 8000, used for example, to calibrate pressure tide recorders.

Shom's automated mass handling piston gauges and calibrator CPC 8000

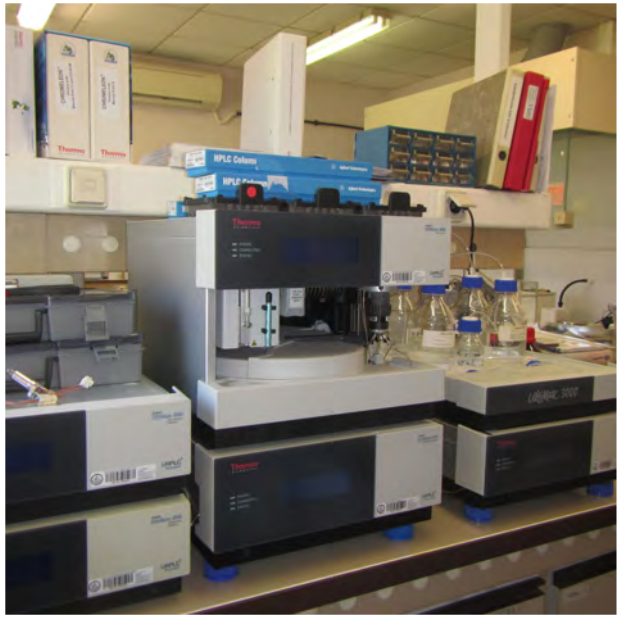
PHYTOPLANCTON PYGMENTS TESTS

The access is also open to phytoplankton pigments tests from samples taken at sea. These measurements are made with a HPLC (High Performance Liquid Chromatography) device following the Van Heukelem method.

In addition to chlorophyll a, the concentration of 27 other pygments can be measured.

The chlorophyll and phaeopigments measuring out can be made also with a SAFAS XENIUS spectrofluorimeter.

These analyses can be used to specify water masses or to calibrate in situ fluorimeters in order to adjust the chlorophylls profiles obtained during campaigns at sea.



CONCLUSION

In order to develop networking and cooperation in oceanography, one part of the MINKE project offers to European scientists a free access to unique facilities located in different countries.

These facilities enable them to test new sensors, to discover and to reduce the uncertainty of their measurements and to improve the quality of collected data, from well-established measurement procedures or from new methods described in peer-reviewed publications.