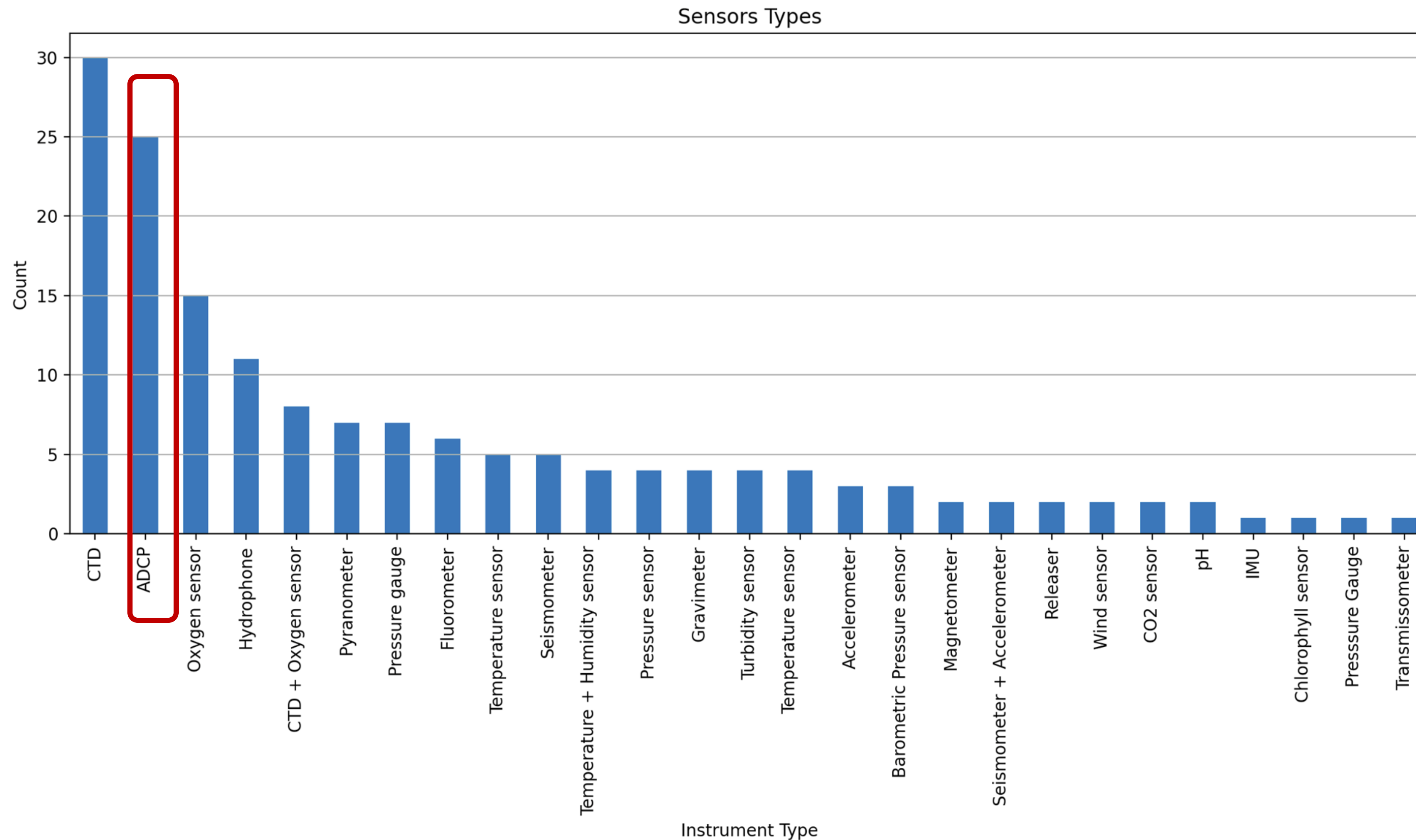


Beatrice Tomasi,
Norwegian Research Center (NORCE), University of Bergen, Norway
EMSO Workshop - Technology strategy
Rome 12 March 2025

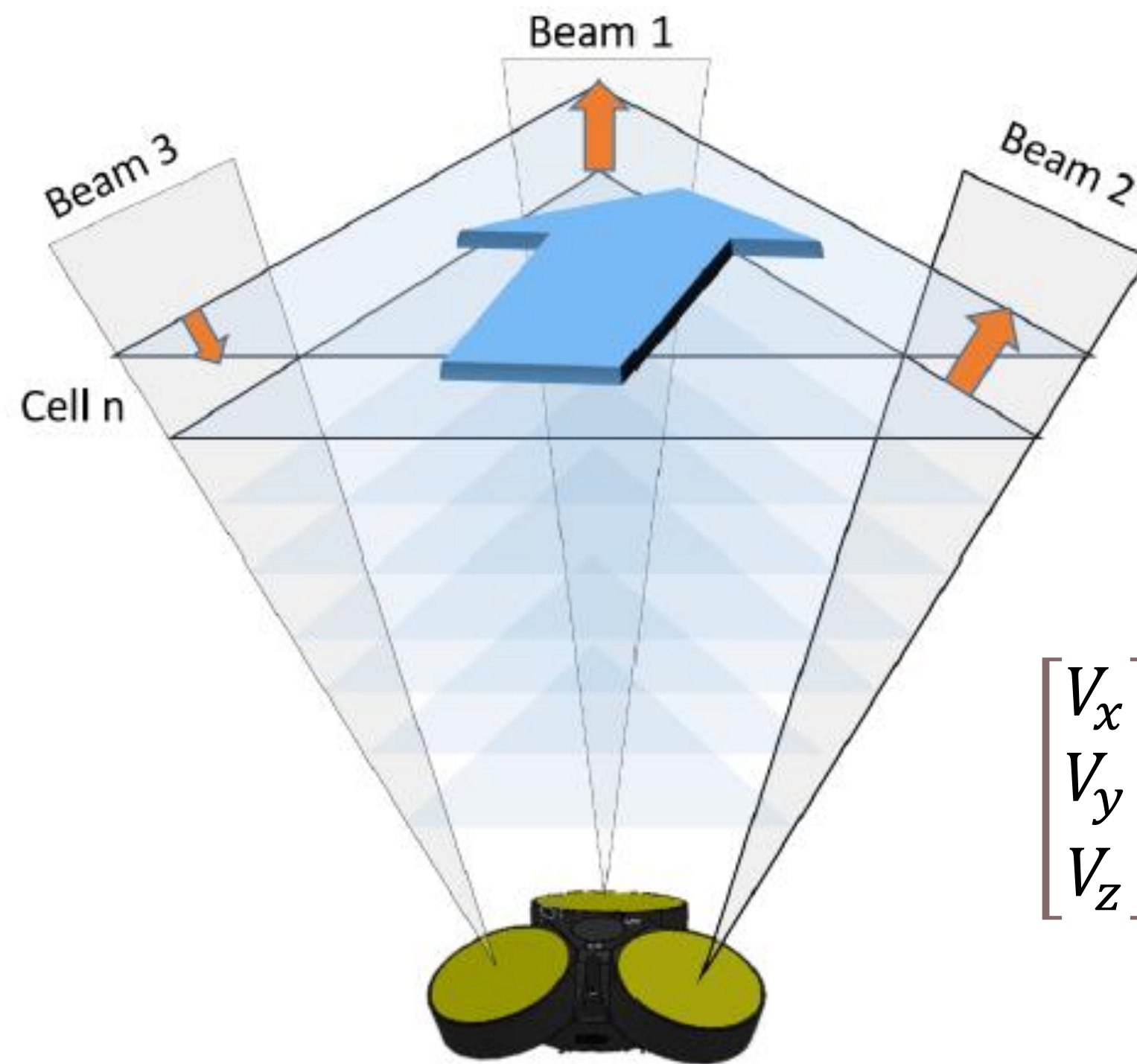
NEEDS OF CALIBRATION FACILITIES, BEST PRACTICES

ACOUSTIC DOPPLER CURRENT PROFILER (ADCP) WORKING GROUP



ACOUSTIC DOPPLER CURRENT PROFILER (ADCP): WORKING PRINCIPLES

Current velocity and directions are measured by using the Doppler effect.



$$V = \frac{F_{Doppler} C}{F_{source} 2}$$

$$\begin{bmatrix} V_x \\ V_y \\ V_z \end{bmatrix} = \begin{bmatrix} \frac{2}{3 \sin(\beta)} & \frac{-1}{3 \sin(\beta)} & \frac{-1}{3 \sin(\beta)} \\ 0 & \frac{-1}{\sqrt{2} \sin(\beta)} & \frac{1}{\sqrt{2} \sin(\beta)} \\ \frac{1}{3 \cos(\beta)} & \frac{1}{3 \cos(\beta)} & \frac{1}{3 \cos(\beta)} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix}$$

ACOUSTIC DOPPLER CURRENT PROFILER (ADCP) WG: CALIBRATION TNA MINKE APPLICATION

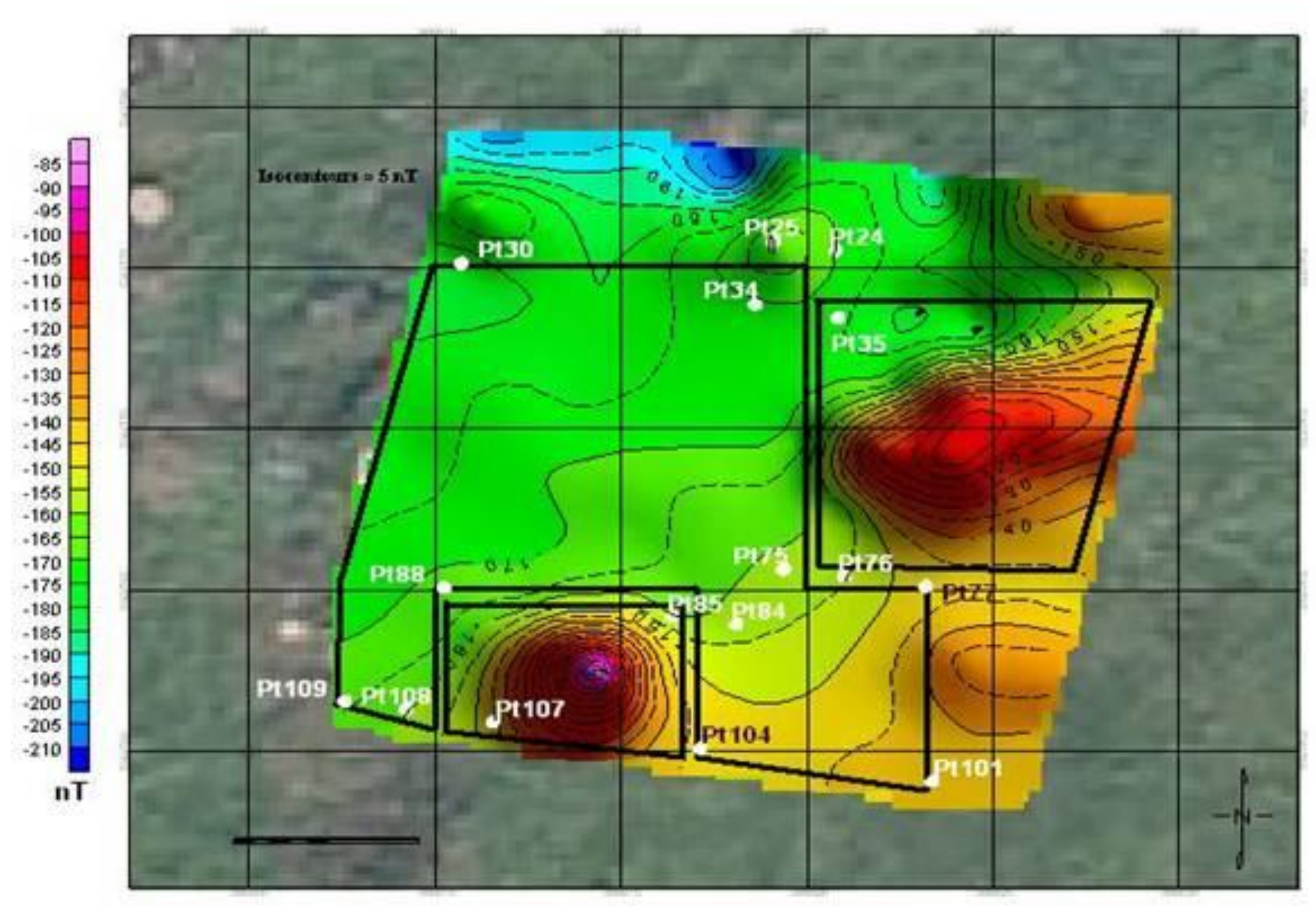
Within the TransNational Access (TNA) of the MINKE project, the working group had access to a platform for compass and tiltmeter calibration, as well as transducers integrity verification at the French Naval Hydrographic and Oceanographic Service (SHOM) in Brest, France.



The following was performed for 3 ADCP units.

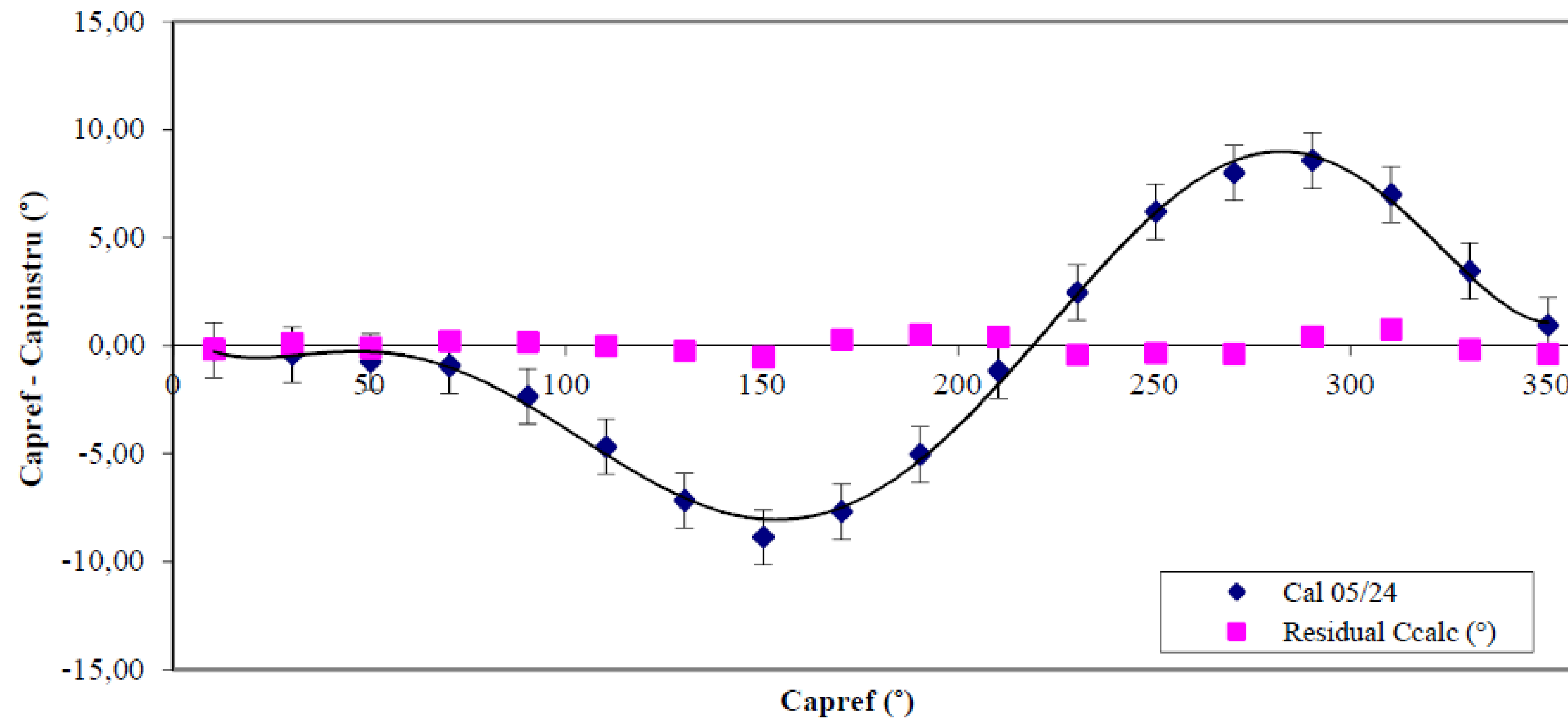
- Transducer integrity
- Compass calibration
- Pitch and roll tiltmeter calibration

CALIBRATION FACILITY AT SHOM FOR ADCP



ACOUSTIC DOPPLER CURRENT PROFILER (ADCP) WG

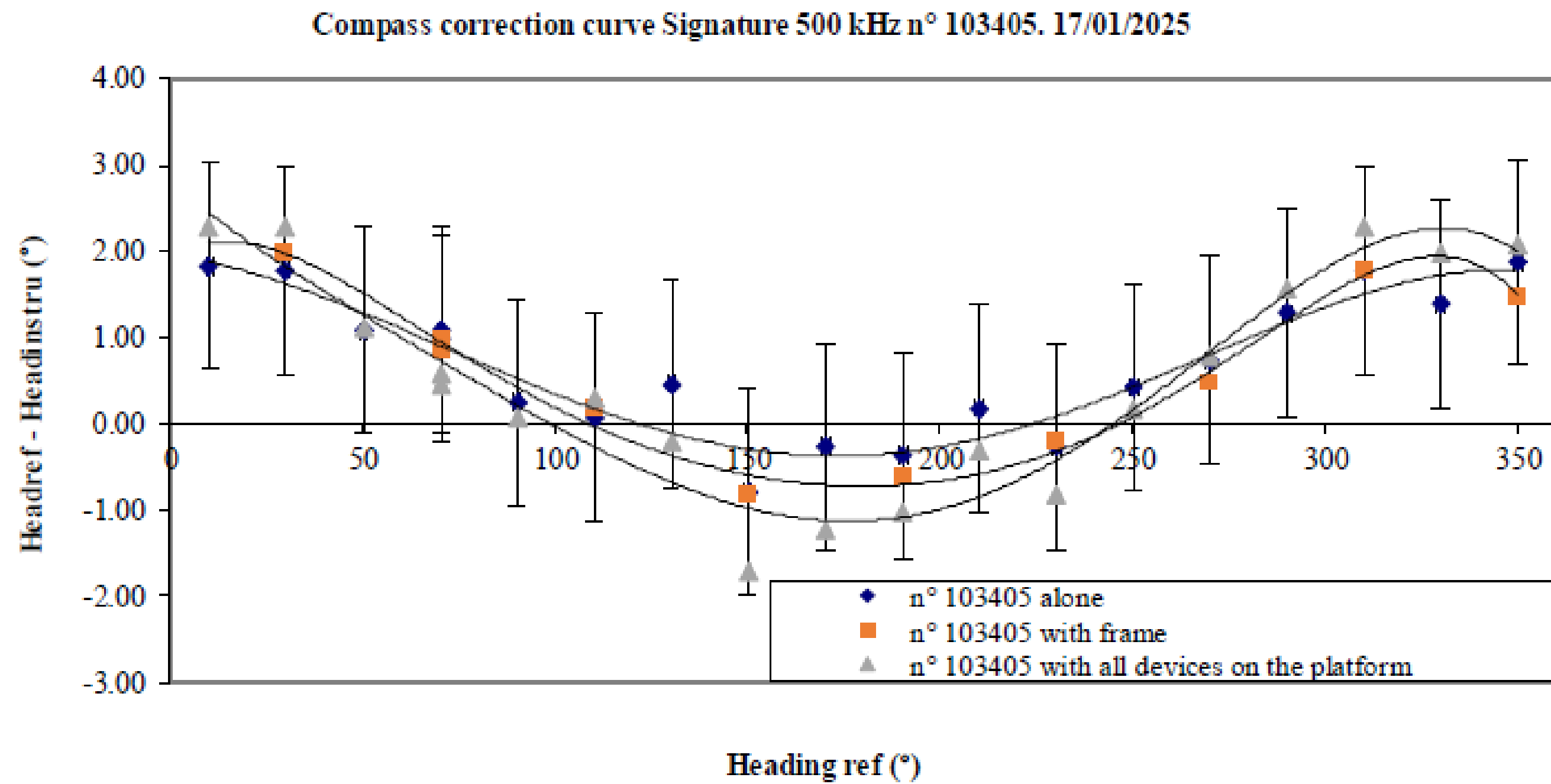
Linearisation of the sn 23556 Workhorse 300 kHz compass on 15/05/2024



$$y = 1,874E-12x^6 - 1,924E-09x^5 + 7,061E-07x^4 - 1,103E-04x^3 + 6,954E-03x^2 - 1,718E-01x + 8,745E-01$$

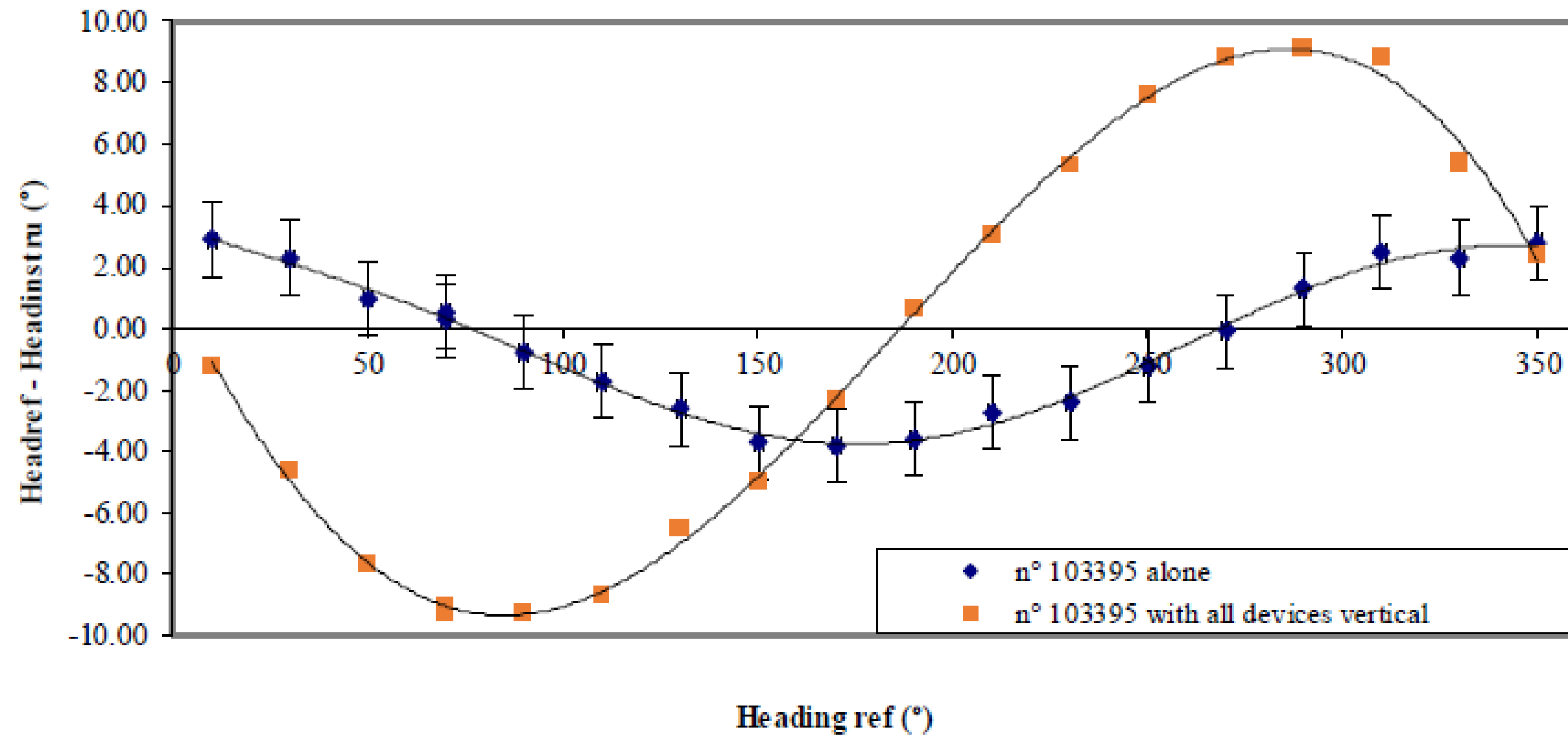


ACOUSTIC DOPPLER CURRENT PROFILER (ADCP) WG

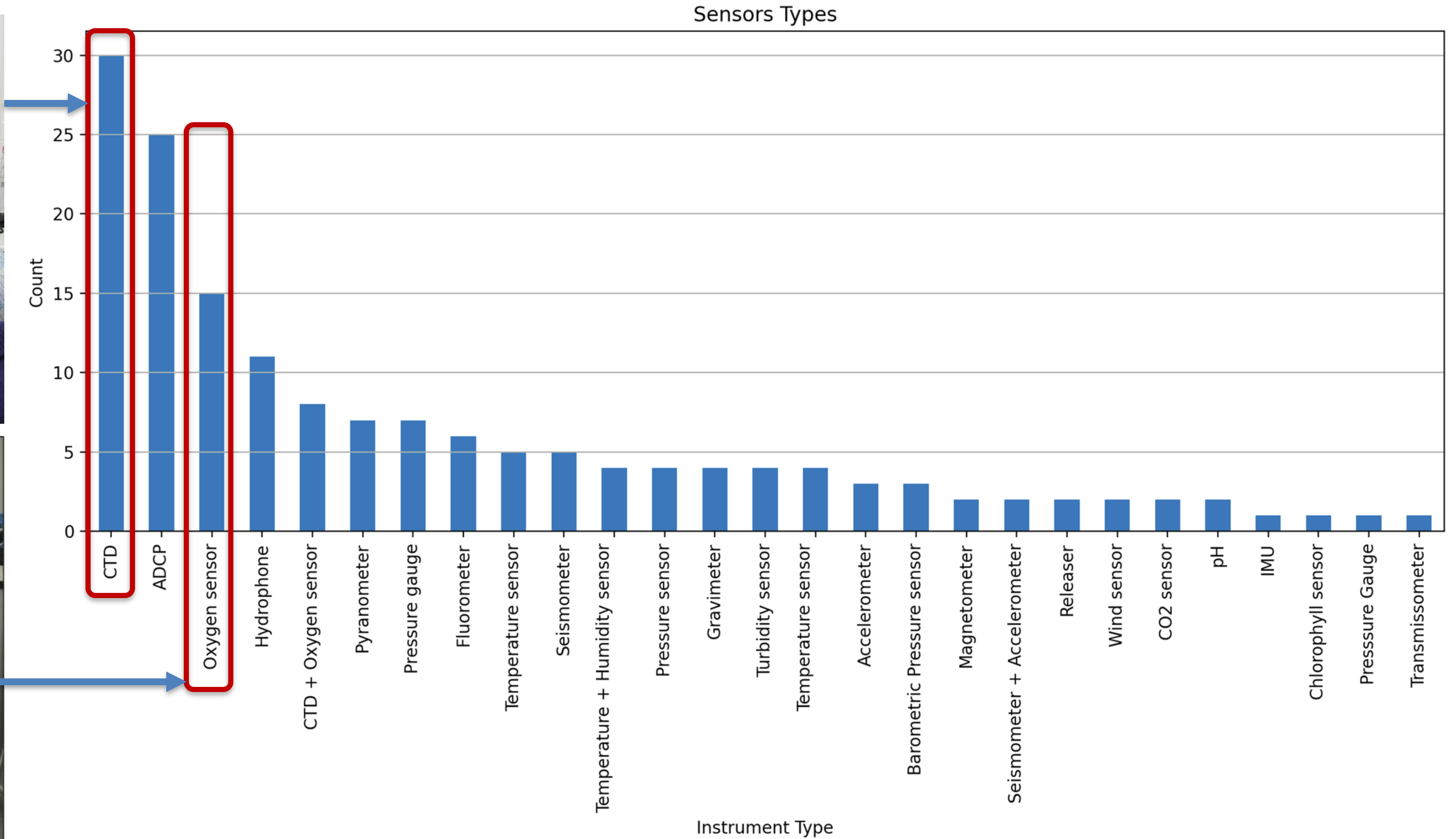
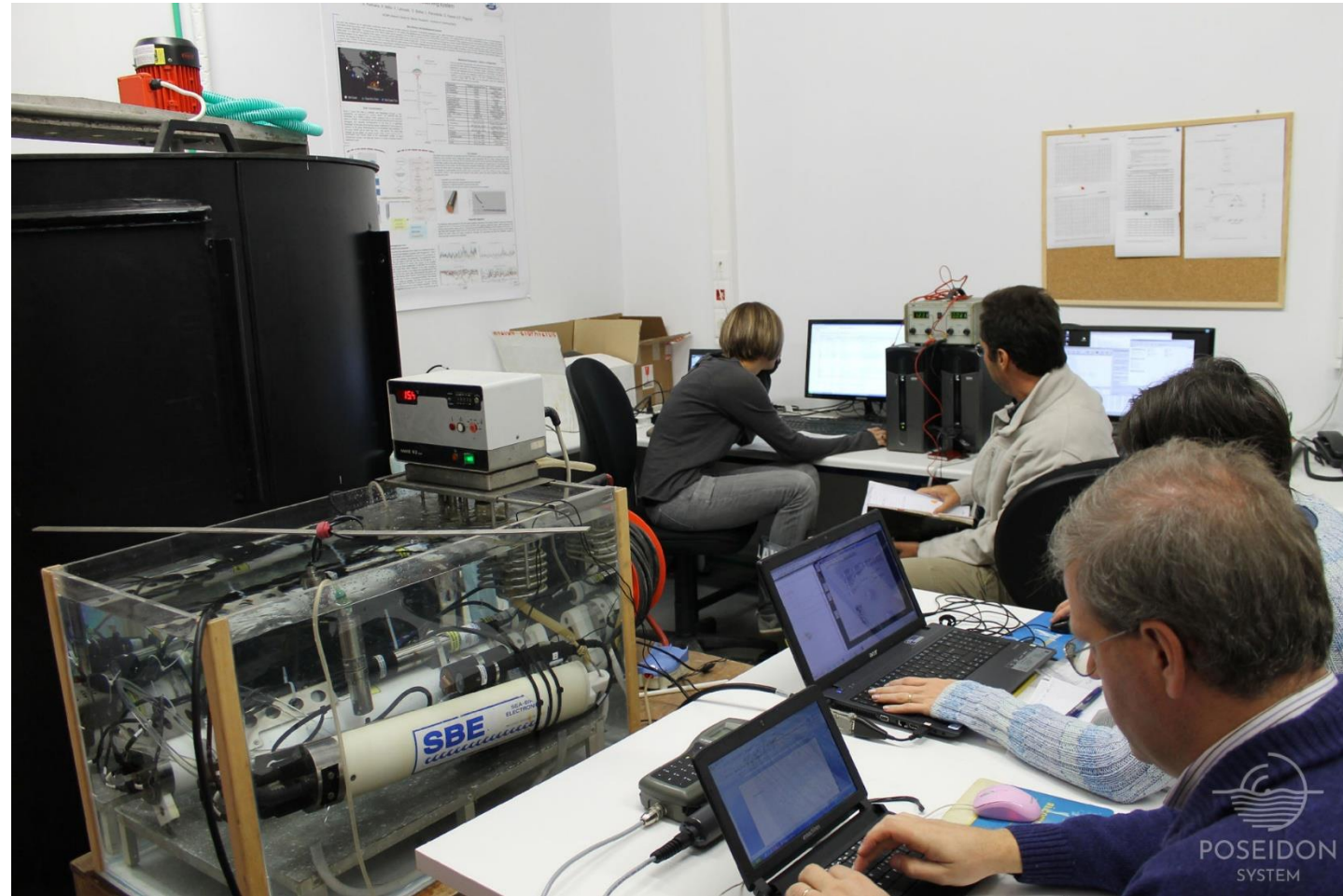


ACOUSTIC DOPPLER CURRENT PROFILER (ADCP) WG

Compass correction curve Signature 500 kHz n° 103405. 20/01/2025



CALIBRATION FACILITIES WITHIN EMSO



CONCLUSIONS AND QUESTIONS

- Calibration procedures showed error in the compass measurements of 5 times above the specifications. These errors are due to the magnetic field anomalies generated by batteries or other instrumentation in the proximity of the compass.
- It is important to be aware of these errors and quantify them before deployment or after deployment in order to be able to compensate for these errors in the data.
- Each oceanographic application should evaluate its own error tolerance value on current data.

Thank you for your attention.



Observing the ocean to save the earth