RBR in the Argo program

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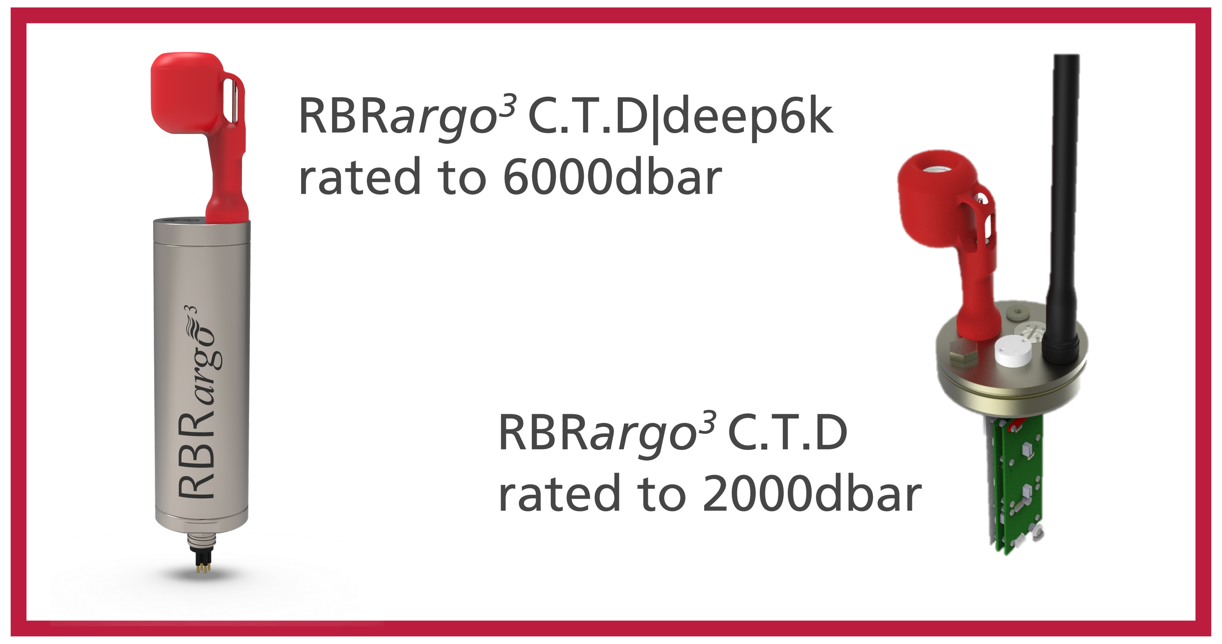
Quantifying performance of the RBR*argo*[3] C.T.D

Both static and dynamic performances of the RBR*argo*[3] C.T.D are investigated from lab-based and in situ datasets. Static accuracy of salinity measurements is improved and long-term deployments show good stability in the RBR*argo*[3] C.T.D accuracy. Corrections for dynamic effects on conductivity, including dependence on profiling speed, are characterised and corrected for. All methods are outlined in Dever et al. (2022).



Advantages of the inductive conductivity cell

All RBR*argo*[3] CTDs have an inductive conductivity cell. Key advantages:

- Water flushes freely through the cell, lowering power consumption compared to pumped CTDs and enabling longer deployments with higher sampling rates
- Inductive cells are unaffected by trace amounts of contaminants as there is no direct coupling with seawater
- Unpumped sensors can sample to the surface, enabling more accurate air-sea flux estimates

RBR*argo*[3]|deep6k mounted on a Deep Argo float.

Photo Brian King (NOC)

Reference

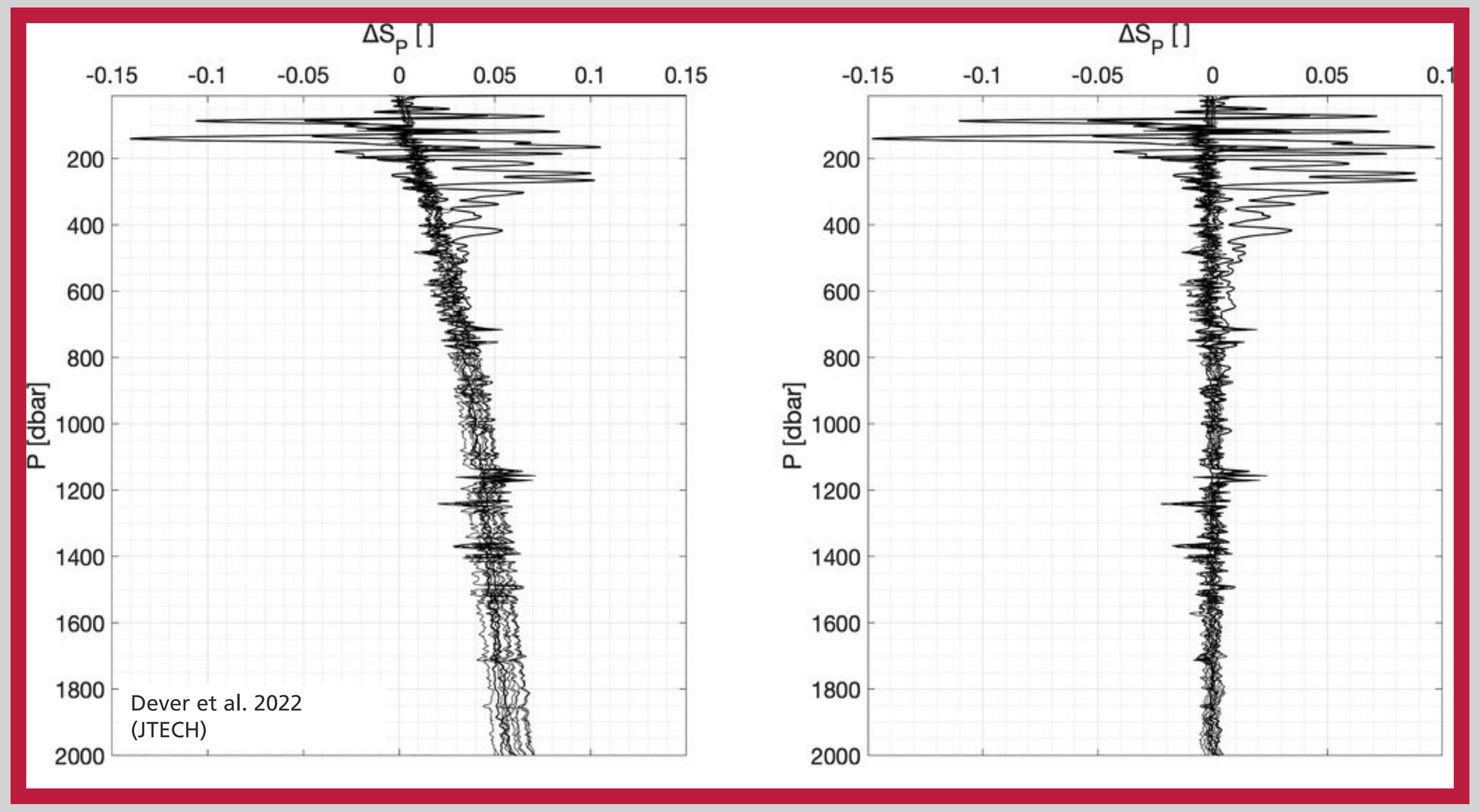
Dever, M., B. Owens, C. Richards, S. Wijffels, A. Wong, I. Shkvorets, M. Halverson, and G. Johnson, 2022: Static and Dynamic Performance of the RBR*argo*[3] CTD. *J. Atmos. Oceanic Technol.*, **39**, 1525-1539, https://doi.org/10.1175/JTECH-D-21-0186.1

Static accuracy

The RBR*argo*[3] C.T.D static (calibrated) accuracy was validated by comparing to a shipboard CTD and found to be well within the industry-standard specifications.

Conductivity: ± 0.003mS/cm
Temperature: ±0.002°C
Pressure: ±0.05% full scale

Compressibility errors on conductivity were corrected for each individual CTD during calibration, over the entire pressure range.



Profile of the salinity error before (left) and after (right) compressibility correction on the RBR*argo*[3] C.T.D compared to a shipboard CTD.

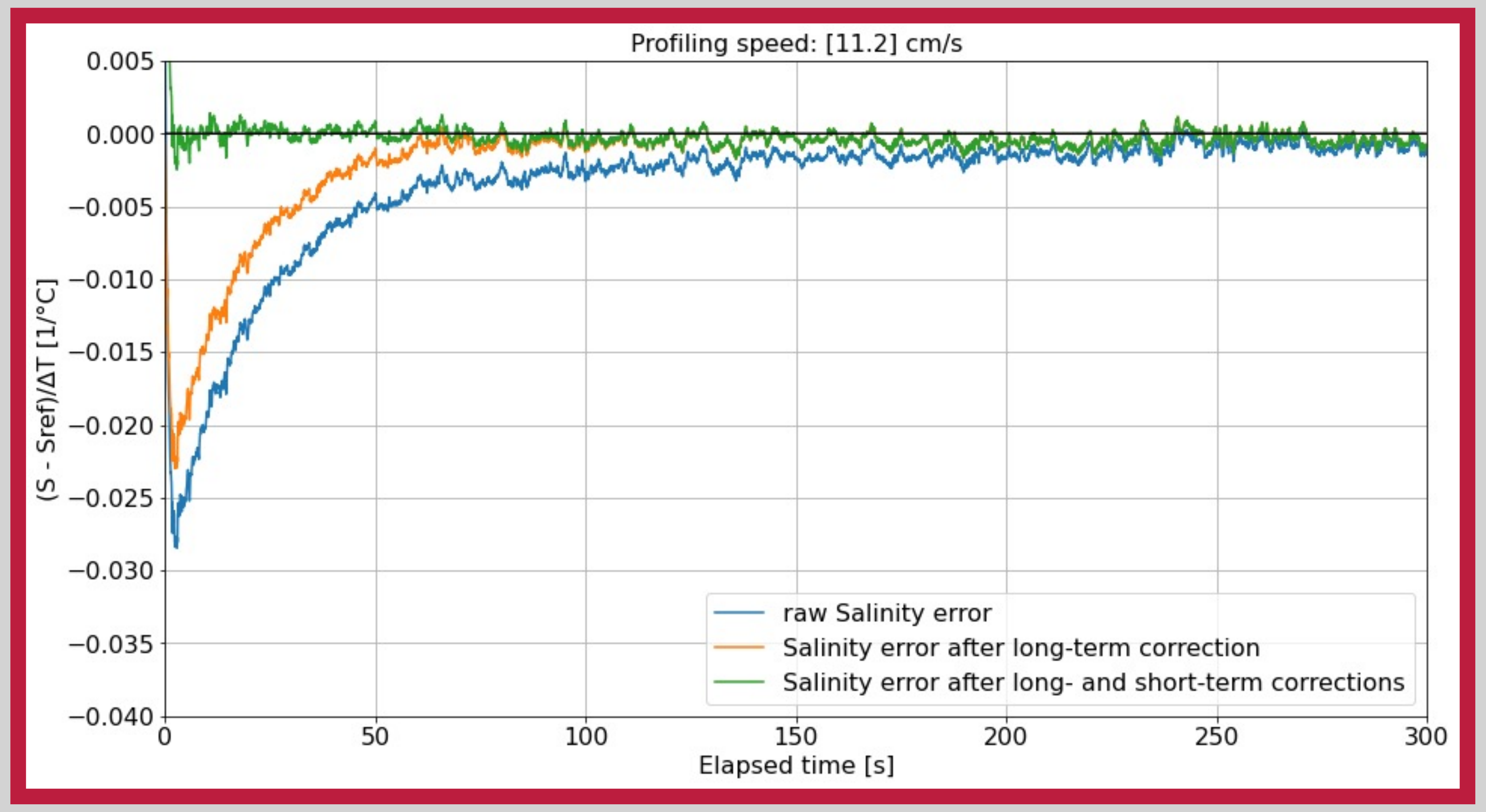
Dynamic accuracy

Two types of dynamic errors affect salinity estimates for a profiling CTD:

Dynamic errors	Time lag between thermistor and conductivity cell	Thermal inertia of the conductivity cell
Causes	• Physical distance between thermistor and conductivity cell • Thermistor response time	Through a temperature gradient, heat is exchanged between conductivity cell and sampling volume where conductivity is measured, skewing the measurements.
Solutions	Constant temporal lag is determined to correct the temperature observations using 25488 segments	Three coefficients correct for thermal inertia errors. Coefficients were determined in the laboratory for a range of flow speeds.

Corrections are computed on the RBR*argo*[3] C.T.D and corrected salinity data are streamed to the Argo float.

Flume testing to determine thermal inertia coefficients for a range of flow speeds.



Time series of raw (blue) and corrected (green) salinity errors after experiencing a sharp (<1s) temperature jump.

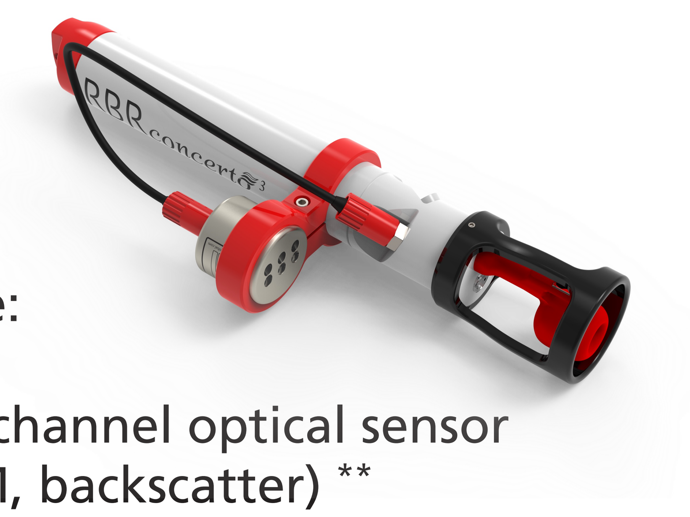
The RBR*argo*[3] C.T.D|deep6k

The RBR*argo*[3] C.T.D|deep6k is suitable for Deep Argo floats and pressure rated to 6000dbar. It has the same specifications as the RBR*argo*[3] C.T.D and undergoes the same calibration process, including determining compressibility correction coefficients during calibration.

Photo Patrick Rousseaux (Ifremer)

Biogeochemical sensor-suite

RBR offers a suite of biogeochemical sensors suitable for integration on BGC-Argo floats. All sensors feature low power consumption and a small form factor.



Current sensors include:

- **RBR*tridente*** three-channel optical sensor (chlorophyll *a*, fDOM, backscatter) **
- **RBR*coda*[3] T.ODO** optical dissolved oxygen sensor, capable of sampling in air **
- **RBR*quadrante*** four-channel radiometer with options including PAR, 413nm, 445nm, 475nm, 488nm, 508nm, 532nm, and 560nm *

* rated to 2000dbar
** rated to 6000dbar