Reviewer2: Hydrographic CTD profiles capturing the onset of near-surface stratification in Southwest Greenland fjords during two consecutive spring 2025 field campaigns

By Marta Umbert et al.

General comment

The dataset presented by the authors is certainly interesting, particularly for a region that has been sampled very little. The main strengths of the paper lie in the methodology used for the monitoring, although some issues need to be clarified.

The data are high resolution, allowing the identification of vertical stratification. The measurements were carried out from a Zodiac boat using a manual winch. The CTD may therefore have been subject to small but significant vertical movements that could affect the purpose of the measurements. The authors should clarify whether and how corrections were applied to account for these movements, particularly with regard to the calculation of salinity.

In the quality control procedure, the authors use gross range checks and fine range checks that appear to be based on methodologies developed for areas different from those examined here. A region-specific adaptation would have been desirable.

We thank the reviewer for the positive evaluation of the dataset and for highlighting the value of the high-resolution observations collected in a region and season that remain poorly sampled. We also appreciate the reviewer's constructive comments regarding the potential influence of Zodiac motion and manual winch operation on the CTD profiles, as well as the need to clarify the regional applicability of the quality-control thresholds. We have revised the manuscript to explain these aspects more explicitly.

Specific comments

Para. 4.3: Could the movements of the small boat, and therefore the vertical movements of the CTD (up and down), introduce spurious data?

Regarding the possible effect of vertical movements of the Zodiac and the manually operated winch, we agree that short pauses or small reversals in the CTD trajectory may occur during zodiac-based deployments. During acquisition, a weight was attached below the CTD to promote a stable vertical descent, the downcast was conducted at a controlled speed not exceeding 0.5 m s^{-1}, and only downcast data were retained for processing. Potential disturbances were subsequently addressed at two stages of the processing chain. First, the despiking step (Sect. 4.3, RSKdespike, 4σ threshold in a 15-point moving window) flags individual anomalous values caused by abrupt sensor motion. Second, using RSKremoveloops, all segments where vertical velocity fell below 0.10 m s^{-1} were removed, thereby excluding winch pauses, minor profile reversals, and short-term vertical motions potentially induced by movement of the Zodiac. Therefore, no separate correction based on the motion of the boat was applied; instead, the portions of the profiles potentially affected by non-continuous descent were identified from the CTD pressure record and excluded before calculation of the final hydrographic variables. The per-sample descent velocity is also

distributed as the variable profile_velocity in the NetCDF file, enabling users to apply stricter velocity filtering if required.
Regarding salinity, practical salinity was calculated only after the signal-conditioning and loop-removal steps. For the 16 Hz instrument, the conductivity and temperature channels were aligned using the estimated thermal response lag of approximately 0.06 s (i.e. ~1 scan at 16 Hz, capped at ±2 scans — corrected from the submitted value of 0.3 s, which corresponded to ~5 scans and did not reflect the lag actually computed by RSKcalculateCTlag for this instrument). This correction was applied specifically to reduce salinity spiking caused by the different response times of the conductivity and temperature sensors. Temperature and conductivity were also despiked and smoothed before practical salinity was derived.

We have introduced the following changes in the manuscript to clarify these procedures.
In Sect. 2.4, after the description of the deployment method, we added:

"Potential short-term vertical motions associated with Zodiac movement or manual winch operation were subsequently identified from the CTD pressure-derived vertical velocity and handled during the signal conditioning (Sect. 4.3) and the loop-removal step described in Sect. 4.4."

In Sect. 4.4, we revised the description of the loop-removal procedure as follows:

"Data segments where vertical velocity fell below 0.10 m s^{-1} were removed using RSKremoveloops to eliminate artefacts associated with winch pauses, minor profile reversals, or short-term vertical motions of the CTD potentially induced by Zodiac movement. This procedure ensures that only continuously descending portions of the downcast are retained for the calculation of the final hydrographic variables."

In Sect. 4.3, we corrected the CT-lag value from "Δt ≈ 0.3 s" to "Δt ≈ 0.06 s (~1 scan at 16 Hz)", reflecting the lag actually estimated by RSKcalculateCTlag for this instrument (S/N 237957), capped at ±2 scans (~0.13 s) to guard against spurious cross-correlation peaks in weakly stratified profiles.**I**

Para. 4.6: The gross range check is certainly appropriate for "oceanic" values, but the threshold values are excessive for this area.
Para. 4.6: The regional range check should be complemented by a different check for each fjord, in order to take into account their different characteristics.

Concerning the quality-control range checks, we agree that regional hydrographic conditions should be considered when defining appropriate thresholds. The processing workflow already combines broad global gross-range limits with narrower Arctic-specific regional limits. The gross range test (T: −5 to 50°C, SP: 0 to 45 PSU, p: 0 to 12,000 dbar) is designed exclusively as a first-pass sanity check for physically impossible values indicative of sensor malfunction or data corruption — not as an oceanographic filter. No observation in this dataset approaches these limits. The operationally relevant filtering is performed by the regional range test, which is selected to encompass the expected hydrographic variability of Arctic and sub-Arctic waters sampled in this study, including the particularly fresh near-surface conditions found in glacier-influenced fjords. We deliberately did not define separate thresholds for each fjord or hydrographic sector because the dataset spans strongly contrasting environments, from very fresh glacier-influenced surface waters to relatively warm and saline Atlantic-origin waters. More restrictive local thresholds could therefore incorrectly classify physically plausible observations as erroneous. Furthermore, the density inversion test (test 6) and the pressure monotonicity check (test 7) provide complementary quality checks that are sensitive to local oceanographic anomalies without requiring predefined regional limits.

We also emphasize that the automated quality-control flags were not used to remove observations. All original values, including those classified as Suspect, remain in the distributed dataset together with their associated flags. This conservative approach is particularly important in the upper few metres, where genuine freshwater lenses, sharp salinity gradients, and small density inversions may otherwise be rejected by automated tests.

To clarify this rationale, we added the following text to Sect. 4.6:

"*The gross range test serves as a first-pass check for physically impossible values indicative of sensor malfunction; all observations in this dataset fall well within these limits. The regional limits were selected to encompass the broad range of hydrographic conditions expected across Arctic and sub-Arctic fjord environments, including highly fresh glacier-influenced surface waters and saline Atlantic-origin waters. Separate thresholds were not defined for individual fjords because the sampled regions exhibit strongly contrasting hydrographic regimes, and more restrictive local limits could incorrectly flag physically plausible observations. Automated QC flags were therefore used as indicators rather than exclusion criteria, and all original values were retained in the dataset.*"