

Title

Supplementary Material for: A High-Resolution Current Velocity Database from Observations in the Yucatan Channel

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Text S1. Acoustic interference in overlapping ADCP bins and current-meter measurements.

Fig. S1. Example of acoustic interference and bin removal for co-located ADCP and current-meter observations.

Fig. S2. Examples of pressure-drift corrections and the pressure step adjustment applied to mooring YUCI9.

Text S1.- Acoustic interference in overlapping ADCP bins

To provide redundancy and independent validation of the velocity measurements, several single-point current meters were deployed within the nominal profiling ranges of adjacent ADCPs. Under these configurations, the instrument body or associated mooring hardware could intersect an acoustic beam or produce sidelobe returns, contaminating velocity estimates in a limited number of range cells.

Potentially affected cells were identified using the known mooring geometry and pressure-derived instrument depths, together with independent acoustic and velocity diagnostics. In the Signature55 records, persistent depth-localized enhancements in echo amplitude tracked the estimated depths of colocated current meters during mooring displacement (**Figure S1**). These features coincided with reduced percent-good values and sharp discontinuities or suppressed variability in the measured velocities, supporting their interpretation as acoustic contamination from mooring hardware rather than oceanographic variability.

Cells were excluded only when their positions coincided with nearby hardware and they exhibited corresponding anomalies in the acoustic or velocity diagnostics. Neighboring cells were retained when their quality-control metrics and velocities remained consistent with the surrounding profile. Thus, overlap between an ADCP profiling range and another instrument did not, by itself, result in data removal.

The resulting gaps were filled using the same shape-preserving piecewise cubic Hermite interpolating polynomial (**PCHIP**) procedure applied throughout the dataset. Because the excluded cells represented only a small fraction of the observations and were generally bounded by valid measurements, their removal preserved the large-scale velocity structure while preventing localized artifacts from propagating into the final gridded product.

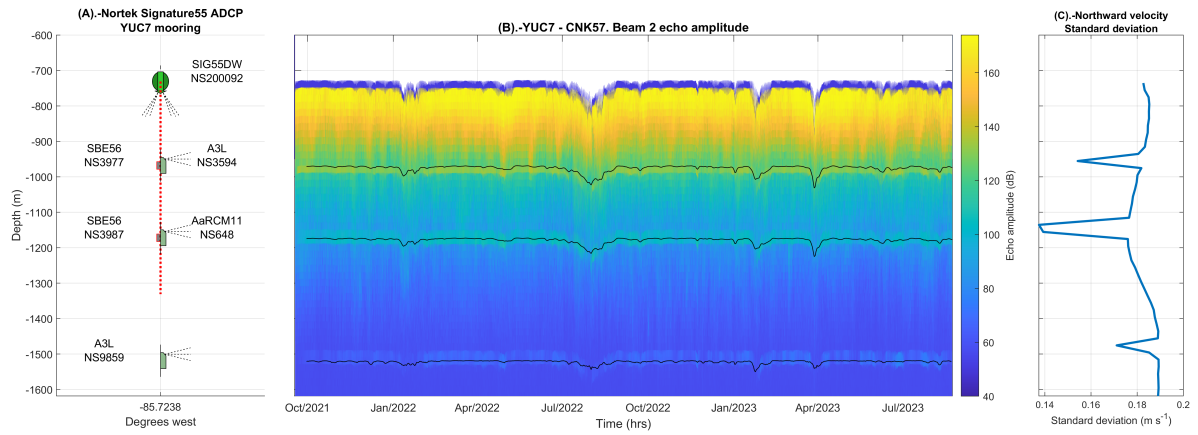


Fig. S1: Evidence of acoustic interference from mooring hardware in the Nortek Signature55 ADCP record from the YUC7 mooring (SN 200092). (A) Mooring schematic showing the downward-looking Signature55 (SIG55DW) near 730 m depth and the instruments located within its profiling range: two SBE56 temperature loggers (NS3977 and NS3987), two Nortek Aquadopp A3L single-point current meters (NS3594 and NS9859), and one Aanderaa RCM11 current meter (NS648). (B) Hovmöller diagram of beam 2 echo amplitude (dB) during the CNK57 deployment (October 2021–August 2023). Black lines indicate the time-varying estimated depths of the three current meters: A3L NS3594 near 970 m, RCM11 NS648 near 1160 m, and A3L NS9859 near 1510 m. The persistent, depth-localized amplitude anomalies closely follow the estimated instrument trajectories, supporting their interpretation as enhanced acoustic returns associated with mooring hardware rather than oceanographic features. (C) Temporal standard deviation of the northward velocity as a function of depth. Sharp local minima occur at the same depths as the amplitude anomalies in panel (B), indicating suppressed or distorted velocity variability within the affected cells. Cells exhibiting these coincident amplitude and velocity anomalies were excluded from subsequent processing.

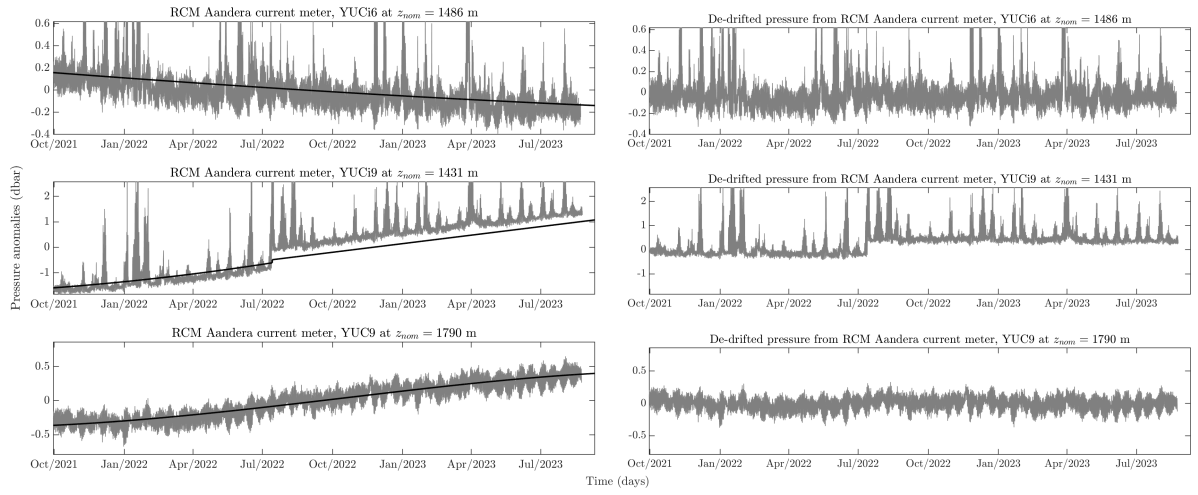


Fig. S2: Examples of pressure-sensor drift correction for three Aanderaa recording current meters. Left panels show the original pressure anomalies from instruments deployed at YUCi6 ($z_{nom} = 1486$ m), YUCi9 ($z_{nom} = 1431$ m), and YUC9 ($z_{nom} = 1790$ m). Black lines indicate the linear trends estimated over each deployment and attributed to sensor drift. Right panels show the corresponding pressure anomalies after subtraction of the fitted trends. Short-period pressure fluctuations associated with mooring displacement were retained. The abrupt offset of approximately 0.5 dbar in the YUCi9 record near July 2022 was treated separately as a step discontinuity before the pressure record was used to estimate instrument depth.