Supplement of Ocean Sci., 20, 123–140, 2024
https://doi.org/10.5194/os-20-123-2024-supplement

Ocean Science Open Access EGU

Supplement of

Water properties and bottom water patterns in hadal trench environments

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Supplementary 1

Table S1. Deployment details

Trench	Lander	Deployment Date	Depth (m)	Latitude (decimal degrees)	Longitude (decimal degrees)
South Sandwich Trench	Flere	5 February 2019	8071±	-57.54	-23.97
	Flere	10 February 2019	8254	-55.23	-26.17
Java Trench	Skaff	6 April 2019	6136	-11.25	114.92
	Skaff	5 April 2019	7197	-11.13	114.94
	Skaff	7 April 2019	6937	-11.12	114.93
Kermadec Trench	Skaff	11 December 2021	9978	-31.92	-177.26
Tonga Trench	Skaff	5 June 2019	10811	-23.27	-174.74
	Skaff	6 June 2019	7471	-23.11	-174.40
New Hebrides Trench	Skaff	4 December 2021	7960	-23.12	172.19
Santa Cruz Trench	Skaff	29 November 2021	9370	-11.25	163.11
Mariana Trench	Flere	27 April 2019	10865	11.37	142.59
	Flere	28 April 2019	10543	11.36	142.59
	Flere	29 April 2019	7495	11.08	142.03
	Skaff	7 June 2020	10846	11.37	142.42
	Skaff	9 June 2020	10922	11.37	142.60
Yap Trench	Closp	15 July 2022	5981	8.88	138.16
	Closp	14 July 2022	8885	10.54	138.69
Palau Trench	Closp	18 July 2022	7995	7.80	135.01
Philippine Trench	Flere	23 February 2021	10068	9.47	126.91
	Flere	24 February 2021	6995	10.29	126.89
	Flere	27 February 2021	7023	11.50	126.19
Izu Ogasawara Trench	Closp	14 August 2022	8283	29.51	143.07
	Closp	15 August 2022	8283	29.45	142.58
	Flere	12 August 2022	6688	29.57	142.98
	Flere	14 August 2022	7890	29.43	143.04
	Flere	15 August 2022	8330	29.44	142.59
	Skaff	15 August 2022	9752	29.46	142.70
	Flere	24 August 2022	6503	34.24	142.40
Japan Trench	Flere	8 September 2022	6462	38.60	143.95
	Skaff	8 September 2022	7491	38.59	144.01
	Skaff	12 September 2022	7991	36.11	142.71
	Flere	13 September 2022	6991	38.54	144.19
	Skaff	13 September 2022	7452	38.46	144.17

Supplementary 2

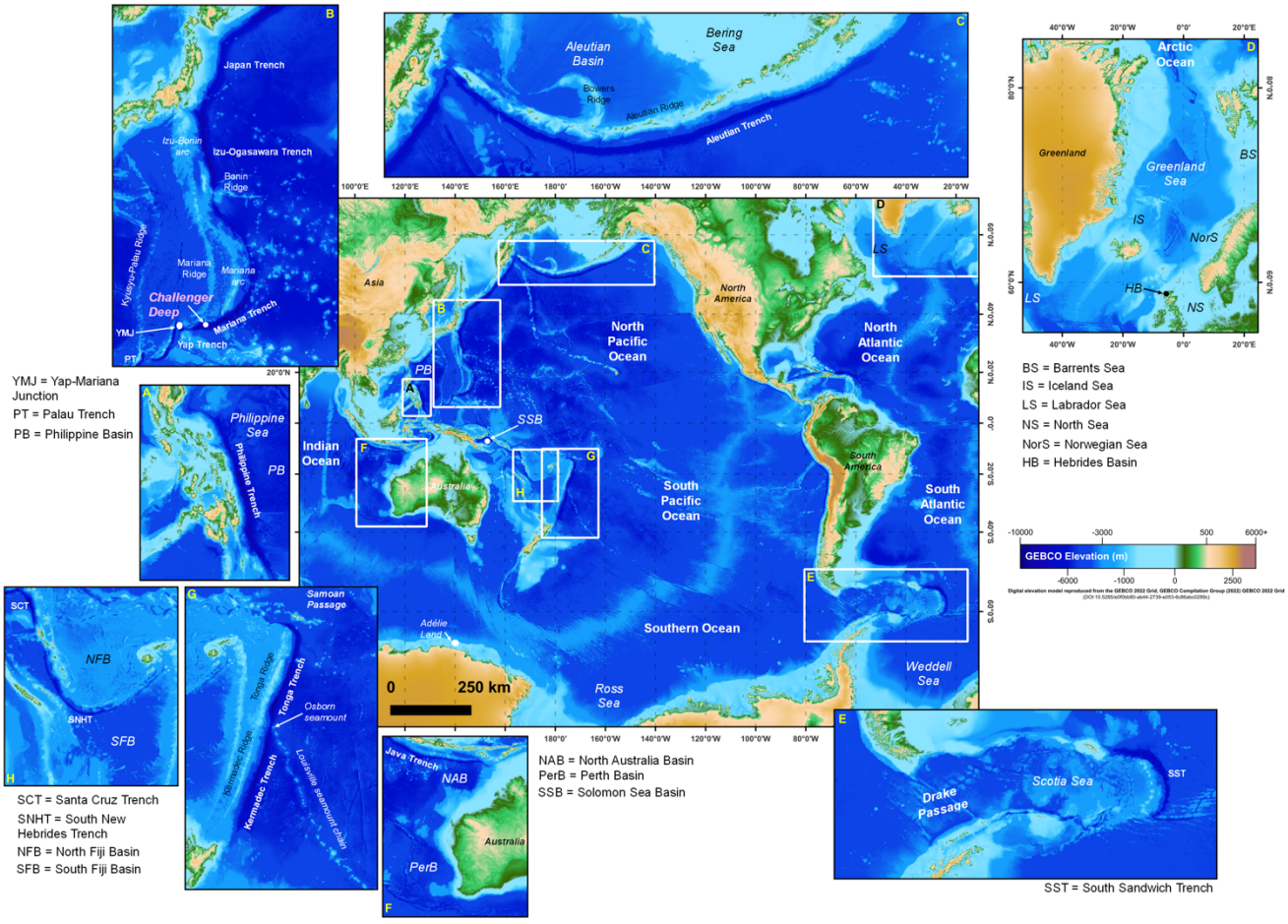

Figure S1. Bathymetry for locations mentioned in the paper using the GEBCO Elevations. Prepared by Devin Harrison from the British Geological Society for this publication.

The CTD profiles were examined conservatively on a case-by-case basis, similar to those completed for Argo profiles (Wong et al., 2022). The profile was rejected if the profile did not collapse onto a distinct deep water Θ/S_A line. We refined trench profiles using nearby WOCE (World Ocean Circulation Experiment) profiles that had undergone stringent quality analysis measures within 4 years of the trench data collection. There is an example in the two figures. Only those WOCE profiles within ±8° longitude and ±3° latitude close proximity and deeper than 4000 dbar were selected. To correct the trench profiles, we firstly assessed their agreement of temperature profiles at pressures over 3500 dbar (Figure 1). This was followed by interpolation of the salinity values from the trench profiles to coincide with the salinity values of the WOCE profiles in the stable portion of the water column, ensuring consistency at the same temperature and pressure levels. This approach standardized the trench profiles based on high-quality WOCE data and in the absence of salinometer measurements.

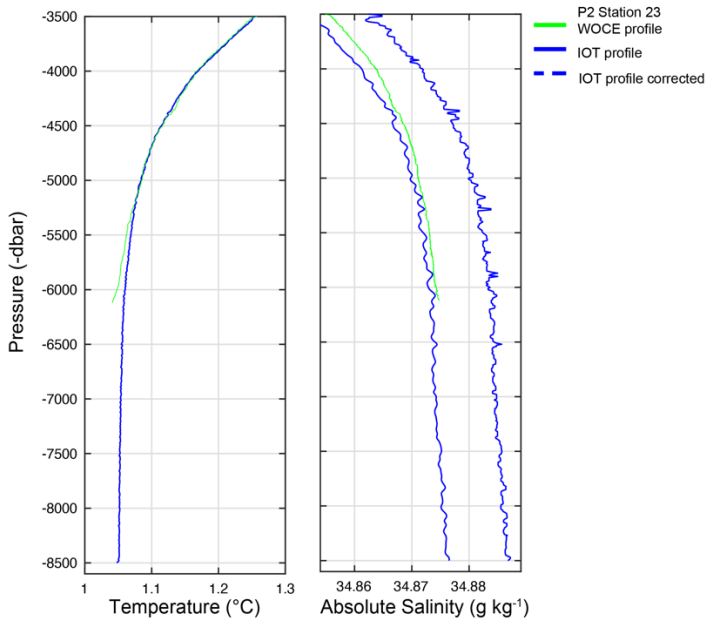

Figure S2. Conservative Temperature and Absolute Salinity profile for IOT Flere lander deployment on 15 August 2022

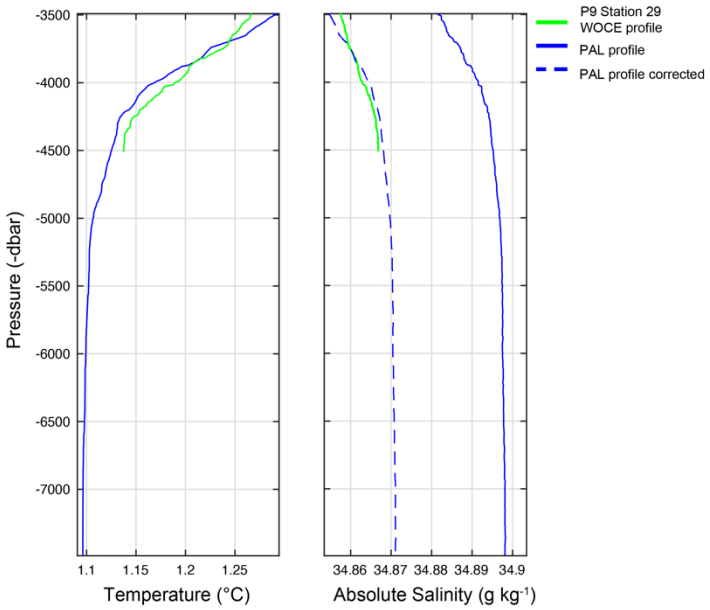

Figure S3. Conservative Temperature and Absolute Salinity profile for PAL Closp lander deployment on 18 July 2022

Supplementary 4

The following figures are Conservative Temperature (Θ, °C) and Absolute Salinity (S_A, g kg^{-1}) profiles for each location and deployment. Some profiles are omitted in the source water type analysis and discussion due to the physically improbable freshening of the water at the bottom of the profile. These are noted throughout the main text and figures, and the profiles are added here for a perspective of the data versus pressure.

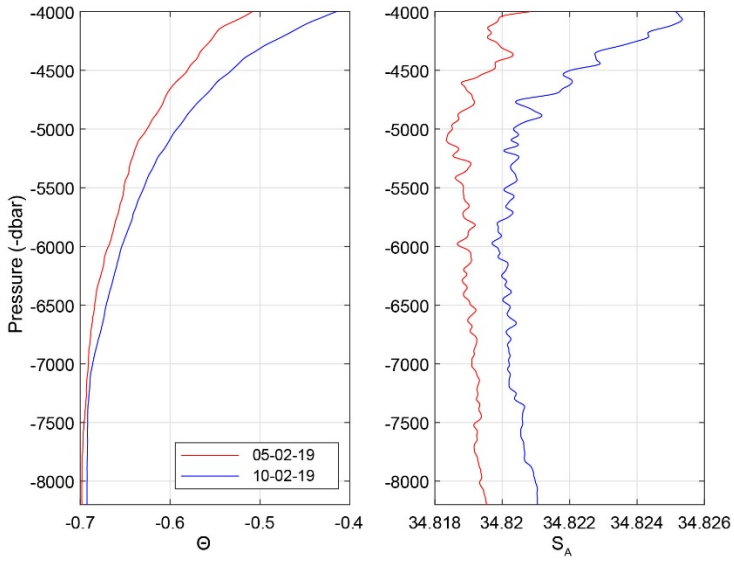

Figure S4. Conservative Temperature (Θ, °C) and Absolute Salinity (S_A, g kg^{-1}) profile from 4000 dbar to the seafloor for the South Sandwich Trench (SAND) deployments (see Table S1 for deployment locations)

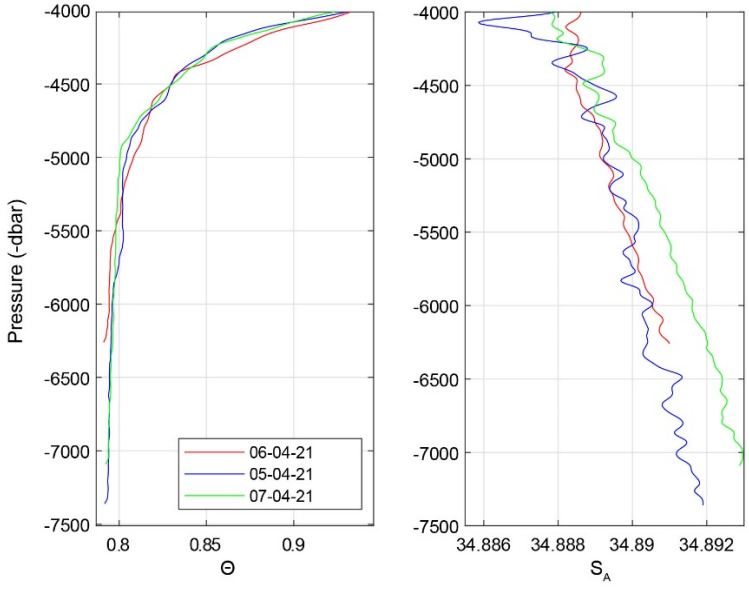

Figure S5. Conservative Temperature (Θ, °C) and Absolute Salinity (S_A, g kg^{-1}) profile from 4000 dbar to the seafloor for the Java Trench (JAV) deployments (see Table S1 for deployment locations)

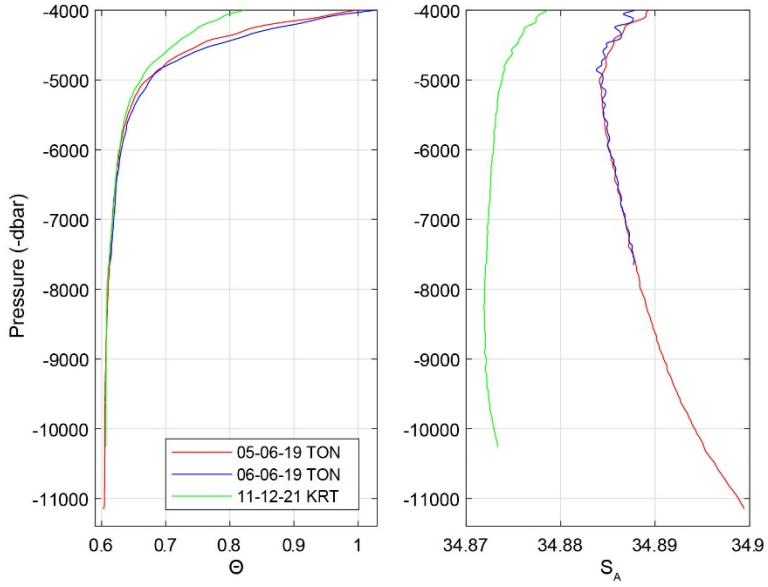

Figure S6. Conservative Temperature (Θ, °C) and Absolute Salinity (S_A, g kg^{-1}) profile from 4000 dbar to the seafloor for the Tonga (TON) and Kermadec (KRT) Trench deployments (see Table S1 for deployment locations)

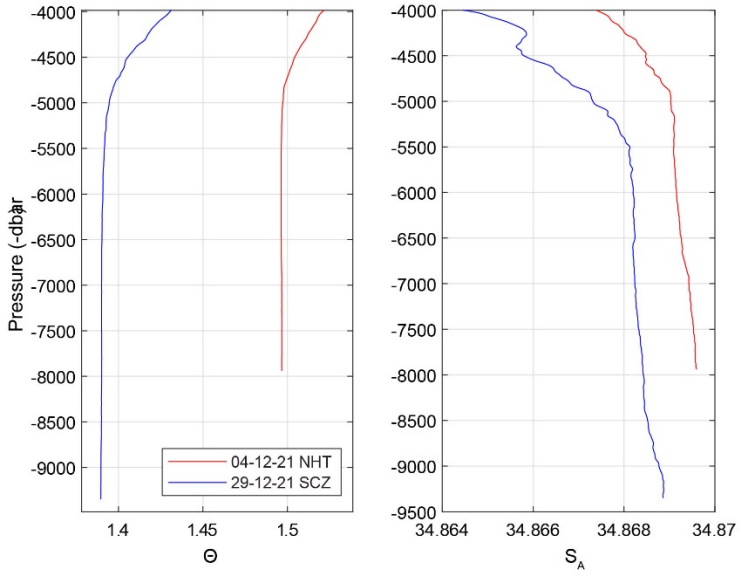

Figure S7. Conservative Temperature (Θ, °C) and Absolute Salinity (S_A, g kg^{-1}) profile from 4000 dbar to the seafloor for the New Hebrides (NHT) and Santa Cruz (SCZ) Trench deployments (see Table S1 for deployment locations)

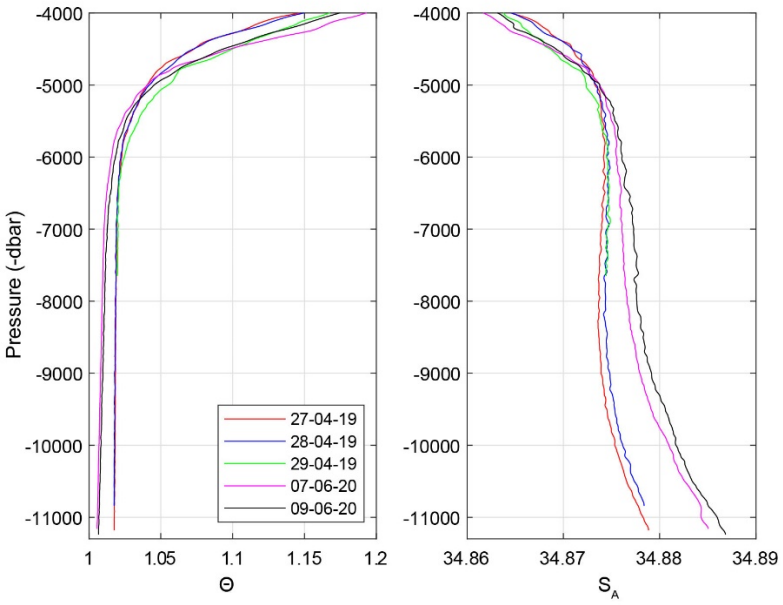

Figure S8. Conservative Temperature (Θ, °C) and Absolute Salinity (S_A, g kg^{-1}) profile from 4000 dbar to the seafloor for the Mariana Trench deployments (see Table S1 for deployment locations)

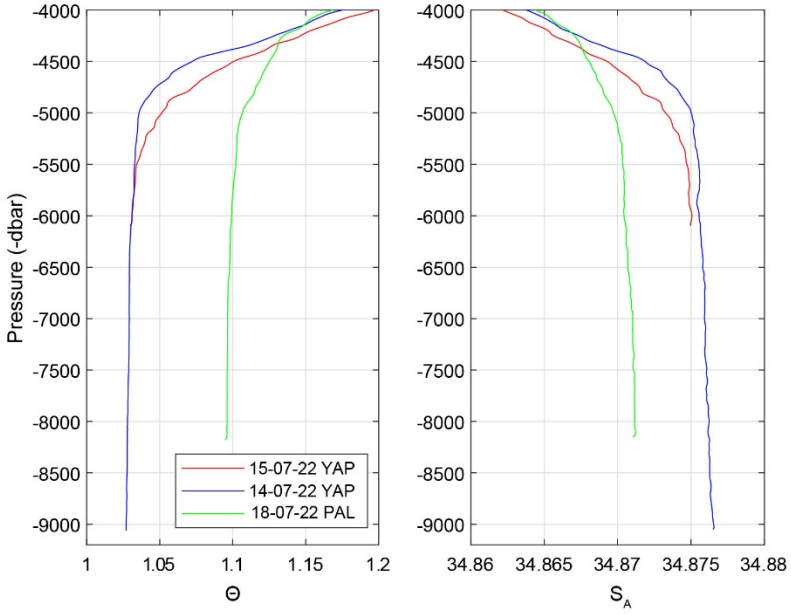

Figure S9. Conservative Temperature (Θ, °C) and Absolute Salinity (S_A, g kg^{-1}) profile from 4000 dbar to the seafloor for the Yap (YAP) and Palau (PAL) Trench deployments (see Table S1 for deployment locations)

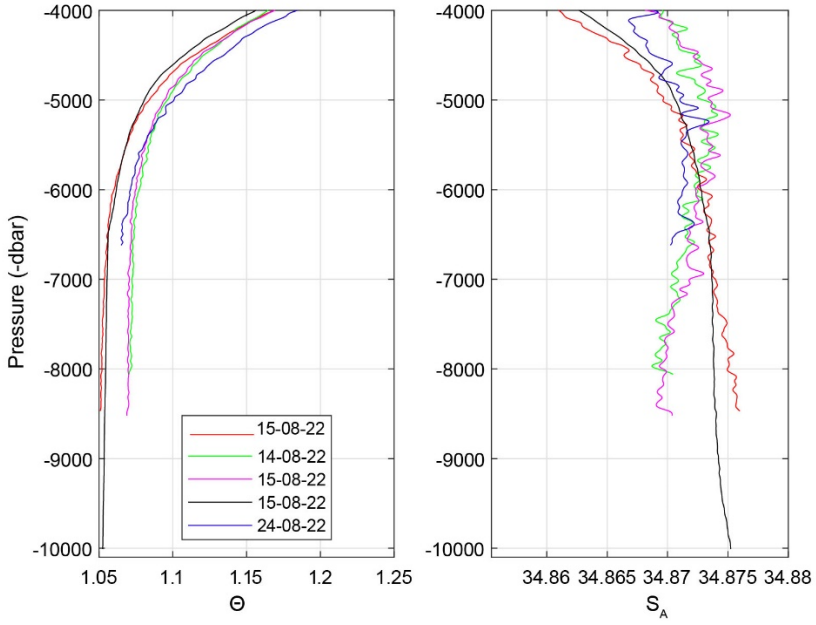

Figure S10. Conservative Temperature (Θ, °C) and Absolute Salinity (S_A, g kg^{-1}) profile from 4000 dbar to the seafloor for the Izu-Ogasawara (IOT) Trench deployments (see Table S1 for deployment locations)

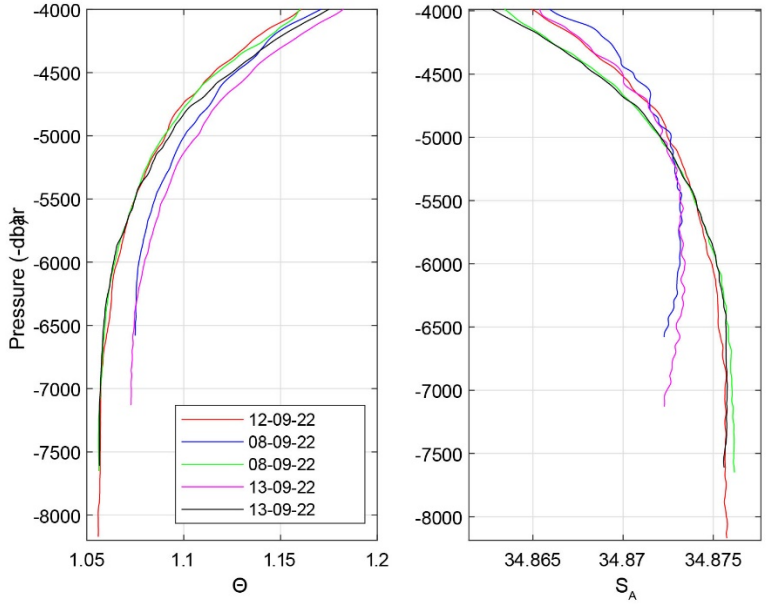

Figure S11. Conservative Temperature (Θ, °C) and Absolute Salinity (S_A, g kg^{-1}) profile from 4000 dbar to the seafloor for the Japan (JPT) Trench deployments (see Table S1 for deployment locations)