



Supplement of

HOTSSea v1: a NEMO-based physical Hindcast of the Salish Sea (1980–2018) supporting ecosystem model development

Greig Oldford et al.

Correspondence to: Greig Oldford (greig.oldford@dfo-mpo.gc.ca)

The copyright of individual parts of the supplement might differ from the article licence.

Supplemental

S.1. - Supplemental Tables

Table S1: Metrics from evaluation of temperature for the hindcast (v1.01 - no temperature bias correction; v1.02 with temperature bias correction), grouped by subdomain and depths.

Sub-domain	Depths (z)	N obs.	Temperature: HOTSSea v1.01					Temperature: HOTSSea v1.02				
			Model Mean	Bias	RMSE	R	WSS	Model Mean	Bias	RMSE	R	WSS
DI	all z	3649	10.06	0.2	0.68	0.89	0.93	9.74	-0.06	0.63	0.88	0.93
	0->30 m	3640	10.48	0.03	0.84	0.9	0.95	10.24	-0.17	0.85	0.9	0.94
	30->150 m	3083	9.72	0.25	0.51	0.87	0.9	9.41	-0.06	0.45	0.88	0.92
	>150 m	1118	9.74	0.45	0.55	0.79	0.75	9.34	0.04	0.33	0.76	0.86
SGN	all z	12365	9.73	0.24	0.47	0.93	0.95	9.4	-0.08	0.37	0.94	0.97
	0->30 m	12349	10.36	-0.17	0.63	0.95	0.98	10.13	-0.39	0.7	0.96	0.97
	30->150 m	11409	9.26	0.16	0.33	0.89	0.92	8.95	-0.14	0.32	0.9	0.92
	>150 m	8348	9.64	0.52	0.59	0.8	0.66	9.25	0.13	0.31	0.77	0.83
SGS	all z	4140	9.79	0.21	0.56	0.95	0.97	9.42	-0.14	0.42	0.95	0.97
	0->30 m	4138	10.36	0.06	0.69	0.95	0.97	10.08	-0.25	0.65	0.95	0.97
	30->150 m	3437	9.47	0.22	0.4	0.94	0.95	9.13	-0.13	0.32	0.94	0.96
	>150 m	1136	9.61	0.48	0.57	0.86	0.79	9.21	0.08	0.31	0.85	0.91
GI	all z	2512	10.61	0.34	0.87	0.93	0.95	10.27	0.04	0.7	0.94	0.96
	0->30 m	2512	11.09	0.36	0.89	0.94	0.95	10.77	0.07	0.73	0.94	0.97
	30->150 m	1832	10.01	0.41	0.8	0.92	0.9	9.68	0.08	0.6	0.93	0.94
	>150 m	175	9.26	0.61	0.84	0.7	0.73	8.78	0.13	0.38	0.86	0.92
HS	all z	800	10.45	0.65	0.88	0.96	0.93	10.01	0.2	0.59	0.97	0.97
	0->30 m	800	10.96	0.71	0.95	0.96	0.92	10.58	0.33	0.66	0.97	0.96
	30->150 m	610	9.63	0.45	0.66	0.84	0.84	9.13	-0.05	0.37	0.87	0.93
	>150 m	442	9.22	0.59	0.79	0.67	0.68	8.69	0.06	0.35	0.83	0.9
JFS	all z	3707	9.29	0.66	0.92	0.74	0.75	8.74	0.12	0.47	0.85	0.91
	0->30 m	3707	10.38	0.79	1.18	0.79	0.77	9.9	0.31	0.79	0.81	0.87
	30->150 m	3521	8.91	0.59	0.84	0.69	0.72	8.35	0.03	0.43	0.84	0.91
	>150 m	448	8.06	0.98	1.16	0.36	0.47	7.37	0.29	0.52	0.72	0.79
PS	all z	99	11.12	-0.1	0.8	0.89	0.94	10.81	-0.41	0.91	0.89	0.92
	0->30 m	99	11.62	0.04	0.73	0.92	0.96	11.32	-0.25	0.77	0.92	0.95
	30->150 m	88	10.69	-0.25	0.94	0.85	0.91	10.36	-0.57	1.09	0.84	0.88
	>150 m	3	11.66	-0.15	0.43	0.6	0.71	11.18	-0.63	0.75	0.57	0.55

Table S2: Metrics from evaluation of salinity for the hindcast (v1.01 – no temperature bias correction; v1.02 - temperature bias correction) over the hindcast period (1980 – 2018), grouped by subdomain and depths.

Sub-domain	Depths (z)	N obs.	Salinity: HOTSSea v1.01					Salinity: HOTSSea v1.02				
			Model Mean	Bias	RMSE	R	WSS	Model Mean	Bias	RMSE	R	WSS
DI	all z	3474	29.11	-0.19	1.06	0.72	0.79	29.28	-0.09	1.03	0.68	0.75
	0->30 m	3465	27.75	-0.56	1.18	0.46	0.64	27.87	-0.48	1.14	0.4	0.61
	30->150 m	3062	29.91	0.2	0.84	0.65	0.67	29.96	0.25	0.85	0.66	0.67
	>150 m	1118	30.82	0.22	0.43	0.81	0.7	30.87	0.26	0.46	0.81	0.68
SGN	all z	12288	30.25	0.29	0.49	0.92	0.94	30.33	0.34	0.49	0.93	0.93
	0->30 m	12272	28.3	0.03	0.69	0.71	0.83	28.38	0.09	0.67	0.72	0.83
	30->150 m	11388	30.5	0.41	0.48	0.77	0.66	30.56	0.47	0.52	0.79	0.62
	>150 m	8347	31.2	0.26	0.3	0.63	0.57	31.25	0.3	0.34	0.64	0.52
SGS	all z	3834	28.57	0	2.73	0.89	0.93	29.23	0.38	1.45	0.96	0.98
	0->30 m	3832	27.29	0.05	2.8	0.86	0.91	27.84	0.44	1.6	0.95	0.97
	30->150 m	3437	30.56	0.46	0.5	0.86	0.69	30.61	0.51	0.55	0.86	0.65
	>150 m	1136	31.21	0.32	0.35	0.85	0.71	31.26	0.37	0.39	0.86	0.66
GI	all z	2473	29.02	-0.58	1.21	0.67	0.77	29.1	-0.53	1.18	0.66	0.76
	0->30 m	2473	28.44	-0.65	1.27	0.56	0.67	28.51	-0.6	1.25	0.56	0.67
	30->150 m	1832	29.79	-0.46	0.78	0.76	0.79	29.84	-0.41	0.75	0.77	0.8
	>150 m	175	31.54	-0.14	0.49	0.91	0.93	31.57	-0.1	0.48	0.91	0.93
HS	all z	800	30.49	-0.2	0.69	0.94	0.93	30.54	-0.16	0.67	0.94	0.93
	0->30 m	800	29.6	-0.47	0.81	0.87	0.85	29.64	-0.43	0.78	0.87	0.86
	30->150 m	610	31.32	0.15	0.41	0.71	0.82	31.37	0.2	0.43	0.71	0.81
	>150 m	442	31.99	0.1	0.35	0.83	0.9	32.03	0.14	0.36	0.84	0.9
JFS	all z	3675	32.18	-0.02	0.51	0.82	0.9	32.23	0.02	0.48	0.83	0.91
	0->30 m	3675	30.73	-0.52	0.93	0.42	0.59	30.79	-0.46	0.88	0.41	0.6
	30->150 m	3514	32.7	0.19	0.43	0.87	0.92	32.73	0.22	0.45	0.87	0.91
	>150 m	448	33.83	0.07	0.21	0.78	0.86	33.84	0.07	0.21	0.78	0.86
PS	all z	99	29.7	-0.15	0.9	0.55	0.69	29.77	-0.08	0.88	0.56	0.7
	0->30 m	99	29.11	-0.48	1.04	0.43	0.59	29.18	-0.4	0.99	0.45	0.61
	30->150 m	88	30.13	0.05	0.73	0.61	0.73	30.2	0.12	0.72	0.62	0.74
	>150 m	3	30.88	0.19	0.24	1	0.86	30.96	0.28	0.3	1	0.79

S.2. – Supplemental Figures

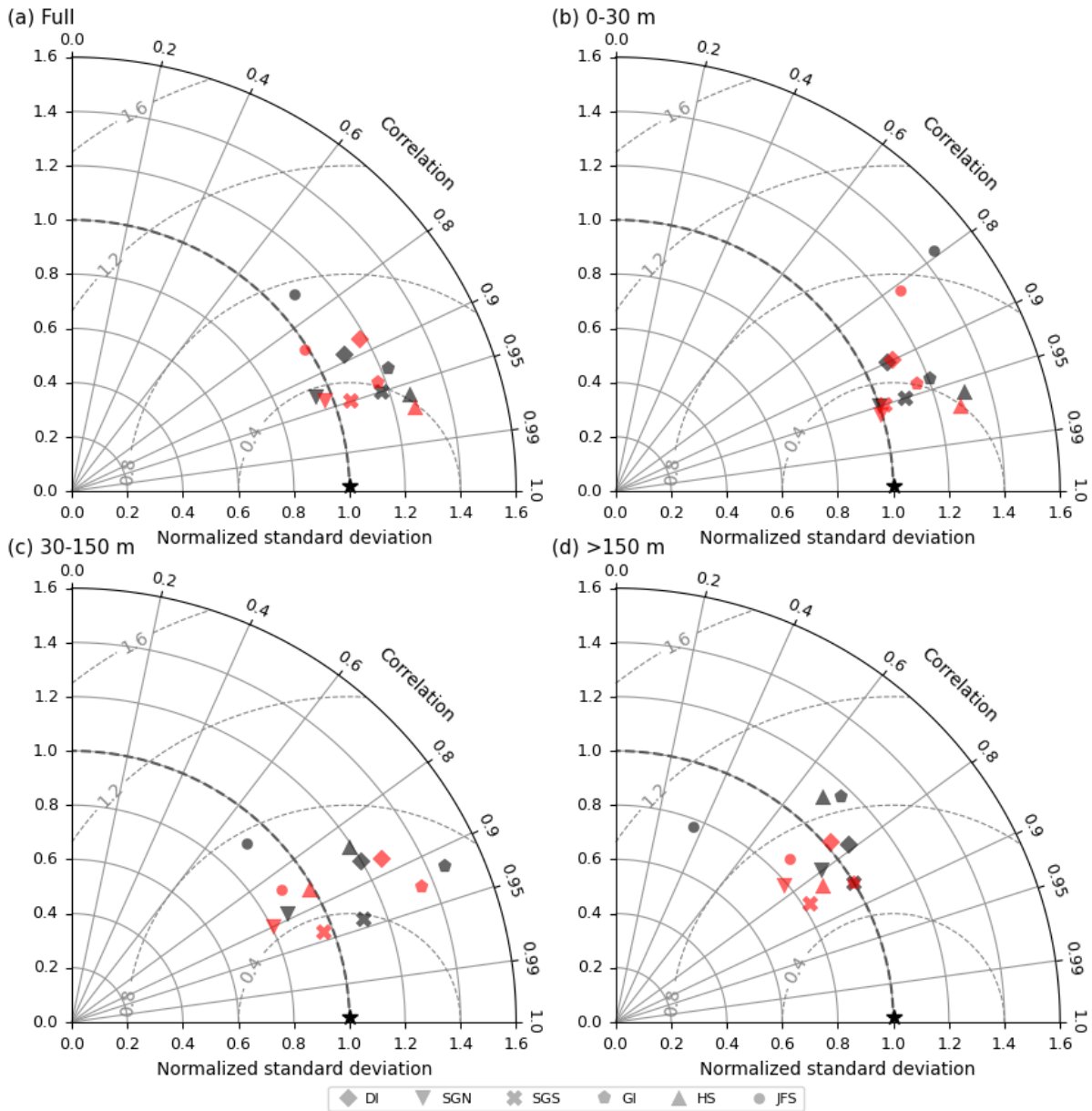


Figure S1: Taylor plots of temperature using CTD measurements grouped by subdomain and illustrating change in model performance after applying temperature bias correction at open boundary (grey = HOTSSea v1.01; before bias correction, red = HOTSSea v1.02; after bias correction). Standard deviation (solid grey contours) and centred root mean square error (dashed grey contours) have been normalised.

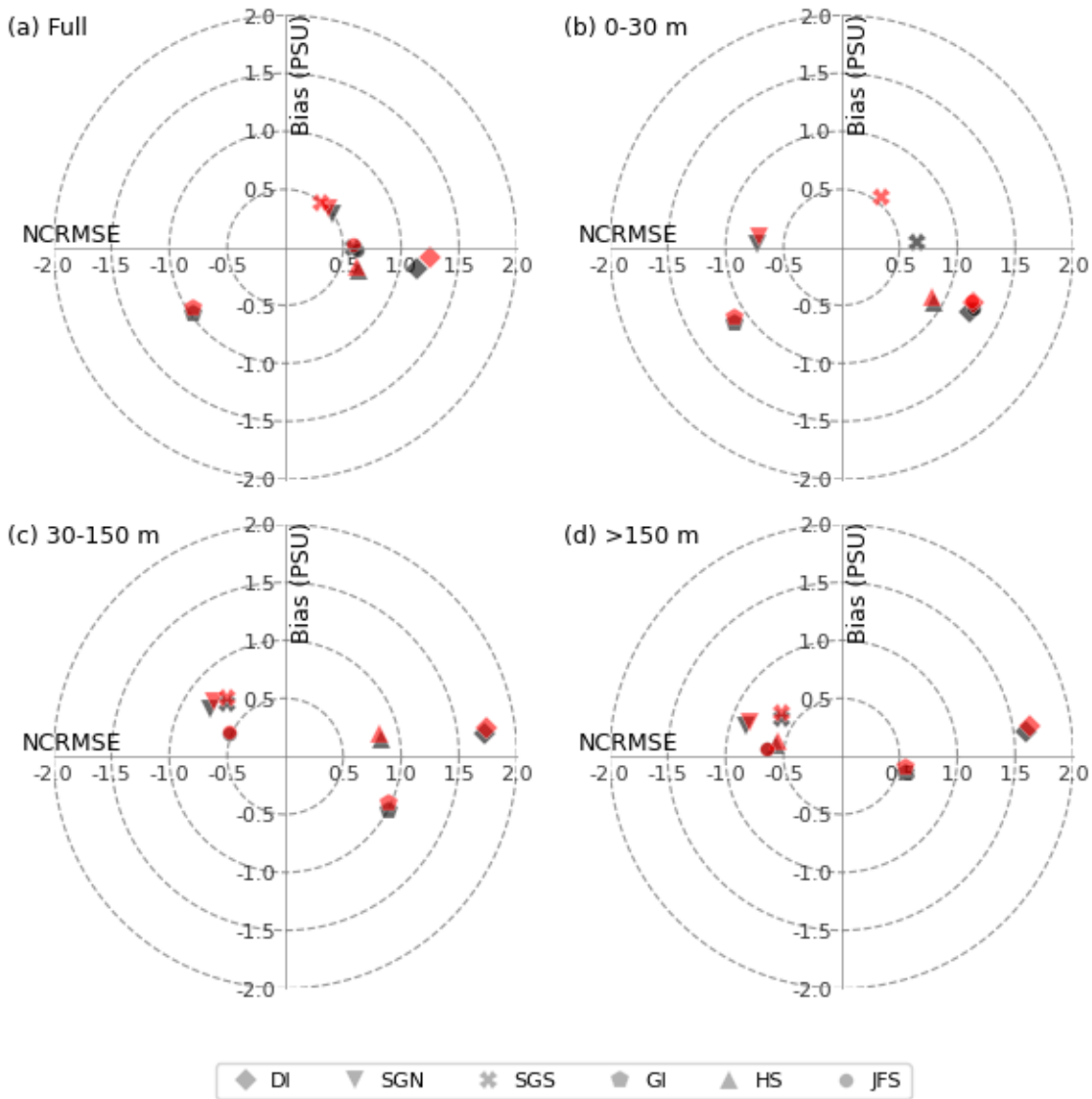


Figure S2: Target plots of the model's salinity bias and normalised centred root mean squared error (NCRMSE) using CTD data grouped by depth strata (panels a - d) and by subdomain. Results without bias correction to western open ocean boundary conditions (HOTSSea v1.01) are shown in grey and results with temperature bias correction (HOTSSea v1.02) are shown in red.

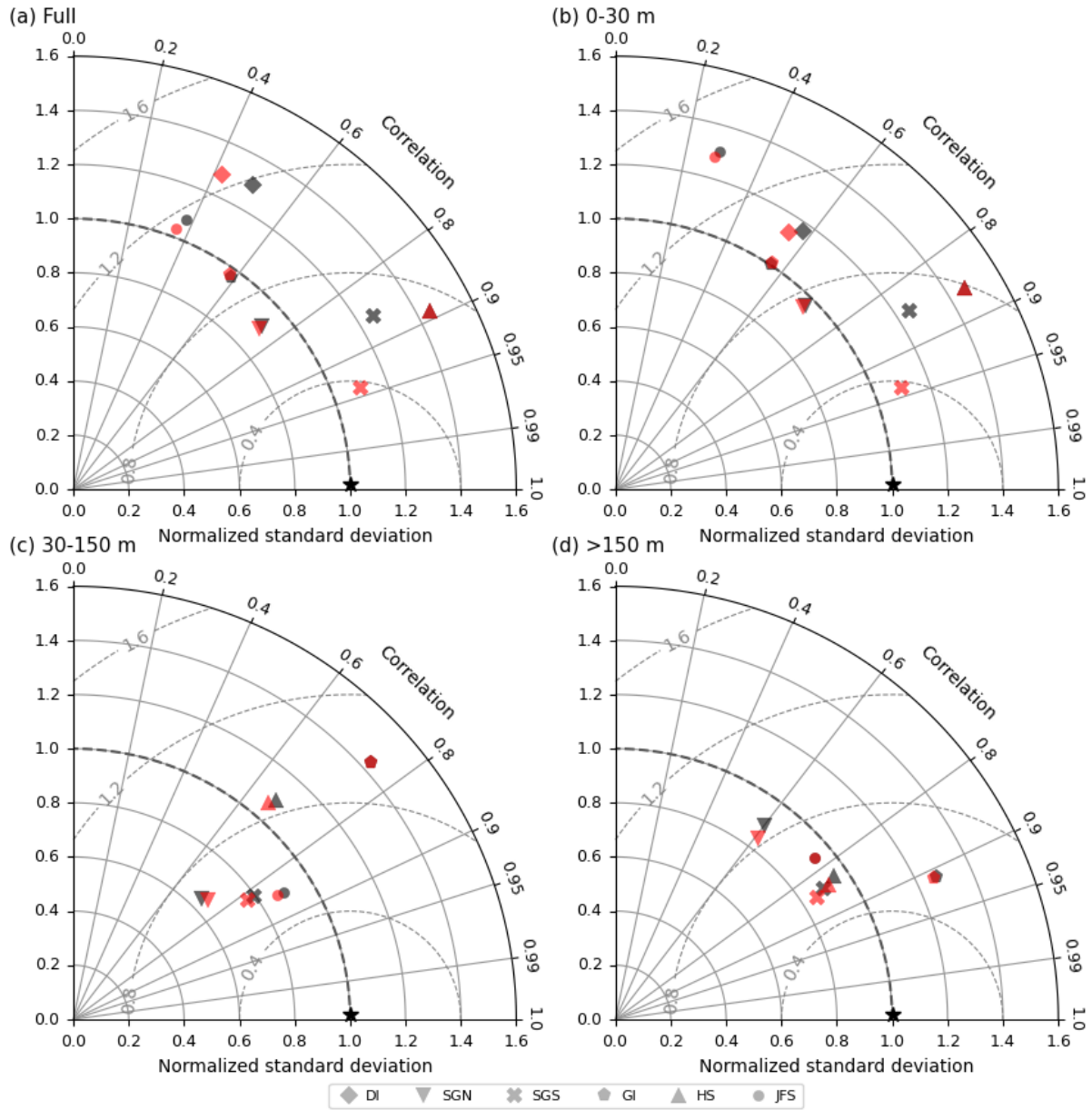


Figure S3: Taylor diagrams showing salinity (PSU) using CTD measurement grouped by depth and subdomain. Plots show minor differences in temperature bias correction at open boundary before bias correction (grey = HOTSSea v1.01) versus after bias correction (red = HOTSSea v1.02). Standard deviation (solid grey contours) and centred root mean square error (dashed grey contours) have been normalised.

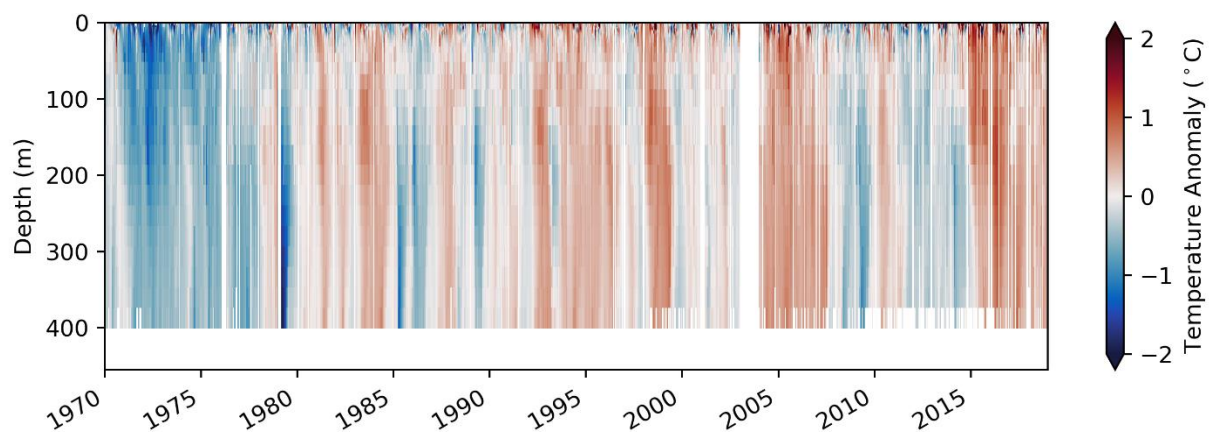


Figure S4: Water temperature anomalies from observations taken at Nanoose station from 1970 to present illustrating the cold 1970 – 1979 period not covered by the model hindcast.