frontiers

Supplementary Material

Table S1 | RMS amplitudes of residual OBP time series of observations and those using numerical ocean models for all the data analyzed at the six subduction zones of (a) the Hikurangi Trough, (b) the Nankai Trough, (c) the Japan Trench, (d) the Aleutian Trench, (e) the Cascadia Subduction Zone, and (f) the Chile Trench. In each cell, values with and without brackets indicate the ocean models include SOM_P or not, respectively. Mean residual RMS amplitude and mean RMS reduction rate defined by Eq. (5) over the respective regions are added.

(a) Hikurangi Trough

No.	Site	Latitude/ Longitude (°N/°E)	Depth (m)	Obs. (hPa)	SOM_W ($+SOM_P$) (hPa)	HYCOM ($+SOM_P$) (hPa)	GLORYS ($+SOM_P$) (hPa)	ECCO2 ($+SOM_P$) (hPa)
1	LOBS1	–38.5921 178.8187	993	2.02	1.49 (1.21)	1.75 (1.71)	1.55 (1.22)	1.47 (1.27)
2	LOBS4	–39.1201 178.9815	3540	2.07	1.62 (1.34)	1.80 (1.72)	1.73 (1.46)	1.71 (1.57)
3	LOBS6	–38.9778 178.7960	1874	2.18	1.50 (1.18)	1.59 (1.53)	1.59 (1.30)	1.40 (1.28)
4	LOBS8	–38.8432 178.4594	651	2.12	1.48 (1.21)	1.80 (1.72)	1.69 (1.40)	1.74 (1.67)
5	LOBS9	–39.0716 178.5214	1457	1.98	1.48 (1.09)	1.72 (1.60)	1.70 (1.32)	1.58 (1.35)
6	LOBS10	–39.1333 178.3132	1444	2.12	1.55 (1.32)	1.66 (1.61)	1.61 (1.29)	1.57 (1.41)
7	TXBP2	–38.7135 178.5686	779	2.05	1.57 (1.27)	1.63 (1.26)	1.69 (1.36)	1.66 (1.62)
8	TXBP5	–38.9478 178.5722	1246	2.07	1.41 (1.04)	1.29 (0.93)	1.49 (1.08)	1.62 (1.48)
		Mean RMS		**2.08**	**1.51 (1.21)**	**1.66 (1.51)**	**1.63 (1.30)**	**1.59 (1.46)**
		Mean RMS reduction			**0.27 (0.42)**	**0.20 (0.27)**	**0.21 (0.37)**	**0.23 (0.30)**

(b) Nankai Trough

No.	Site	Latitude/ Longitude (°N/°E)	Depth (m)	Obs. (hPa)	SOM_w ($+SOM_p$) (hPa)	HYCOM ($+SOM_p$) (hPa)	GLORYS ($+SOM_p$) (hPa)	ECCO2 ($+SOM_p$) (hPa)	JCOPE2M ($+SOM_p$) (hPa)
1	KMA01	33.8048 136.5570	2039	1.22	1.16 (1.05)	1.70 (1.64)	1.53 (1.47)	1.39 (1.32)	1.35 (1.26)
2	KMA02	33.7524 136.6488	2011	1.23	1.16 (1.05)	1.83 (1.83)	1.52 (1.47)	1.39 (1.33)	1.38 (1.28)
3	KMA03	33.6484 136.6037	2063	1.27	1.20 (1.08)	1.96 (1.94)	1.57 (1.51)	1.35 (1.25)	1.44 (1.37)
4	KMA04	33.6781 136.4674	2054	1.21	1.15 (1.05)	1.88 (1.87)	1.51 (1.47)	1.33 (1.26)	1.28 (1.21)
5	KMB05	33.4772 136.9264	1998	1.22	1.18 (1.00)	1.75 (1.67)	1.61 (1.60)	1.37 (1.25)	1.47 (1.34)
6	KMB06	33.3584 136.9216	2499	1.06	1.02 (0.84)	1.57 (1.49)	1.48 (1.49)	1.20 (1.10)	1.43 (1.32)
7	KMB07	33.3613 136.8072	1980	1.16	1.11 (0.94)	1.74 (1.66)	1.65 (1.65)	1.28 (1.18)	1.43 (1.31)
8	KMB08	33.4664 136.8039	1924	1.17	1.13 (0.98)	1.94 (1.94)	1.61 (1.62)	1.33 (1.24)	1.38 (1.31)
9	KMC09	33.0584 136.8313	3511	1.15	1.11 (0.96)	2.24 (2.15)	1.57 (1.59)	1.12 (1.05)	1.56 (1.62)
10	KMC10	33.0533 136.9335	4247	1.22	1.18 (1.05)	2.72 (2.66)	1.63 (1.65)	1.15 (1.09)	1.66 (1.76)
11	KMC12	33.1279 136.8188	3784	1.16	1.12 (0.99)	1.95 (1.83)	1.58 (1.61)	1.12 (1.06)	1.46 (1.45)
12	KMC21	32.9506 136.7417	4449	1.16	1.16 (1.02)	2.36 (2.28)	1.58 (1.61)	1.01 (1.00)	1.81 (1.92)
13	KMD13	33.2201 136.6903	2441	1.13	1.10 (0.92)	1.76 (1.61)	1.51 (1.52)	1.27 (1.18)	1.50 (1.40)
14	KMD14	33.1727 136.5770	2350	1.14	1.10 (0.91)	1.59 (1.48)	1.54 (1.54)	1.27 (1.17)	1.41 (1.33)
15	KMD15	33.2331 136.5631	1909	1.25	1.18 (1.01)	1.78 (1.68)	1.77 (1.78)	1.39 (1.31)	1.40 (1.31)

16	KMD16	33.3045 136.5958	1970	1.20	1.15 (0.96)	1.78 (1.73)	1.68 (1.67)	1.28 (1.15)	1.39 (1.30)
17	MRA01	33.4085 134.7449	1375	1.30	1.22 (1.07)	1.48 (1.41)	1.89 (1.89)	1.54 (1.46)	1.48 (1.48)
18	MRA02	33.3393 134.8641	1360	1.32	1.21 (1.08)	1.42 (1.37)	1.93 (1.93)	1.50 (1.43)	1.55 (1.55)
19	MRA03	33.2490 134.7691	1352	1.37	1.28 (1.14)	1.54 (1.45)	1.95 (1.95)	1.40 (1.28)	1.81 (1.77)
20	MRA04	33.3205 134.6723	1372	1.06	1.00 (0.99)	1.50 (1.42)	1.70 (1.80)	1.54 (1.47)	1.24 (1.30)
21	MRB05	33.3222 135.0667	1470	1.43	1.37 (1.17)	1.43 (1.32)	1.88 (1.84)	1.51 (1.37)	1.51 (1.45)
22	MRB06	33.2252 135.1698	1388	1.28	1.19 (1.06)	1.35 (1.33)	1.89 (1.90)	1.51 (1.45)	1.48 (1.49)
23	MRB07	33.1755 135.0964	1077	1.31	1.23 (1.20)	1.43 (1.47)	1.99 (2.05)	1.59 (1.59)	1.51 (1.59)
24	MRB08	33.2750 134.9869	1262	1.31	1.21 (1.07)	1.41 (1.35)	1.95 (1.95)	1.51 (1.43)	1.46 (1.45)
25	MRC09	33.2280 135.4584	1555	1.26	1.18 (1.02)	1.65 (1.63)	1.84 (1.83)	1.34 (1.24)	1.43 (1.42)
26	MRC10	33.1251 135.5249	1720	1.22	1.16 (1.00)	1.46 (1.45)	1.81 (1.81)	1.32 (1.22)	1.45 (1.39)
27	MRC11	33.0837 135.4121	2001	1.23	1.16 (1.00)	1.52 (1.49)	1.77 (1.76)	1.31 (1.21)	1.47 (1.45)
28	MRC12	33.1752 135.3414	1317	1.17	1.11 (0.98)	1.35 (1.34)	1.82 (1.84)	1.32 (1.26)	1.37 (1.40)
29	MRD13	33.1594 135.7557	2353	1.15	1.10 (0.92)	1.51 (1.50)	1.64 (1.64)	1.27 (1.16)	1.34 (1.29)
30	MRD14	33.1359 135.8584	2398	1.08	1.04 (0.87)	1.44 (1.42)	1.55 (1.55)	1.19 (1.09)	1.32 (1.26)
31	MRD15	33.1420 135.9586	2244	1.14	1.08 (0.92)	1.43 (1.43)	1.64 (1.64)	1.26 (1.17)	1.28 (1.24)
32	MRD16	33.0299 135.8401	2415	1.07	1.01 (0.87)	1.50 (1.52)	1.60 (1.62)	1.19 (1.11)	1.23 (1.20)

33	MRD17	33.0915 135.7144	2700	1.09	1.06 (0.88)	1.53 (1.52)	1.49 (1.49)	1.22 (1.11)	1.32 (1.27)
34	MRE18	32.9270 135.7747	3548	1.15	1.10 (0.96)	1.68 (1.69)	1.58 (1.60)	1.11 (1.06)	1.37 (1.33)
35	MRE19	32.8920 135.8336	3456	1.14	1.10 (0.95)	1.74 (1.69)	1.58 (1.59)	1.10 (1.03)	1.38 (1.34)
36	MRE20	32.8017 135.7733	3603	1.19	1.18 (1.02)	1.79 (1.73)	1.58 (1.59)	1.13 (1.05)	1.49 (1.48)
37	MRE21	32.8603 135.6670	3534	1.14	1.10 (0.95)	1.71 (1.70)	1.55 (1.56)	1.17 (1.09)	1.36 (1.33)
38	MRF22	32.9879 135.2250	2104	1.13	0.99 (0.85)	1.43 (1.30)	1.10 (1.12)	1.12 (1.03)	1.21 (1.17)
39	MRF23	32.8827 135.3082	2646	1.06	1.01 (0.84)	1.32 (1.31)	1.52 (1.53)	1.23 (1.15)	1.24 (1.19)
40	MRF24	32.8545 135.1916	2393	1.07	1.02 (0.84)	1.37 (1.37)	1.52 (1.53)	1.17 (1.08)	1.24 (1.18)
41	MRF25	32.8919 135.1538	2278	1.13	1.06 (0.91)	1.38 (1.39)	1.67 (1.67)	1.26 (1.18)	1.34 (1.30)
42	MRG26	32.7615 134.5167	1855	1.21	1.11 (0.97)	1.45 (1.43)	1.81 (1.82)	1.36 (1.28)	1.39 (1.41)
43	MRG27	32.7089 134.5996	2494	1.09	1.05 (0.86)	1.38 (1.38)	1.58 (1.58)	1.15 (1.07)	1.41 (1.37)
44	MRG28	32.6251 134.5164	2499	1.11	1.04 (0.90)	1.42 (1.42)	1.67 (1.70)	1.19 (1.14)	1.32 (1.31)
45	MRG29	32.6752 134.4334	2141	1.18	1.11 (0.94)	1.37 (1.34)	1.75 (1.76)	1.24 (1.16)	1.36 (1.36)
		Mean RMS		**1.19**	**1.13 (0.98)**	**1.63 (1.59)**	**1.66 (1.66)**	**1.29 (1.21)**	**1.42 (1.38)**
		Mean RMS reduction			**0.05 (0.17)**	**–0.38 (–0.34)**	**–0.40 (–0.40)**	**–0.09 (–0.02)**	**–0.19 (–0.17)**

(c) Japan Trench

No.	Site	Latitude/ Longitude (°N/°E)	Depth (m)	Obs. (hPa)	SOM_w ($+SOM_p$) (hPa)	HYCOM ($+SOM_p$) (hPa)	GLORYS ($+SOM_p$) (hPa)	ECCO2 ($+SOM_p$) (hPa)	JCOPE2M ($+SOM_p$) (hPa)
1	P01	38.3330 142.4167	1038	1.63	1.48 (1.34)	2.33 (2.24)	1.34 (1.17)	1.35 (1.27)	1.88 (1.76)
2	P02	38.5006 142.5035	1109	1.65	1.57 (1.36)	2.12 (2.03)	1.58 (1.36)	1.56 (1.42)	1.76 (1.59)
3	P03	38.1834 142.3996	1056	1.52	1.42 (1.20)	1.54 (1.44)	1.63 (1.47)	1.40 (1.28)	1.70 (1.50)
4	P06	38.6338 142.5833	1269	1.92	1.90 (1.78)	1.78 (1.74)	1.97 (1.84)	1.94 (1.88)	2.19 (2.08)
5	P07	38.0000 142.4486	1064	1.68	1.53 (1.40)	1.56 (1.62)	1.51 (1.43)	1.43 (1.31)	1.92 (1.79)
6	P08	38.2833 142.8329	1424	1.64	1.52 (1.37)	1.53 (1.58)	1.63 (1.50)	1.55 (1.41)	2.00 (1.87)
7	P10	38.2500 143.1666	2066	1.58	1.48 (1.34)	1.34 (1.26)	1.41 (1.24)	1.48 (1.36)	1.77 (1.66)
8	JFASTb	37.9336 143.9154	6799	1.81	1.61 (1.44)	2.23 (2.17)	1.62 (1.51)	1.57 (1.42)	1.91 (1.73)
9	MYGI	38.0832 142.9166	1697	1.63	1.52 (1.41)	1.77 (1.71)	1.75 (1.64)	1.57 (1.50)	1.86 (1.78)
10	KAMN	38.8862 143.3639	2360	1.42	1.30 (1.14)	1.46 (1.36)	1.21 (1.04)	1.25 (1.11)	1.64 (1.55)
11	GFK	37.5812 142.7647	2245	1.42	1.40 (1.26)	1.64 (1.67)	1.58 (1.47)	1.46 (1.33)	1.71 (1.60)
12	TJT1	38.2080 143.7904	5744	1.75	1.62 (1.59)	1.95 (2.06)	1.75 (1.71)	1.70 (1.68)	2.01 (1.93)
13	GJT3b	38.2948 143.4811	3260	1.22	1.12 (0.90)	1.33 (1.26)	1.34 (1.10)	1.26 (1.06)	1.45 (1.23)
14	GJT4	38.4010 142.8162	1434	1.56	1.45 (1.38)	1.64 (1.66)	1.70 (1.59)	1.54 (1.48)	1.78 (1.82)
		Mean RMS		**1.60**	**1.49 (1.35)**	**1.73 (1.70)**	**1.57 (1.43)**	**1.50 (1.39)**	**1.83 (1.71)**
		Mean RMS reduction			**0.07 (0.16)**	**–0.08 (–0.06)**	**0.02 (0.11)**	**0.06 (0.13)**	**–0.14 (–0.07)**

(d) Aleutian Trench

No.	Site	Latitude/ Longitude (°N/°E)	Depth (m)	Obs. (hPa)	SOM_w ($+SOM_p$) (hPa)	HYCOM ($+SOM_p$) (hPa)	GLORYS ($+SOM_p$) (hPa)	ECCO2 ($+SOM_p$) (hPa)
1	LA21	54.3715 –155.0717	5097	2.74	2.31 (2.27)	2.37 (2.34)	2.28 (2.20)	2.33 (2.25)
2	LA23	54.9200 –155.2550	3767	1.96	1.72 (1.68)	1.54 (1.49)	1.61 (1.56)	1.59 (1.57)
3	LA25	54.8830 –155.9170	2496	1.87	1.71 (1.65)	1.55 (1.48)	1.67 (1.62)	1.62 (1.59)
4	LA26	54.5150 –156.2500	5068	2.17	1.88 (1.84)	1.74 (1.68)	1.75 (1.67)	1.73 (1.72)
5	LA28	54.9000 –156.6000	1815	1.77	1.71 (1.67)	1.58 (1.55)	1.77 (1.76)	1.73 (1.74)
6	LA30	54.6711 –157.4156	1565	1.87	1.75 (1.66)	1.71 (1.63)	1.73 (1.67)	1.69 (1.63)
7	LA32	54.5001 –157.8500	1610	2.26	2.15 (2.05)	2.16 (2.07)	2.25 (2.18)	2.27 (2.21)
8	LA33	54.1550 –158.1000	4483	1.84	1.72 (1.62)	1.53 (1.44)	1.56 (1.48)	1.54 (1.51)
9	LA34	54.0500 –158.5830	4645	1.82	1.65 (1.58)	1.50 (1.42)	1.54 (1.48)	1.56 (1.55)
10	LA39	56.9500 –151.0830	1024	1.87	1.79 (1.74)	1.75 (1.71)	1.94 (1.95)	1.75 (1.74)
		Mean RMS		**2.02**	**1.84 (1.78)**	**1.74 (1.68)**	**1.81 (1.76)**	**1.78 (1.75)**
		Mean RMS reduction			**0.09 (0.12)**	**0.14 (0.17)**	**0.10 (0.13)**	**0.12 (0.13)**

(e) Cascadia Subduction Zone

No.	Site	Latitude/ Longitude (°N/°E)	Depth (m)	Obs. (hPa)	SOM_w ($+SOM_p$) (hPa)	HYCOM ($+SOM_p$) (hPa)	GLORYS ($+SOM_p$) (hPa)	ECCO2 ($+SOM_p$) (hPa)
1	M18	44.8871 –124.9712	720	1.72	1.45 (1.51)	1.34 (1.43)	1.35 (1.33)	1.19 (1.26)
2	M10	43.6248 –124.9728	675	1.56	1.33 (1.41)	1.37 (1.49)	1.20 (1.21)	1.23 (1.33)
3	G34	42.5554 –125.2010	2954	1.31	1.18 (1.20)	1.09 (1.17)	0.98 (0.96)	1.00 (1.06)
4	G09	40.6568 –124.7187	842	1.33	1.17 (1.19)	1.13 (1.21)	0.98 (0.91)	1.02 (1.07)
5	FS20	40.3895 –125.0311	2378	1.22	1.13 (1.11)	1.07 (1.10)	0.88 (0.84)	0.90 (0.96)
6	FS07	40.3392 –124.6596	1297	1.55	1.47 (1.52)	1.49 (1.59)	1.24 (1.22)	1.20 (1.28)
7	FS43	40.7119 –124.5839	719	2.42	2.30 (2.27)	2.23 (2.17)	2.24 (2.13)	2.28 (2.23)
8	G25	41.9811 –124.7267	688	2.22	2.09 (2.01)	2.19 (2.06)	2.11 (1.96)	2.20 (2.13)
9	J18	43.9772 –125.4814	3050	4.30	4.31 (4.19)	4.46 (4.35)	4.42 (4.28)	4.56 (4.43)
10	M14	42.9136 –124.9779	997	1.95	1.76 (1.73)	1.75 (1.70)	1.75 (1.65)	1.86 (1.86)
11	M15	42.2107 –124.9074	993	1.52	1.45 (1.67)	1.15 (1.34)	1.20 (1.35)	1.36 (1.58)
12	M17	41.0370 –124.6298	749	2.60	2.53 (2.43)	2.62 (2.50)	2.71 (2.57)	2.76 (2.65)
13	nep889	48.6708 –126.8480	1258	1.63	1.51 (1.55)	1.67 (1.79)	1.48 (1.44)	1.59 (1.59)
14	nep52	47.7626 –127.7583	2654	1.86	1.76 (1.87)	1.94 (2.10)	1.82 (1.85)	1.75 (1.81)
15	nep80	47.9486 –129.0987	2195	1.73	1.58 (1.69)	1.75 (1.92)	1.52 (1.55)	1.62 (1.69)

	Mean RMS	**1.93**	**1.80 (1.82)**	**1.82 (1.86)**	**1.72 (1.68)**	**1.77 (1.80)**
	Mean RMS reduction		**0.07 (0.05)**	**0.06 (0.03)**	**0.11 (0.13)**	**0.08 (0.07)**

(f) Chile Trench

No.	**Site**	**Latitude/ Longitude (°N/°E)**	**Depth (m)**	**Obs. (hPa)**	**SOM_w ($+SOM_p$) (hPa)**	**HYCOM ($+SOM_p$) (hPa)**	**GLORYS ($+SOM_p$) (hPa)**	**ECCO2 ($+SOM_p$) (hPa)**
1	CP01	–34.7018 –72.9323	2442	1.11	1.04 (0.98)	1.22 (1.24)	1.04 (0.97)	1.07 (1.07)
2	CP02	–34.5862 –73.2931	3956	1.35	1.24 (1.25)	1.37 (1.40)	1.43 (1.39)	1.48 (1.49)
3	CP04	–34.6713 –73.0377	2739	1.05	0.98 (0.92)	1.16 (1.19)	0.92 (0.85)	0.92 (0.93)
4	CP10	–34.7146 –73.1373	3022	1.38	1.35 (1.37)	1.65 (1.70)	1.35 (1.37)	1.36 (1.43)
	Mean RMS			**1.22**	**1.15 (1.13)**	**1.35 (1.38)**	**1.19 (1.14)**	**1.21 (1.23)**
	Mean RMS reduction				**0.06 (0.08)**	**–0.10 (–0.13)**	**0.03 (0.06)**	**0.01 (0.00)**