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Supplement of

Modelling wave–current interactions off the east coast of Scotland

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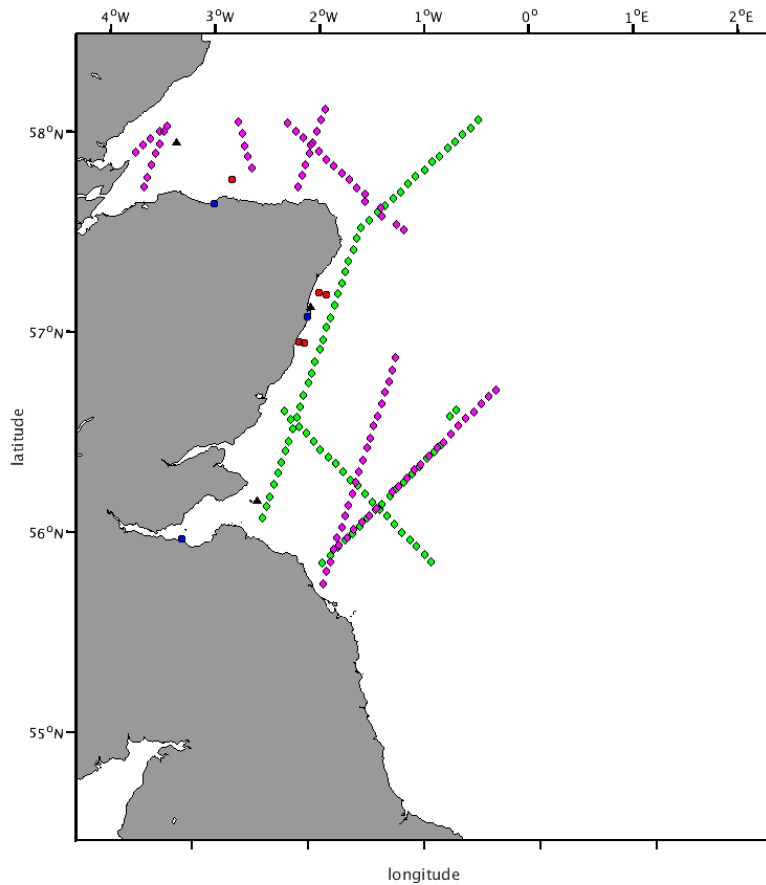


Figure 1: Position of the devices used for the calibration/validation of the model: blue circles are tide gauges, black triangles are wave buoys, red squares are current meters observations, green diamonds are spring satellite observations and magenta diamonds are winter satellite observations

Table 1: Comparison of the observed and modelled amplitude and phase for dominant semi-diurnal tidal components h_0 and g_0 are the observed amplitude in cm and the phase degrees respectively and h_m and g_m are the modelled amplitude in cm and the phase degrees

h.c.	Aberdeen				Leith				Buckie			
	h_o	g_o	h_m	g_m	h_o	g_o	h_m	g_m	h_o	g_o	h_m	g_m
M_2	130	24.6	127	23.7	179	55.2	176	54.2	117	338	118	338
S_2	44.1	62.7	45.2	59.9	61.6	95.2	59.9	92.6	40.9	17.5	42.9	12.4
N_2	25.9	2.36	25.5	0.	34.6	32.8	32.6	30.4	23.9	318	24.9	314
O_1	12.5	50.8	12.5	55.8	13.9	64.6	12.6	72.2	11.7	33.8	11.6	36.1
K_1	10.7	207	11.2	200	11.7	220	11.4	219	11.3	155	10.8	179
Q_1	4.40	9.88	3.89	354	3.74	18.7	3.79	7.19	4.24	349	3.73	263

Table 2: Results from the validation of the currents, showing the difference between the modelled and observed u- and v-components of the speed at the eight locations reported in Table 1. Cfr Table 3 of the manuscript

RCM No	Lat	Lon	RMSE (m/s)	NRMSE	R^2	Bias (m/s)
u						
4551	-2.8	57.791	0.098	0.111	0.71	-0.06
4561	-1.968	57.232	0.071	0.088	0.78	-0.007
4562	-1.968	57.232	0.054	0.075	0.9	0.01
4571	-1.902	57.226	0.151	0.133	0.43	-0.028
4572	-1.902	57.226	0.049	0.068	0.84	-0.004
4582	-2.15	56.987	0.041	0.071	0.88	0.006
4591	-2.098	56.982	0.078	0.081	0.76	0.008
4592	-2.098	56.982	0.058	0.085	0.91	0.006
v						
4551	-2.8	57.791	0.099	0.206	0.17	0.08
4561	-1.968	57.232	0.101	0.064	0.92	0.02
4562	-1.968	57.232	0.079	0.062	0.9	-0.01
4571	-1.902	57.226	0.215	0.121	0.71	0.02
4572	-1.902	57.226	0.09	0.061	0.93	0.0122
4582	-2.15	56.987	0.083	0.072	0.91	-0.002
4591	-2.098	56.982	0.116	0.07	0.94	0.035
4592	-2.098	56.982	0.076	0.068	0.92	-0.008

Table 3: Details of satellite observations used for validating the wave model

No	Date	Time (UTC)	Satellite
1W	01/02/2010	21:46	Ers-2
2W	02/02/2010	15:07	Jason-1
3W	02/02/2010	20:59	Jason-1
4W	02/02/2010	11:27	Ers-2
5W	05/02/2010	11:32	Ers-2
6W	08/02/2010	11:38	Ers-2
7W	08/02/2010	13:31	Jason-1
1S	02/05/2010	11:29	Ers-2
2S	05/05/2010	20:06	Jason-1
3S	08/05/2010	19:17	Jason-1
4S	10/05/2010	01:43	Jason-1

Table 4: Winter satellite validation: (o) are the observed data, (c) is the coupled model, (u) is the uncoupled model and No corresponds to the observation reported in Table S2

No		Lat	Lon	$H_s(o)$	$T_m(o)$	$H_s(c)$	$T_m(c)$	$H_s(u)$	$T_m(u)$
1W	1	57.85	-2.62	3.4	7.1	1.6	6.2	1.5	6.2
1W	2	57.91	-2.66	1.8	5.4	1.5	6.3	1.5	6.2
1W	3	57.96	-2.69	1.2	4.5	1.5	6.2	1.5	6.2
1W	4	58.02	-2.72	1.4	4.7	1.5	6.2	1.5	6.1
1W	5	58.08	-2.76	1.7	5.2	1.5	6.1	1.5	6.1
2W	6	57.91	-3.72	0.9	4.2	0.5	4.6	0.5	4.7
2W	7	57.95	-3.65	0.9	4.3	0.6	4.7	0.6	4.5
2W	8	57.98	-3.58	1.1	4.7	0.6	5	0.6	4.7
2W	9	58.02	-3.5	1	4.5	0.6	5.1	0.6	4.9
2W	10	58.05	-3.43	0.9	4.2	0.6	5.2	0.6	5.1
3W	11	58.08	-2.29	1.9	5.5	1.7	6.5	1.7	6.4
3W	12	58.04	-2.21	2	5.6	1.6	6.5	1.7	6.4
3W	13	58.01	-2.14	2.2	5.8	1.6	6.5	1.7	6.4
3W	14	57.97	-2.07	2.4	6	1.6	6.4	1.7	6.4
3W	15	57.94	-1.99	2.2	5.8	1.6	6.4	1.6	6.4
3W	16	57.9	-1.92	2.2	5.8	1.5	6.3	1.6	6.4
3W	17	57.87	-1.85	2	5.6	1.6	6.1	1.6	6.3
3W	18	57.83	-1.77	2.3	5.8	1.6	6	1.6	6.2
3W	19	57.8	-1.7	2.3	5.9	1.6	5.9	1.6	6.2
3W	20	57.76	-1.63	2.7	6.3	1.6	5.7	1.5	6

3W	21	57.73	-1.55	2.3	5.8	1.6	5.4	1.6	5.6
3W	22	57.69	-1.55	2.2	5.8	1.6	5.3	1.6	5.5
3W	23	57.66	-1.41	2.2	5.7	1.7	5	1.7	5
3W	24	57.62	-1.4	2.4	6	1.7	4.9	1.7	5
3W	25	57.58	-1.26	2.5	6.2	1.7	4.9	1.7	4.9
3W	26	57.55	-1.19	2.3	5.9	1.7	4.9	1.8	4.9
4W	27	55.78	-1.9	1.3	4.9	1.2	4.2	1.2	4.2
4W	28	55.84	-1.87	1.3	4.9	1.3	4.2	1.3	4.3
4W	29	55.89	-1.84	1.1	4.4	1.4	4.2	1.4	4.3
4W	30	55.95	-1.81	1.4	4.8	1.4	4.2	1.5	4.2
4W	31	56.01	-1.78	1.3	4.6	1.4	4.2	1.5	4.3
4W	32	56.06	-1.74	1.7	5.4	1.5	4.2	1.5	4.3
4W	33	56.12	-1.71	1.4	4.8	1.5	4.3	1.5	4.4
4W	34	56.17	-1.68	1.7	5.3	1.5	4.3	1.5	4.4
4W	35	56.23	-1.65	1.8	5.5	1.5	4.3	1.6	4.4
4W	36	56.29	-1.62	1.4	5	1.5	4.3	1.6	4.4
4W	37	56.34	-1.59	1.7	5.3	1.5	4.4	1.6	4.4
4W	38	56.4	-1.55	1.4	4.8	1.5	4.4	1.6	4.4
4W	39	56.46	-1.52	1.8	5.5	1.5	4.4	1.6	4.4
4W	40	56.51	-1.49	1.5	4.9	1.6	4.4	1.6	4.4
4W	41	56.57	-1.46	1.7	5.2	1.6	4.4	1.6	4.4
4W	42	56.62	-1.42	1.8	5.3	1.6	4.4	1.6	4.4
4W	43	56.68	-1.39	1.9	5.5	1.6	4.3	1.6	4.4
4W	44	56.74	-1.36	1.9	5.4	1.6	4.4	1.6	4.3
4W	45	56.79	-1.32	1.9	5.4	1.6	4.4	1.6	4.3
4W	46	56.85	-1.29	1.8	5.3	1.6	4.4	1.6	4.3
4W	47	56.91	-1.26	1.8	5.4	1.6	4.4	1.6	4.4
5W	48	57.76	-2.18	1.1	4.4	1.1	5.5	1.2	5.7
5W	49	57.82	-2.15	1.7	5.5	1.5	5.9	1.5	6.1
5W	50	57.87	-2.12	2	5.9	1.7	6.3	1.7	6.5
5W	51	57.93	-2.08	1.9	5.6	1.9	6.6	1.9	6.7
5W	52	57.98	-2.05	2.3	6.1	2	6.8	2	6.9
5W	53	58.04	-2.01	2.7	6.7	2.1	6.9	2.1	7
5W	54	58.1	-1.98	2.5	6.3	2.1	7	2.1	7.1
5W	55	58.15	-1.94	2.6	6.3	2.2	7	2.2	7.1
6W	56	57.74	-3.63	0.9	4.2	1	4.8	1	4.8
6W	57	57.79	-3.6	0.9	4.1	1.2	5.1	1.1	5.1
6W	58	57.85	-3.56	1.1	4.4	1.2	5.2	1.2	5.3
6W	59	57.91	-3.53	0.8	3.8	1.2	5.3	1.2	5.3
6W	60	57.96	-3.49	0.8	3.8	1.2	5.3	1.2	5.4
6W	61	58.02	-3.46	1	4.2	1.2	5.3	1.2	5.3

7W	62	55.97	-1.76	1.6	5.3	1.5	5.2	1.5	5.2
7W	63	56.01	-1.69	1.3	4.9	1.6	5.3	1.6	5.2
7W	64	56.05	-1.63	1.5	5.2	1.6	5.3	1.6	5.3
7W	65	56.09	-1.56	1.3	4.9	1.6	5.3	1.7	5.3
7W	66	56.12	-1.49	1.6	5.4	1.6	5.3	1.7	5.3
7W	67	56.16	-1.43	1.3	4.9	1.7	5.3	1.7	5.3
7W	68	56.24	-1.29	1.4	5.1	1.7	5.2	1.7	5.2
7W	69	56.27	-1.23	2	5.8	1.7	5.2	1.7	5.3
7W	70	56.31	-1.16	2.1	6	1.7	5.2	1.7	5.3
7W	71	56.35	-1.09	2	5.8	1.7	5.2	1.7	5.3
7W	72	56.38	-1.03	2.2	6.2	1.7	5.2	1.7	5.3
7W	73	56.42	-0.96	2.1	6	1.7	5.3	1.7	5.3
7W	74	56.46	-0.88	1.8	5.6	1.7	5.3	1.8	5.3
7W	75	56.49	-0.82	1.6	5.3	1.8	5.4	1.8	5.4
7W	76	56.53	-0.76	1.9	5.7	1.8	5.4	1.8	5.4
7W	77	56.57	-0.69	1.5	5.1	1.8	5.4	1.8	5.5
7W	78	56.61	-0.62	1.5	5.2	1.8	5.4	1.8	5.5
7W	79	56.64	-0.55	2.2	6	1.8	5.4	1.8	5.5
7W	80	56.68	-0.48	2.6	6.6	1.8	5.4	1.8	5.4
7W	81	56.72	-0.41	1.5	5.1	1.8	5.4	1.8	5.4
7W	82	56.75	-0.35	1.5	5.2	1.8	5.4	1.8	5.4

Table 5: Spring satellite validation: (o) are the observed data, (c) is the coupled model, (u) is the uncoupled model and No corresponds to the observation reported in Table S2

No		Lat	Lon	$H_s(o)$	$T_m(o)$	$H_s(c)$	$T_m(c)$	$H_s(u)$	$T_m(u)$
1S	1	56.1	-2.45	0.8	4	1	5.3	1.1	5.5
1S	2	56.16	-2.42	1	4.5	1.1	5.3	1.2	5.5
1S	3	56.21	-2.39	0.8	4	1.1	5.3	1.2	5.4
1S	4	56.27	-2.35	1.1	4.6	1.1	5.2	1.2	5.4
1S	5	56.33	-2.32	1	4.6	1.1	5.2	1.2	5.4
1S	6	56.38	-2.29	0.9	4.3	1.1	5.2	1.2	5.4
1S	7	56.44	-2.26	0.9	4.3	1.1	5.2	1.2	5.4
1S	8	56.49	-2.23	0.8	3.9	1.2	5.2	1.2	5.4
1S	9	56.55	-2.19	0.8	4	1.2	5.3	1.2	5.4
1S	10	56.61	-2.16	0.8	4.1	1.2	5.3	1.2	5.4
1S	11	56.66	-2.13	0.9	4.1	1.2	5.4	1.2	5.5
1S	12	56.72	-2.1	0.9	4.1	1.2	5.4	1.2	5.5
1S	13	56.78	-2.06	1	4.4	1.3	5.3	1.2	5.4

1S	14	56.83	-2.03	1.1	4.6	1.3	5.3	1.2	5.4
1S	15	56.89	-2	1	4.3	1.2	5.3	1.2	5.4
1S	16	56.95	-1.96	1.3	4.9	1.2	5.3	1.2	5.3
1S	17	57	-1.93	1.3	5	1.3	5.4	1.2	5.3
1S	18	57.06	-1.9	1.2	4.7	1.3	5.4	1.2	5.3
1S	19	57.11	-1.86	1.1	4.7	1.3	5.4	1.2	5.3
1S	20	57.17	-1.83	1.2	4.8	1.3	5.4	1.2	5.3
1S	21	57.23	-1.8	1.3	4.9	1.3	5.3	1.2	5.3
1S	22	57.28	-1.76	1.3	5	1.4	5.4	1.3	5.4
1S	23	57.34	-1.73	1.3	5	1.5	5.6	1.4	5.5
1S	24	57.39	-1.7	1.7	5.7	1.5	5.7	1.4	5.7
1S	25	57.45	-1.66	1.2	4.8	1.6	5.9	1.5	5.8
1S	26	57.51	-1.63	1.6	5.5	1.7	6	1.6	6
1S	27	57.56	-1.59	1.4	5.2	1.8	6.1	1.7	6.1
2S	28	57.6	-1.51	0.8	4	0.9	6.7	0.9	6.7
2S	29	57.64	-1.44	0.8	4	0.9	6.7	0.9	6.7
2S	30	57.67	-1.37	1	4.5	0.9	6.6	0.9	6.6
2S	31	57.71	-1.29	1.1	4.8	0.9	6.6	0.9	6.6
2S	32	57.74	-1.22	1.5	5.5	0.9	6.6	0.9	6.6
2S	33	57.78	-1.15	1	4.4	0.9	6.6	0.9	6.6
2S	34	57.82	-1.08	1	4.6	0.9	6.6	0.9	6.6
2S	35	57.85	-1	1.2	4.9	0.9	6.6	0.9	6.5
2S	36	57.89	-0.93	1.2	4.9	0.9	6.5	0.9	6.5
2S	37	57.92	-0.86	1.4	5.3	0.9	6.5	0.9	6.5
2S	38	57.96	-0.78	1.2	4.8	0.8	6.5	0.8	6.5
2S	39	57.99	-0.71	1.3	5	0.8	6.5	0.8	6.4
2S	40	58.03	-0.64	1.1	4.6	0.8	6.4	0.8	6.4
2S	41	58.06	-0.56	1.4	5.2	0.8	6.4	0.8	6.4
2S	42	58.1	-0.49	1.2	4.9	0.8	6.4	0.8	6.4
3S	43	55.88	-1.91	1.8	5.7	1.5	5.3	1.5	5.3
3S	44	55.92	-1.84	1.5	5.3	1.5	5.2	1.5	5.2
3S	45	55.96	-1.77	1.7	5.6	1.5	5.1	1.5	5.2
3S	46	56	-1.71	1.9	6	1.5	5.1	1.5	5.2
3S	47	56.03	-1.64	1.7	5.6	1.5	5.1	1.6	5.2
3S	48	56.07	-1.58	1.8	5.8	1.6	5.1	1.6	5.1
3S	49	56.11	-1.51	2	6	1.6	5.1	1.6	5.1
3S	50	56.15	-1.44	1.8	5.7	1.6	5.1	1.6	5.1
3S	51	56.18	-1.38	1.7	5.5	1.6	5.1	1.6	5.1
3S	52	56.22	-1.31	2	6	1.6	5.1	1.6	5.1
3S	53	56.26	-1.25	1.7	5.6	1.6	5.1	1.6	5.1
3S	54	56.29	-1.18	1.9	5.9	1.6	5.1	1.6	5.1

3S	55	56.33	-1.11	1.6	5.5	1.6	5	1.6	5.1
3S	56	56.37	-1.04	1.9	5.9	1.6	5	1.6	5
3S	57	56.41	-0.98	1.6	5.4	1.6	5	1.6	5
3S	58	56.44	-0.91	1.7	5.6	1.6	5	1.6	5
3S	59	56.48	-0.84	1.6	5.4	1.6	5	1.6	5
3S	60	56.62	-0.77	1.5	5.3	1.6	5	1.6	4.9
3S	61	56.65	-0.71	1.6	5.4	1.6	5	1.6	4.9
4S	62	56.64	-2.27	1.4	5.1	1	4	1	4
4S	63	56.6	-2.21	1.4	5.2	1	4	1	4
4S	64	56.56	-2.14	1.6	5.4	1.1	4	1.1	4
4S	65	56.53	-2.07	1.4	5.1	1.1	4	1.1	4
4S	66	56.49	-2	1.6	5.3	1.2	4	1.2	4
4S	67	56.45	-1.94	1.6	5.3	1.2	4.1	1.2	4
4S	68	56.41	-1.87	1.5	5.2	1.2	4.1	1.2	4.1
4S	69	56.38	-1.8	1.9	5.8	1.3	4.2	1.3	4.1
4S	70	56.34	-1.73	1.9	5.8	1.4	4.3	1.4	4.3
4S	71	56.3	-1.67	1.7	5.4	1.4	4.3	1.4	4.3
4S	72	56.27	-1.6	2	5.9	1.5	4.3	1.5	4.3
4S	73	56.23	-1.53	1.8	5.6	1.5	4.4	1.5	4.4
4S	74	56.19	-1.47	2	6	1.5	4.4	1.5	4.4
4S	75	56.15	-1.4	2.1	6.1	1.5	4.4	1.5	4.4
4S	76	56.12	-1.33	2.1	6	1.5	4.4	1.5	4.4
4S	77	56.08	-1.27	1.8	5.6	1.5	4.4	1.5	4.4
4S	78	56.04	-1.2	1.9	5.8	1.6	4.4	1.5	4.4
4S	79	56	-1.13	1.8	5.7	1.6	4.4	1.6	4.4
4S	80	55.97	-1.07	2.1	6	1.6	4.5	1.6	4.4
4S	81	55.93	-1	1.6	5.3	1.6	4.5	1.6	4.4
4S	82	55.89	-0.94	1.7	5.5	1.6	4.5	1.6	4.4