Supporting Materials

Tables S-1 to 8 contain triplicate measurements, averages and standard deviations of the physical properties (e.g. density and viscosity) of oils as a function of weathering time taking into consideration the slick thickness of the oils, water temperature and wind speeds.

Table S-1. Density and Viscosity Data for AWB-W (6.6 mm, 21.9 °C, 12.9 km/hr) at 15 °C.

Time	Density					Viscosity				
hr	1	2	3	Average	StDev	1	2	3	Average	StDev
	g/cm³					cSt.				
0	0.9194	0.9193	0.9187	0.9189		241	246	246	244	3
3	0.9763	0.9747	0.9746	0.9752	0.0010	14357	14578	14425	14453	113
8	0.9809	0.9802	0.9826	0.9812	0.0012	28684	29026	30144	29285	764
24	0.9889	0.9888	0.9889	0.9889	0.0001	38208	38307	38253	38256	50
72	0.9968	0.9967	0.9968	0.9968	0.0001	77109	81008	78927	79015	1951
96	0.9971	0.9970	0.9969	0.9970	0.0001	95807	90976	87874	91552	3998
120	0.9968	0.9963	0.9965	0.9965	0.0003	136598	136194	142044	138278	3267
240	0.9994	0.9982		0.9988	0.0008	185808	175314		180561	7421
264	0.9997	0.9993	0.9993	0.9994	0.0002	198544	194544	192576	195221	3041

Table S-2. Density and Viscosity Data for AWB-W (3.7 mm, 22.0 °C, 13.3 km/hr) at 15 °C.

Time	Density					Viscosity				
	1	2	3	Average	StDev	1	2	3	Average	StDev
hr	g/cm³					cSt.				
0	0.9194	0.9193	0.9187	0.9189	0.0004	241	246	246	244	3
3	0.9857	0.9813	0.9792	0.9821	0.0033	25888	25964	25870	25907	50
8	0.9838			0.9838		62007			62007	
24	0.9946	0.9944	0.9941	0.9944	0.0003	189431	190125	189031	189529	554
48	0.9957	0.9970	0.9971	0.9966	0.0008	280232	286242	253207	273227	17597
72	0.9991	0.9991	0.9990	0.9991	0.0001	301075	363197	341470	335248	31525
144	1.0010	1.0006	1.0002	1.0006	0.0004	500257	465115	529168	498180	32077
192	1.0014	1.0018	1.0020	1.0017	0.0003	470878	476071	474970	473973	2736
240	1.0025	1.0028	1.0026	1.0026	0.0002	816403	787408	819068	807626	17561
284	1.0044	1.0030	1.0033	1.0036	0.0007	895099	791979	903742	863606	62182

Table S-3. Density and Viscosity Data for IFO 180 (6.9 mm, 21.9 °C, 12.9 km/hr) at 15 °C.

Time	Density					Viscosity				
	1	2	3	Average	StDev	1	2	3	Average	StDev
hr	g/cm³					cSt.				
0	0.9627	0.9631	0.9659	0.9639	0.0017	2344	2340	2342	2342	2
3	0.9670	0.9670	0.9671	0.9670	0.0001	3344	3417	3399	3387	38
8	0.9637	0.9647	0.9590	0.9625	0.0030	3186	3226	3223	3212	23
24	0.9682	0.9682	0.9682	0.9682	0.0000	4194	4174	4140	4169	27
72	0.9697	0.9697	0.9698	0.9697	0.0001	5500	5564	5943	5669	239
96	0.9707	0.9707	0.9707	0.9707	0.0000	6433	6501	6598	6510	83
120	0.9710	0.9708	0.9709	0.9709	0.0001	5725	5992	5841	5853	134
192	0.9729	0.9732	0.9730	0.9730	0.0002	9869	10075	10553	10166	351
240	0.9739	0.9739	0.9740	0.9739	0.0001	16663	13989	16070	15574	1405
264	0.9796	0.9797		0.9797	0.0001	20460	19508		19984	673

Table S-4. Density and Viscosity Data for IFO 180 (4.0 mm, 22.0 °C, 13.3 km/hr) at 15 °C.

Time	Density					Viscosity				
	1	2	3	Average	StDev	1	2	3	Average	StDev
hr	g/cm³					cSt.				
0	0.9627	0.9631	0.9659	**0.9639**	0.0017	2344	2340	2342	2342	2
3	0.9643	0.9644	0.9644	0.9644	0.0001	3798	3666	3762	3742	68
8	0.9636			0.9636		3876			3876	
24	0.9643	0.9643	0.9646	0.9644	0.0002	4044	4071	4173	4096	68
48	0.9704	0.9703	0.9703	0.9703	0.0001	5033	5880	6076	5663	554
72	0.9701	0.9704	0.9760	0.9722	0.0033	6993	6739	6780	6837	136
144	0.9720	0.9721	0.9710	0.9717	0.0006	8404	8543	8563	8504	87
192	0.9723	0.9725	0.9724	0.9724	0.0001	10773	11970	11970	11571	691
240	0.9739	0.9739	0.9883	0.9787	0.0083	14994	15227	15560	15260	285

Table S-5. Density and Viscosity Data for CLB-S (7.1 mm, 13.2 °C, 17.6 km/hr) at 15 °C.

Time	Density					Viscosity				
	1	2	3	Average	StDev	1	2	3	Average	StDev
hr	g/cm³					cSt.				
0	0.9393	0.9393	0.9401	0.9396	0.0005	720	720	749	730	17
3	0.9605	0.9605	0.9605	0.9605	0.0000	3478	3484	3487	3483	5
8	0.9659	0.9659	0.9659	0.9659	0.0000	5504	5486	5490	5493	9
24	0.9745	0.9745	0.9745	0.9745	0.0000	11680	12250	12062	11997	290
72	0.9849	0.9843	0.9844	0.9845	0.0003	36907	37966	37398	37424	530
96	0.9869	0.9869	0.9869	0.9869	0.0000	35521	35402	35356	35426	85
144	0.9885	0.9880	0.9883	0.9883	0.0003	38304	38175	37966	38148	171
192	0.9914	0.9870	0.9879	0.9888	0.0023	52570	50794	50989	51451	974
240	0.9915	0.9895	0.9891	0.9900	0.0013	68100	56526	73620	66082	8724
288	0.9901	0.9903	0.9902	0.9902	0.0001	82551	82469	80489	81836	1168
360	0.9938	0.9928	0.9922	0.9929	0.0008	153560	134991	115654	134735	18954

Table S-6. Density and Viscosity Data for CLB-S (3.6 mm, 19.3 °C, 14.9 km/hr) at 15 °C.

Time	Density					Viscosity				
	1	2	3	Average	StDev	1	2	3	Average	StDev
hr	g/cm³					cSt.				
0	0.9393	0.9393	0.9401	0.9396	0.0005	749	749	749	730	0
3	0.9881	0.9881	0.9882	0.9881	0.0001	56180	52006	52038	53408	2401
24	0.9869	0.9870	0.9870	0.9870	0.0001	51300	51209	50972	51160	169
96	0.9945	0.9944	0.9944	0.9944	0.0003	147228	146053	144787	146023	1221
120	0.9970	0.9969	0.9970	0.9970	0.0001	225061	223851	223871	224261	693
168	0.9958	0.9952	0.9952	0.9954	0.0004	195089	202202	199566	198952	3596
192	0.9966	0.9967	0.9965	0.9966	0.0003	222532	223539	220606	222226	1491
264	0.9975	0.9981	0.9982	0.9979	0.0004	251313	249255	247794	249454	1768
312	0.9947	0.9951		0.9949	0.0003	305836	313142		309489	5166

Table S-7. Density and Viscosity Data for Heidrun (3.6 mm, 19.3 °C, 14.9 km/hr) at 15 °C.

Time	Density					Viscosity				
	1	2	3	Average	StDev	1	2	3	Average	StDev
hr	g/cm³					cSt.				
0	0.9131	0.9131	0.9154	0.9139	0.0013	71	71	77	73	3
3	0.9239	0.9239	0.9239	0.9239	0.0000	142	143	143	143	0
8	0.9265	0.9264	0.9264	0.9264	0.0001	175	173	173	174	1
24	0.9319	0.9318	0.9318	0.9318	0.0001	272	271	272	272	0
96	0.9412	0.9393	0.9397	0.9401	0.0010	516	546	536	532	15
120	0.9447	0.9437	0.9388	0.9424	0.0032	610	662	679	650	36
168	0.9433	0.9432	0.9422	0.9429	0.0006	616	619	618	618	1
192	0.9446	0.9429	0.9496	0.9457	0.0035	717	764	751	744	24
264	0.9434	0.9434	0.9434	0.9434	0.0000	830	827	820	826	5
312	0.9444	0.9449	0.9491	0.9461	0.0026	843	843	873	853	17

Table S-8. Density and Viscosity Data for Synbit (3.8 mm, 13.2 °C, 17.6 km/hr) at 15 °C.

Time	Density					Viscosity				
	1	2	3	Average	StDev	1	2	3	Average	StDev
hr	g/cm³					cSt.				
0	0.9390	0.9321	0.9322	0.9344	0.0040	232	235	235	234	2
3	0.9572	0.9572	0.9572	0.9572	0.0000	1475	1471	1469	1471	3
8	0.9600	0.9601	0.9601	0.9601	0.0001	1968	1961	1954	1961	7
24	0.9654	0.9643	0.9642	0.9646	0.0007	3059	3071	3041	3057	15
72	0.9710	0.9703	0.9708	0.9707	0.0004	6514	6393	6389	6432	71
96	0.9721	0.9716	0.9715	0.9717	0.0003	7956	7826	7577	7786	193
144	0.9771	0.9738	0.9735	0.9748	0.0020	10144	10246	9828	10073	218
192	0.9751	0.9753	0.9752	0.9752	0.0001	14017	13351	12797	13388	611
240	0.9782	0.9783	0.9779	0.9781	0.0002	17366	16823	16766	16985	331
288	0.9800	0.9802	0.9796	0.9799	0.0003	29429	28628	24642	27566	2564
360	0.9823	0.9824	0.9823	0.9823	0.0001	36499	36991	36370	36620	328

Tables S-9 to 11 contain empirical model physical property predictions for AWB-W, IFO 180, and CLB-S as a function of weathering time at 7 and 4 mm slick thickness.

Table S-9. AWB-W Density and Viscosity Predictions at 15 °C as a Function of Oil Weathering Time Taking into Consideration Oil Slick Thickness.

(7mm, 21.9 °C, 12.9 km/hr)			(4 mm, 22.0 °C, 13.3 km/hr)	
t (hrs)	**r (g/cm³)**	**v (cSt)**	**r (g/cm³)**	**v (cSt)**
0	0.9189	244	0.9189	244
3	0.9656	6533	0.9683	22194
8	0.9822	16160	0.9857	56398
10	0.9850	19742	0.9886	69313
24	0.9927	41292	0.9966	149314
48	0.9959	68062	1.0000	254485
72	0.9971	86900	1.0011	332661
96	0.9976	100877	1.0017	393053
120	0.9980	111659	1.0021	441110
144	0.9982	120230	1.0023	480260
192	0.9985	132994	1.0026	540197
240	0.9987	142045	1.0028	583925
264	0.9988	145651	1.0029	601636
288	0.9988	148798	1.0029	617237
360	0.9989	156226	1.0031	654581

Table S-10. IFO 180 Density and Viscosity Predictions at 15 °C as a Function of Oil Weathering Time Taking into Consideration Oil Slick Thickness.

IFO 180 (7mm, 21.9 °C, 12.9 km/hr)			IFO 180 (4mm, 22.0 °C, 13.3 km/hr)	
t (hrs)	**r (g/cm³)**	**v (cSt)**	**r (g/cm³)**	**v (cSt)**
0	0.9652	2342	0.9639	2342
3	0.9696	2342	0.9641	3042
8	0.9699	2632	0.9643	3222
10	0.9700	2748	0.9644	3294
24	0.9708	3560	0.9651	3798
48	0.9723	4952	0.9663	4662
72	0.9737	6344	0.9675	5526
96	0.9752	7736	0.9687	6390
120	0.9766	9128	0.9699	7254
144	0.9780	10520	0.9711	8118
192	0.9809	13304	0.9735	9846
240	0.9838	16088	0.9759	11574
264	0.9852	17480	0.9771	12438
360	0.9910	23048	0.9819	15894

Table S-11. CLB-S Density and Viscosity Predictions at 15 °C as a Function of Oil Weathering Time Taking into Consideration Oil Slick Thickness.

CLB-S (7mm, 13.2 °C, 17.6 km/hr)			CLB-S (4mm, 19.3 °C, 14.9 km/hr)	
t (hrs)	**r (g/cm³)**	**v (cSt)**	**r (g/cm³)**	**v (cSt)**
0	0.9396	730	0.9396	749
3	0.9541	2351	0.9746	15378
8	0.9663	4968	0.9863	36278
10	0.9692	5986	0.9882	43628
24	0.9796	12688	0.9934	83649
72	0.9876	31171	0.9964	149969
96	0.9888	38462	0.9967	166549
144	0.9901	50344	0.9971	187274
192	0.9908	59616	0.9973	199709
244	0.9912	67606	0.9975	208567
264	0.9914	70245	0.9975	211187
288	0.9915	73150	0.9975	213920
360	0.9918	80482	0.9976	220190

Plots of empirical models predicting the effects of oil slick thickness on the changes in density and viscosity as a function of oil weathering time on seawater are illustrated in Figure S-1 and 2.

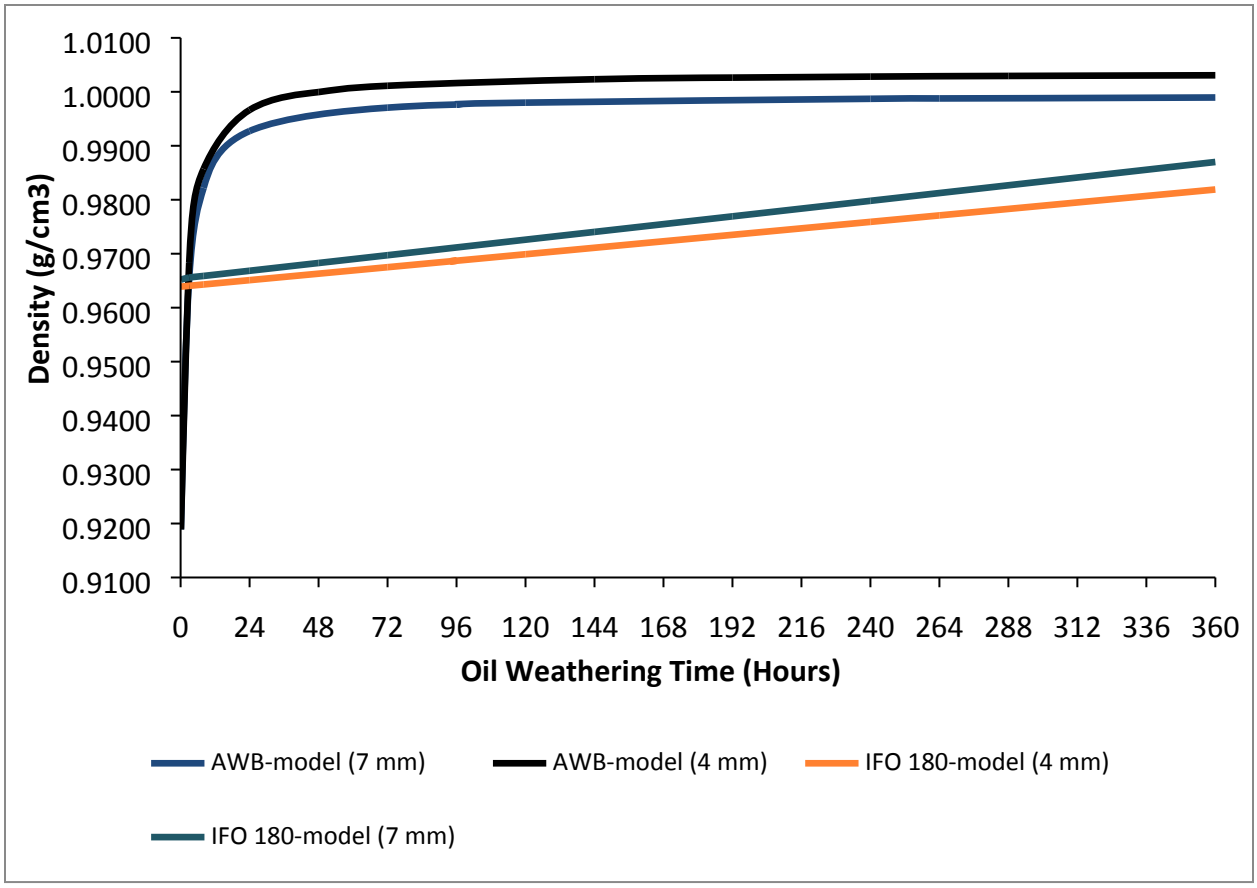

Figure S-1. A plot showing empirical models predicting of the effects of oil slick thickness on the changes in density as a function of oil (AWB and IFO 180) weathering time on seawater in a flume tank.

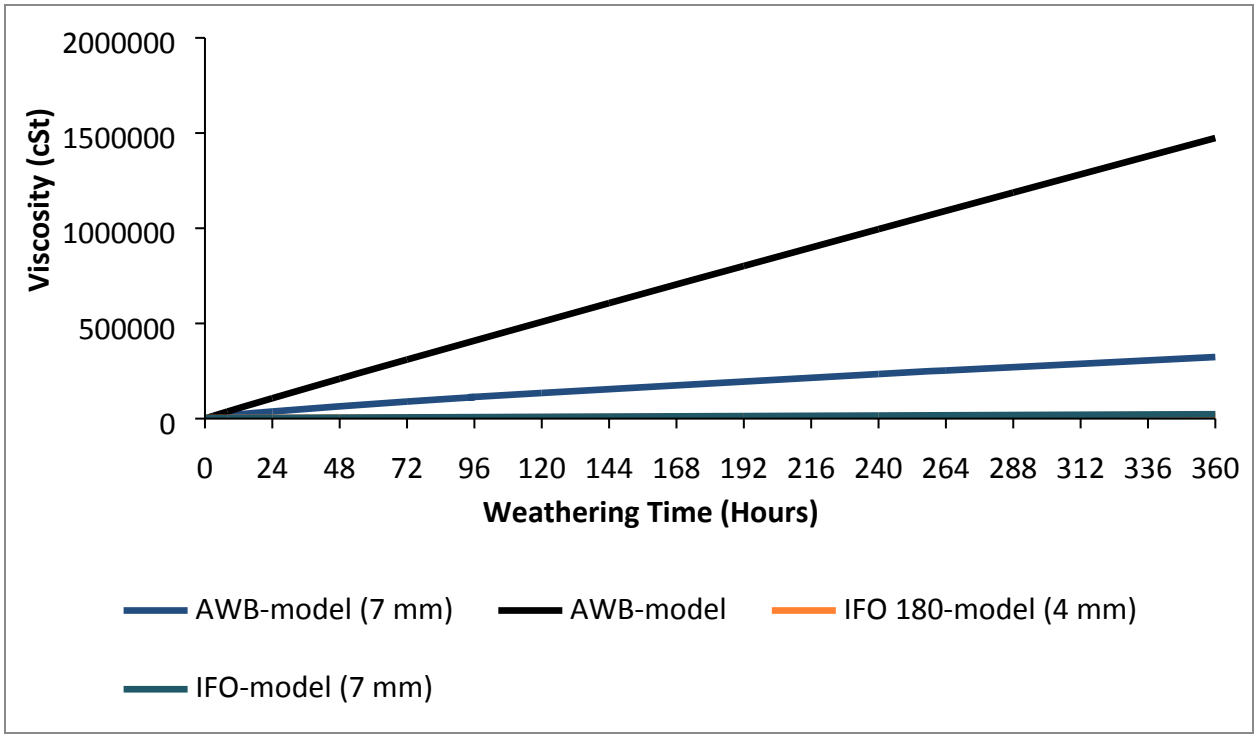

Figure S-2. Plot of empirical models predicting the effects of oil slick thickness on the changes in viscosity as a function of oil (AWB and IFO 180) weathering time on seawater in a flume tank.