Supplementary materials

The geometric parameter values and motion amplitudes for the optimal geometries, shown in figures 5 and 6 of the main document, are tabulated here. Each table below gives information for a particular group, for the heave-only (denoted 'heave') and the heave-surge-pitch (denoted 'h-s-p') optimisations, for α_0= 3 and 1 and ϵ_0= 0.1 and 0.2, totalling 8 optimisations for each group.

In the tables, each row describes the properties of the optimal shape for one of the 8 optimisations. As in the main paper, nondimensional l_S is wavenumber k^* times square-root of wetted surface area, $l_S^* = (S_W^*)^{1/2}$. l_V is k^* times cube-root of submerged volume, $l_V^* = (V^*)^{1/3}$. Then, the relevant geometric parameters for the optimised geometries are listed (for definitions, see §4.1). For a description of each group, see §4.4. And finally, the motion amplitudes are listed (for the definition, see §3).

	α_0	ϵ_0	l_S	l_V	R	H	α_1	α_3	α_5
heave	3	0.1	1.89	0.9	0.58	0.7		3.02	
heave	3	0.2	1.89	0.9	0.58	0.7		3.02	
heave	1	0.1	2.59	1.19	1.05	0.49		0.99	
heave	1	0.2	2.59	1.19	1.05	0.49		0.99	
h-s-p	3	0.1	2.83	1.26	1.23	0.42	0.64	0.74	2.85
h-s-p	3	0.2	3.02	1.3	1.37	0.37	0.66	0.6	1.74

Table 1: Dimensions and characteristics of the optimal **cylinder** shapes

	α_0	ϵ_0	l_S	l_V	R	H	r_1	α_1	α_3	α_5
heave	3	0.1	1.87	0.87	0.59	0.54	1.1		3.01	
heave	3	0.2	1.89	0.9	0.58	0.7	1.0		3.02	
heave	1	0.1	2.58	1.24	1.02	0.65	0.9		1.0	
heave	1	0.2	2.58	1.24	1.02	0.65	0.9		1.0	
h-s-p	3	0.1	2.8	1.26	1.21	0.44	0.9	0.64	0.75	2.92
h-s-p	3	0.2	2.99	1.3	1.36	0.38	0.9	0.66	0.61	1.75

Table 2: Dimensions and characteristics of the optimal **flat-bottomed** shapes

	α_0	ϵ_0	l_S	l_V	R	H	r_1	z_1	α_1	α_3	α_5
heave	3	0.1	1.86	0.91	0.59	0.84	1.1	-0.6		3.0	
heave	3	0.2	1.85	0.9	0.6	0.73	1.15	-0.6		3.03	
heave	1	0.1	2.57	1.26	1.03	0.79	0.95	-0.7		0.99	
heave	1	0.2	2.57	1.27	1.03	0.9	0.95	-0.6		1.0	
h-s-p	3	0.1	2.81	1.2	1.23	0.37	0.95	-0.6	0.71	0.76	2.93
h-s-p	3	0.2	2.95	1.3	1.32	0.43	0.95	-0.6	0.64	0.65	2.02

Table 3: Dimensions and characteristics of the optimal **one-kink** shapes

	α_0	ϵ_0	l_S	l_V	R	H	a_{12}	b_{12}	α_1	α_3	α_5
heave	3	0.1	1.47	0.84	0.52	0.46	-0.25	0.1		3.01	
heave	3	0.2	1.47	0.86	0.52	0.58	-0.25	0.0		2.87	
heave	1	0.1	2.13	1.21	0.91	0.84	-0.2	-0.1		1.0	
heave	1	0.2	2.17	1.23	0.91	1.02	-0.15	-0.05		1.0	
h-s-p	3	0.1	2.28	1.28	1.02	0.9	-0.15	-0.05	0.86	0.82	2.98
h-s-p	3	0.2	2.28	1.28	1.02	0.9	-0.15	-0.05	0.86	0.82	2.98

Table 4: Dimensions and characteristics of the optimal **no-kink-2nd-order** shapes

	α_0	ϵ_0	l_S	l_V	R	H	z_1	α_1	α_3	α_5
heave	3	0.1	1.88	0.92	0.57	0.9	-0.75		3.03	
heave	3	0.2	1.88	0.92	0.57	1.01	-0.65		3.0	
heave	1	0.1	2.57	1.25	1.04	0.78	-0.6		1.0	
heave	1	0.2	2.57	1.25	1.04	0.78	-0.6		1.0	
h-s-p	3	0.1	2.89	1.25	1.27	0.33	-0.6	0.66	0.7	2.48
h-s-p	3	0.2	2.95	1.3	1.32	0.43	-0.6	0.64	0.65	2.02

Table 5: Dimensions and characteristics of the optimal **wall-sided** shapes

	α_0	ϵ_0	l_S	l_V	R	H	r_2	z_2	α_1	α_3	α_5
heave	3	0.1	1.89	0.89	0.57	0.77	0.3	-0.9		3.02	
heave	3	0.2	1.89	0.89	0.57	0.77	0.35	-0.9		3.01	
heave	1	0.1	2.64	1.2	1.04	0.64	0.35	-0.78		1.0	
heave	1	0.2	2.65	1.21	1.04	0.67	0.35	-0.74		1.0	
h-s-p	3	0.1	3.63	1.3	1.81	0.38	0.35	-0.74	0.99	0.36	0.74
h-s-p	3	0.2	3.63	1.3	1.81	0.38	0.35	-0.74	0.99	0.36	0.74

Table 6: Dimensions and characteristics of the optimal **compound cylinder** shapes