The additionality problem of Ocean Alkalinity Enhancement

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Supplementary material

Table S1. Additional information on location and time of beach transects. The coordinates provided here show the exact location of the upper end of the swash zone. Transects extended 150-220 m offshore as shown in Fig. 2 in the main text.

Location	Latitude	Longitude	Sampling time	Low tide	High tide
Clifton South	-42.992299	147.524931	11:30-1:30	0.48 m at 11:02 am	1.08 m at 17:58 pm
Goats	-43.022267	147.500408	10:24-11:40	0.9 m at 13:26 pm	1.02 m at 9:40 am
Clifton North	-42.987078	147.54194	10:16:-11:23	0.51 m at 9:37 am	1.15 m at 16:36 pm
Wedge	-43.033122	147.475549	10:39-11:50	0.55 m at 6:56 am	1.19 m at 13:57 pm

Table S2. Additional information on beach sand and alkalinity source minerals used for the three laboratory experiments. Sampling coordinates for olivine and steel slag are approximate as it was not recorded where exactly in the quarry/deposition site rocks were collected. The range provided for carbonate weights is based on the two most extreme assumptions that all carbonate in beach sand is $MgCO_3$ (lower value) or $CaCO_3$ (upper value).

Mineral	Latitude	Longitude	PIC/POC (mol:mol)	Water content (%)	Carbonate weight (%)
Beach 1	-42.992872	147.52372	1.02	5.9	2.7 - 3.3
Beach 2	-42.991129	147.52686	2.97	13.5	11.9 - 14.2
Beach 3	-42.989084	147.53179	5.21	10.9	12.8 - 15.2
Beach 4	-42.988162	147.53538	16.25	4.3	24.4 - 28..9
Beach 5	-42.992724	147.52394	1.65	14.6	4.9. - 5.9
Olivine	-38.006	142.793	-	-	-
Steel slag	-33.01	137.589	-	-	-

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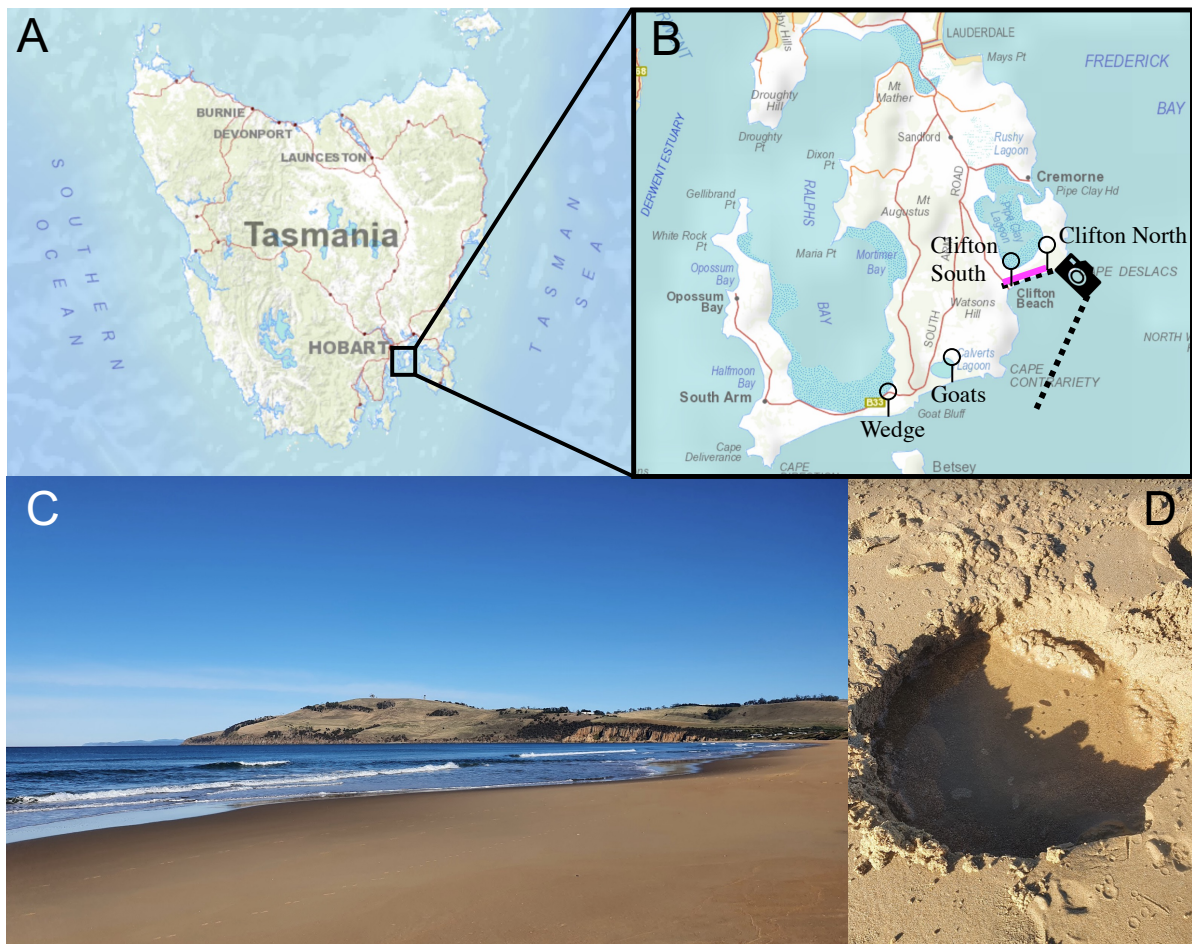
Figure S1. Locations of the beach transects and beach sand sampling in Tasmania. (A) Map
of Tasmania with (B) enlarged map of the Southarm region south of Hobart. The needles
show locations with names of the beach transects shown in Fig. 2 of the main text. The pink
line along Clifton Beach shows the part of the beach from where sand samples (Sand 1-5)
were collected for incubation experiments. The camera symbol illustrates the position from
where the picture shown in panel (C) was taken. (D) One of the holes that was dug to sample
seawater just above the swash zone, i.e. the first sample location along the transects from the
beach towards 150-200 m offshore. The two screenshots of the maps were reproduced with
the permission of the Environment Heritage and Land Division, Department of Natural
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42 **Figure S2**. The plankton wheel used for experiments 1, 2, and 3. The picture shows the

43 plankton wheel with incubation bottles mounted on it.

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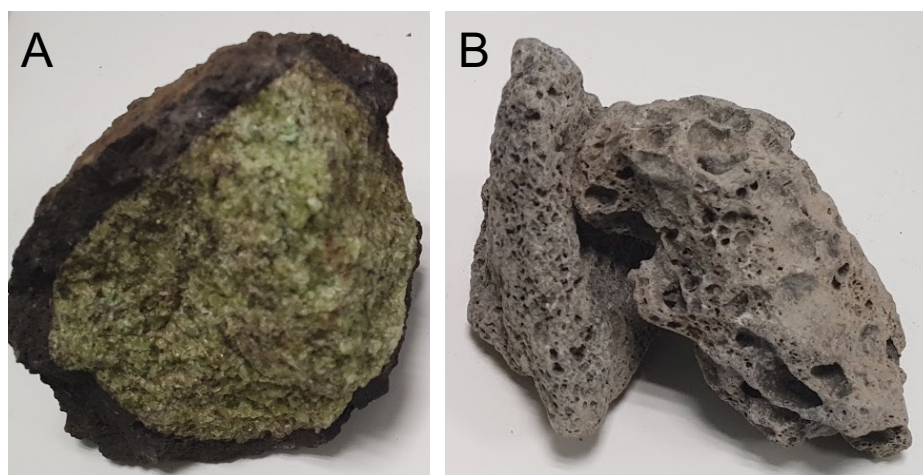
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46 **Figure S3**. Raw material of olivine from Mortlake, Victoria, Australia (A) and steel slag

47 from Whyalla, South Australia, Australia (B) before their crushing to powder.

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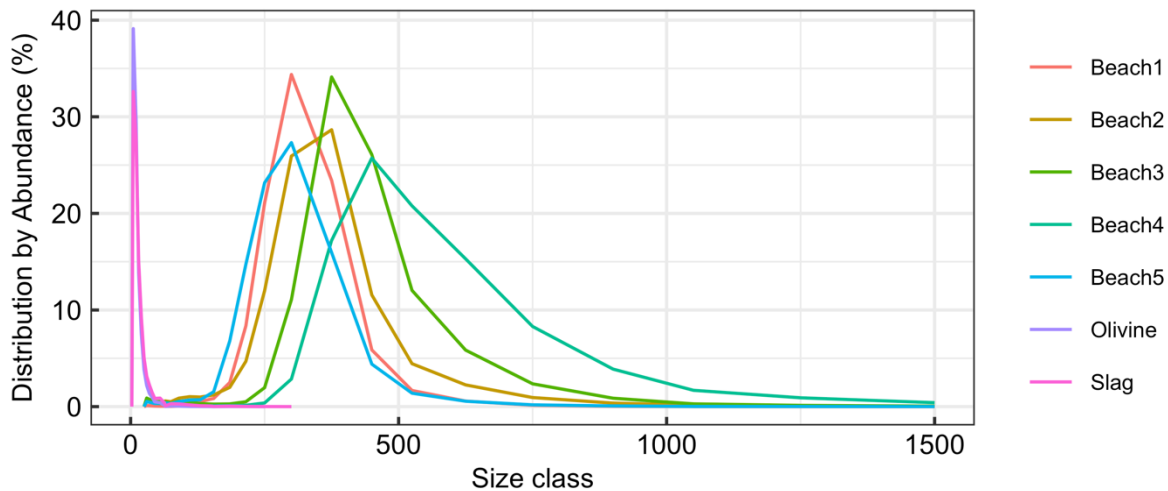
Figure S2. Size distribution of particles in beach sand and ground olivine/slag mineral used for incubations. Please note that distribution by abundance shows in which size class most of the particles occur but does not reflect the size class in which most of the mass is accumulated.