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Supplement of

Role of zooplankton in determining the efficiency of the biological carbon pump

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1 **Table S1.** Site information including the depth the MSCs were deployed to.

Station #	Site	Latitude (° N)	Longitude (° W)	Date	MSC depth (m)
1	SO	-59.9096	53.03006	15/1/2013	25, 125
2	SO	-58.51637	51.25974	16/1/2013	40, 140
3	SO	-59.91357	49.41599	17/1/2013	40, 140
4	SO	-60.97059	48.13545	18/1/2013	40, 140
5	SO	-57.97091	42.93436	20/1/2013	40, 140
6	SO	-55.20345	41.32185	21/1/2013	40, 140
7	SO	-52.90708	40.13592	22/1/2013	40, 140
8	SO	-50.28753	39.02036	23/1/2013	40, 140
9	SO	-50.95719	37.61516	24/1/2013	70, 170
10	SO	-52.68932	36.62300	25/1/2013	70, 170
11	SO	-51.68808	34.97653	28/1/2013	70, 170
12	SO	-51.36901	31.09135	29/1/2013	70, 170
13	SO	-53.6265	29.32742	30/1/2013	70, 170
14	SO	-55.92838	27.25843	31/1/2013	70, 170
15	SO	-58.08564	25.92572	1/2/2013	70, 170
16	SO	-63.25913	25.35395	3/2/2013	20, 120
17	SO	-62.26828	26.84829	4/2/2013	70, 170
18	SO	-60.14215	29.48655	5/2/2013	70, 170
19	PAP	48.3869	16.08420	4/6/2013	60, 160
20	PAP	48.3892	16.08580	5/6/2013	40, 140
21	PAP	48.3891	16.08570	7/6/2013	45, 145
22	PAP	48.3892	16.08750	7/6/2013	45, 145
23	PAP	48.3894	16.08580	9/6/2013	45, 145
24	ETNP	13.2464	91.22750	15/1/2014	40, 120
25	ETNP	13.2129	91.22780	21/1/2014	70, 220
26	ETNP	13.1370	91.17910	27/1/2014	40, 120
27	ETNP	13.0418	91.11520	2/2/2014	50, 110

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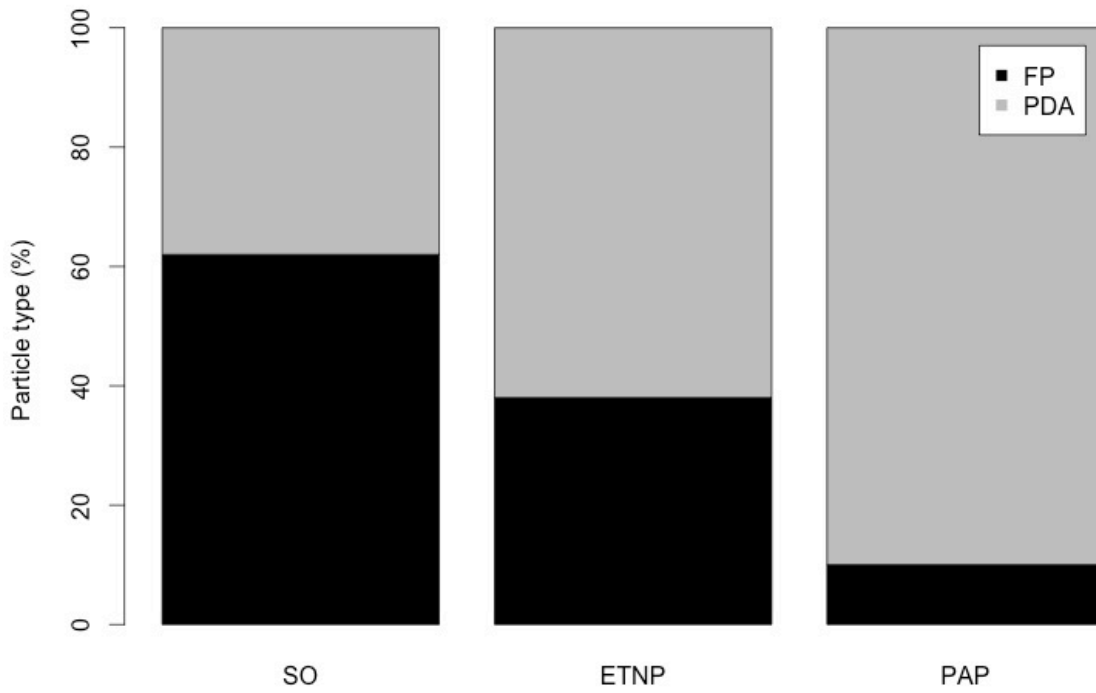
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5 **Table S2.** Fast and slow sinking mean b and z^* at each site. NA shows sites where the range
6 was too large (> 1000) and n too small (< 5) to produce an accurate mean. ‘ - ‘ depicts where
7 mean z^* values were negative because of higher fluxes at depth, suggesting POC fluxes
8 going into the atmosphere.

Sinking	Site	b		z^* (m)	
		Model	Observation	Model	Observation
Fast	SO	0.63	0.47	229	-
	PAP	0.72	0.57	199	329
	ETNP	0.70	0.24	207	-
Slow	SO	0.87	1.13	166	-
	PAP	1.27	NA	113	169
	ETNP	1.47	NA	98	33

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36 **Figure S1.** Abundance of phytodetrital aggregates (PDAs) and faecal pellets (FPs) as
37 percentage of total particle flux. FPs dominated in the SO but PDAs were most abundant in
38 both the ETNP and at PAP.

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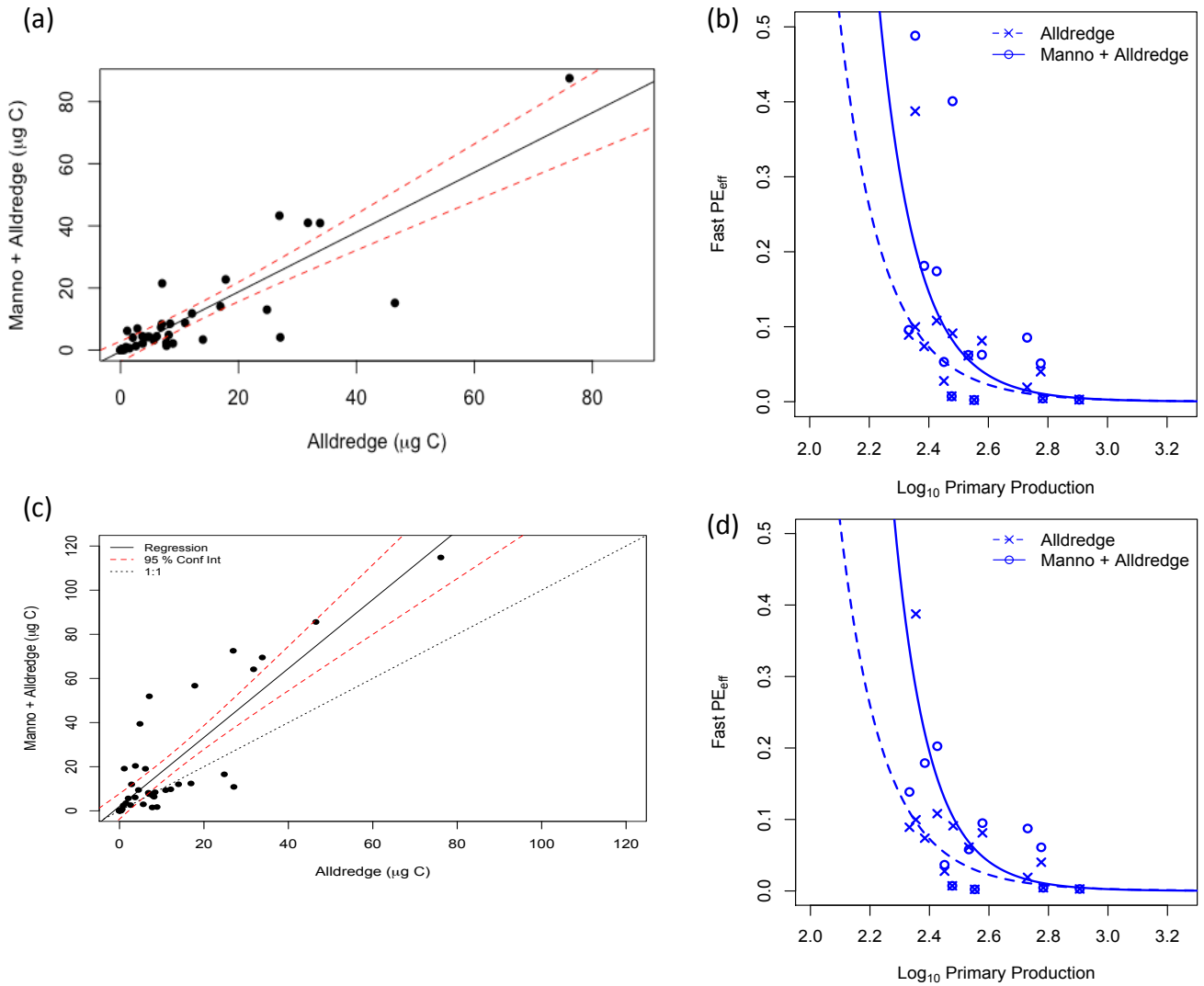
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52 **Figure S2.** Conversion factor (CF) sensitivity analysis using Southern Ocean observational

53 data. Comparison of total (phytodetrital aggregate + faecal pellet) fast sinking mass for MSC

54 deployment using Alldredge CFs for both PDAs and FPs (x-axis) and Alldredge CFs for

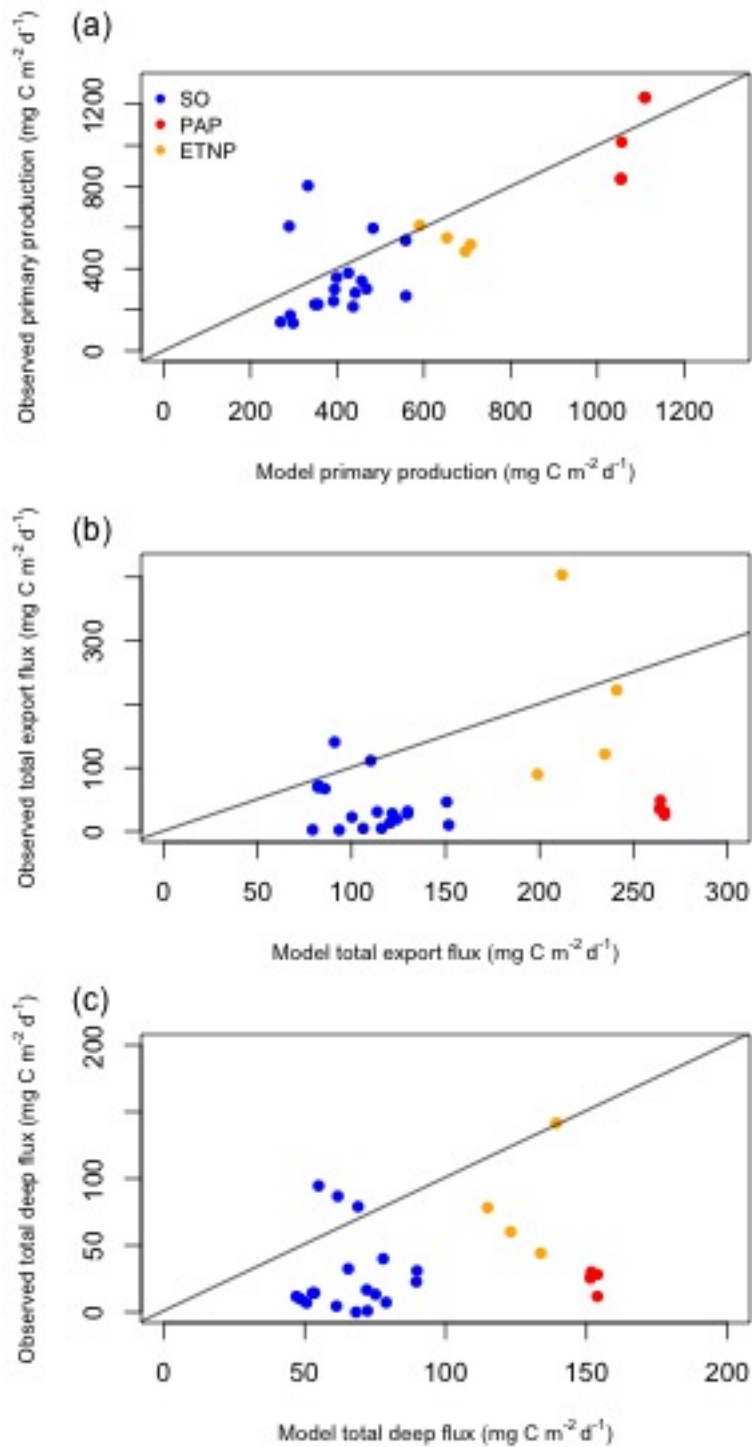
55 PDAs and Manno CFs for FPs (y-axis) in winter (a) and summer (c). Solid black line is the

56 regression (slope 0.96) and dashed red lines the 95 % confidence intervals. Note FPs

57 dominated particle abundance in the Southern Ocean (see Fig. S3). b) Primary production

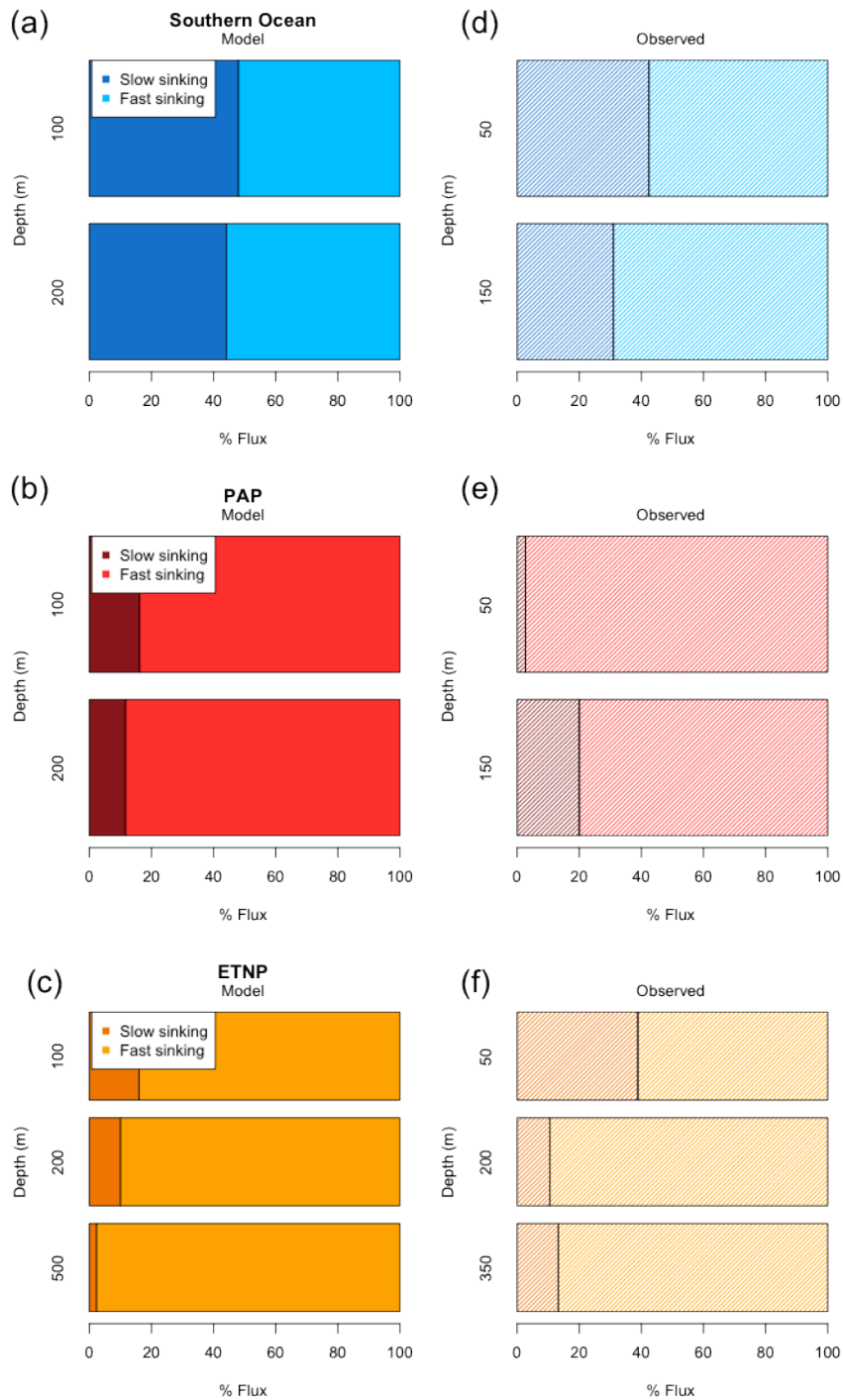
58 against particle export efficiency using masses in a) and c), winter (b) and summer (d).

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61 **Fig. S3.** Comparison of observations and model outputs for (a) primary production, (b) total
 62 sinking export and (c) deep fluxes with the 1:1 line (black). Blue points are Southern Ocean,
 63 red PAP and orange equatorial Pacific.



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65 **Fig. S4.** Percentage contribution of fast and slow sinking fluxes to total sinking fluxes from
 66 the model (a-c) and observations (d-f) at all site, SO (a & d), PAP (b & e) and the ETNP (c &
 67 f). Slow sinking fluxes are the darker shading on each plot.

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