

**Supplementary Materials for the research article “*Meltwater as a source of potentially bioavailable iron to Antarctica waters*”**

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**Table S1.** Basic calculation parameters (areas, lengths of coastlines) of Potter Cove (PC), King George Island (KGI) and South Shetland Islands (SSI).

		<b>PC</b>	<b>KGI</b>	<b>SSI</b>
<i>Area<sub>total</sub></i>	km <sup>2</sup>	7.1	1,150	3,700
<i>Area<sub>ice-free</sub></i>	km <sup>2</sup>	1.3	115	740
<i>Area<sub>ice-capped</sub></i>	km <sup>2</sup>	12	1,035	2,960
<i>Length<sub>coastline</sub></i>	km	11	500	1,500
<i>Area<sub>sea</sub></i>	km <sup>2</sup>	7.1	9,700*	2.5 x 10 <sup>4</sup> *

\*after Ardelan *et al.* (2010)

**Table S2.** Parameters for the calculation of SPM and ascorbate leachable iron ( $Fe_A$ ) export from Potter Cove (PC) and Potter Peninsula.

<i>SPM<sub>PC</sub><sub>surficial</sub></i> **	tonnes	3,000
Average sediment accumulation rate (SAR) in PC ( <sup>210</sup> Pb approach)	g m <sup>-2</sup> yr <sup>-1</sup>	3,300
<i>Export rate<sub>SPM PC</sub></i> ***	%	15
$Fe_A$ (fraction of ascorbate leachable Fe from total sediment amount)	wt. %	0.03

\*\* this study, \*\*\* estimated from sediment trap data (this study).

**Equations for the extrapolation of the export of suspended particulate matter (SPM) from Potter Cove (PC), King George Island (KGI) and the South Shetland Islands (SSI) based on the island areas:**

$$SPM\ PC_{export} = \frac{\left( SPM\ PC_{surficial} + SPM\ PC_{subglacial} \right) \cdot \%Export_{SPM\ PC}}{100} \quad (S1)$$

$$SPM\ KGI_{export} = \frac{\left( SPM\ PC_{surficial} \cdot \frac{Area\ KGI_{ice-free}}{Area\ PC_{ice-free}} + SPM\ PC_{subglacial} \cdot \frac{Area\ KGI_{ice-capped}}{Area\ PC_{ice-capped}} \right) \cdot \%Export_{SPM\ PC}}{100} \quad (S2)$$

$$SPM\ SSI_{export} = \frac{\left( SPM\ PC_{surficial} \cdot \frac{Area\ SSI_{ice-free}}{Area\ PC_{ice-free}} + SPM\ PC_{subglacial} \cdot \frac{Area\ SSI_{ice-capped}}{Area\ PC_{ice-capped}} \right) \cdot \%Export_{SPM\ PC}}{100} \quad (S3)$$

**Table S3.** Estimation for the annual export of suspended particulate matter (SPM) from Potter Cove (PC), King George Island (KGI) and the South Shetland Islands (SSI) based on the results of this study.

$SPM\ PC_{export}$	tonnes	$2.3 \times 10^4$
$SPM\ KGI_{export}$	tonnes	$2.0 \times 10^6$
$SPM\ SSI_{export}$	tonnes	$6.7 \times 10^6$

**Equations for the extrapolation of the export of ascorbate leachable iron ( $Fe_A$ ) from King George Island (KGI) using an area based approach:**

$$KGI Fe_{A(\text{export})} = \left( \frac{(SPM KGI_{\text{export}} \cdot Fe_A)}{Area KGI_{\text{sea}}} \right) \cdot 1000 \quad (S4)$$

$$SSI Fe_{A(\text{export})} = \left( \frac{(SPM SSI_{\text{export}} \cdot Fe_A)}{Area SSI_{\text{sea}}} \right) \cdot 1000 \quad (S5)$$

**Equations for the extrapolation of the export of ascorbate leachable ( $Fe_A$ ) from King George Island (KGI) using a coastline approach:**

$$KGI Fe_{A(\text{export})} = \left( \frac{\left( SPM PC_{\text{export}} \cdot Fe_A \cdot \frac{length_{\text{coastline PC}}}{length_{\text{coastline KGI}}} \right)}{Area KGI_{\text{sea}}} \right) \cdot 1000 \quad (S6)$$

$$SSI Fe_{A(\text{export})} = \left( \frac{\left( SPM PC_{\text{export}} \cdot Fe_A \cdot \frac{length_{\text{coastline KGI}}}{length_{\text{coastline SSI}}} \right)}{Area SSI_{\text{sea}}} \right) \cdot 1000 \quad (S7)$$

**Table S4.** Extrapolation of the export of ascorbate leachable iron ( $Fe_A$ ) by surficial SPM transport from King George Island (KGI) and the South Shetland Islands (SSI) using an area based and coastline based approach.

$KGI Fe_{A(\text{export})}$ (area based)	$mg m^{-2} yr^{-1}$	9
$SSI Fe_{A(\text{export})}$ (area based)	$mg m^{-2} yr^{-1}$	12
$KGI Fe_{A(\text{export})}$ (coastline based)	$mg m^{-2} yr^{-1}$	5
$SSI Fe_{A(\text{export})}$ (coastline based)	$mg m^{-2} yr^{-1}$	6