

Table 1

Parameter	Definition	Value	Unit
<b>[Ice algae]</b>			
$V_{\max}$	Maximum photosynthetic rate at 0 °C	0.8	$\text{d}^{-1}$
$K_{\text{NO}_3}$	Half saturation constant for nitrate	3.0	$\text{mmol-N m}^{-3}$
$K_{\text{NH}_4}$	Half saturation constant for ammonium	0.1	$\text{mmol-N m}^{-3}$
$K_{\text{SiL}}$	Half saturation constant for silicate	6.0	$\text{mmol-N m}^{-3}$
$\Psi_{\text{NH}_4}$	Ammonium inhibition coefficient	1.5	$(\text{mmol-N m}^{-3})^{-1}$
$K_{\text{Gpp}}$	Temperature coefficient for photosynthetic rate	0.0693	$^{\circ}\text{C}^{-1}$
$I_{\text{opt}}$	Optimum light intensity	10	$\text{W m}^{-2}$
$\text{Res}_0$	Respiration rate at 0 °C	0.03	$\text{d}^{-1}$
$K_{\text{Res}}$	Temperature coefficient for respiration rate	0.0519	$^{\circ}\text{C}^{-1}$
$\gamma$	Extracellular excretion ratio to photosynthesis	0.135	n. d.
$\text{Mor}_0$	Mortality rate at 0 °C	0.029	$(\text{mmol-N m}^{-3})^{-1} \text{d}^{-1}$
$K_{\text{Mor}}$	Temperature coefficient for mortality rate	0.0693	$^{\circ}\text{C}^{-1}$
$R_{\text{SiN}}$	Si:N ratio	2.0	n. d.
<b>[Light property]</b>			
$\text{PAR}_{\text{frac}}$	Fraction of PAR to shortwave radiation	0.43	n. d.
$k_{\text{snow}}$	light extinction rate for snow	0.12	$\text{cm}^{-1}$
$k_{\text{ice}}$	light extinction rate for sea ice	0.045	$\text{cm}^{-1}$
<b>[Nitrogen/Silicon flow]</b>			
$\text{Nit}_0$	Nitrification rate at 0 °C	0.03	$\text{d}^{-1}$
$K_{\text{Nit}}$	Temperature coefficient for nitrification	0.0693	$^{\circ}\text{C}^{-1}$
$\text{VP2N}_0$	Decomposition rate from PON to ammonium at 0 °C	0.1	$\text{d}^{-1}$
$\text{VP2D}_0$	Decomposition rate from PON to DON at 0 °C	0.1	$\text{d}^{-1}$
$\text{VD2N}_0$	Decomposition rate from DON to ammonium at 0 °C	0.02	$\text{d}^{-1}$
$\text{VP2Si}_0$	Decomposition rate from opal to silicate at 0 °C	0.1	$\text{d}^{-1}$
$K_{\text{P2N}}/K_{\text{P2D}}/K_{\text{D2N}}/K_{\text{P2Si}}$	Temperature coefficient for decomposition rate	0.0693	$^{\circ}\text{C}^{-1}$

Table 2

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Cloud	2011	0.98	0.87	0.79	0.79	0.91	0.88	0.72	0.90	0.76	0.92	0.98	0.96
Fraction	2012	0.94	0.90	0.67	0.81	0.79	0.56	0.61	0.83	0.88	0.97	0.97	0.96
Shortwave	2011	9	0	0	0	4	51	165	236	305	217	102	45
Radiation	2012	10	0	0	0	4	62	170	245	264	184	92	46
Wind	2011	6.7	5.1	5.0	5.1	6.0	4.3	4.6	4.4	4.5	4.4	5.3	5.4
Speed	2012	8.1	5.0	4.8	5.1	4.7	4.5	4.1	3.9	4.7	4.7	7.1	7.1
Snow	2011	11	23	32	37	41	44	46	33	0	0	0	0
Depth	2012	8	23	22	21	23	23	22	13	0	0	0	0
Sea Ice	2011	60	209	216	261	276	281	268	249	228	169	78	0
Thickness	2012	60	210	232	271	279	278	286	259	207	141	62	0
Sea Ice	2011	0.21	0.89	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.83	0.19	0
Concentration	2012	0.19	0.90	0.98	0.98	0.98	0.98	0.99	0.97	0.87	0.70	0.18	0