Appendix A

Table A1: Calculated values of the amount of Fe and S in laminated sediments based on magnetic measurements and the method developed by Lascu et al. (2010). MWP/HTM=mean value within these laminated time periods (see text for further explanation). SIRM data for F80 and LL19B are from Reinholdsson et al. (2013).

	epth m	nean SIRM 0^{-3} Am^2kg^{-1}	0^{-3} g greigite/ kg sediment	$^{-3}$ g Fe bound as greigite/ kg sediment	)$^{-3}$ g S bound as greigite/ kg sediment
B2 MWP	10.5	1.81	50	28	22
B2 HTM		5.93	190	108	82
9B MWP	169	2.57	77	43	33
9B HTM		2.25	66	37	28
MWP	181	5.37	158	90	69
HTM		3.01	78	44	34

Table A2: Flux calculations input data table. [a](Reinholdsson et al., 2013), [b](Snowball et al., 2002b), [c](Snowball et al., 1999) [d](Snowball et al., 2002a).

Core	Resolution of SIRM data	SIRM (range) $10^{-3} Am^2kg^{-1}$	Background SIRM value [1]homogenous sediment mean SIRM [2]measured pre-isolation mean SIRM
F80[a]	every cm	3.6 (0.1-13.7)	0.70[1]
LL19[a]	every cm	2.3 (0.05-9.7)	0.31[1]
LZGB2	every cm	4.8 (0.07-17.3)	0.33[1]
Frängsjön	every 2nd cm	12.6[d] (1.8-22.1)	4.32[2b]
Furuskogstjärnet[b]	every 2nd-6th cm	16.8 (2.9-27.2)	4.14[2]
Sarsjön	every ~4 cm	9.8[c] (1.5-23.6)	2.76[2b]

Table A3: Sediment stratigraphy for sediment core LZGB2.

LZGB2 unit	**Sediment stratigraphy**
B	
0-31 cm	Light grey gyttja-clay.
C	
31-56 cm	Laminated black and dark brown gyttja-clay (sapropel).
D	
56-86 cm	Light grey gyttja-clay.
86-111.5 cm	Bluish-grey gyttja-clay.
111.5-120.5	Poorly laminated brown and dark grey gyttja-clay.
120.5-161.5	Bluish-grey gyttja-clay.
E	
161.5-170.5 cm	Laminated brown and dark grey gyttja-clay (sapropel).
170.5-198 cm	Bluish-grey gyttja-clay.
198-226 cm	Laminated black, grey gyttja-clay (sapropel).
226-250 cm	Laminated black and grey clay-gyttja (sapropel).
250-285 cm	Laminated black and grey gyttja-clay (sapropel).
F	
285-315 cm	Light grey gyttja clay.
G	
315-480.5 cm	Bluish-grey clay.

Appendix B: Fe and S flux calculations

The F80 core is used as an example.

The concentration of magnetosomal greigite (in g/kg of total solids) was calculated according to Lascu et al. (2010), which allows the quantification of Fe and S bound as greigite.

$f_{ferri}=M_S/\mu_{ferri}$ (eq. 3 in Lascu et al. 2010)

Greigite μ_{ferri} = 59 Am^2/kg

SIRM (~M_{RS}) values were used to calculate M_S, with a correction made for the contribution of non-magnetosomal greigite to SIRM. This correction was based on the knowledge of the mean SIRM of homogenous sediments ($0.7*10^{-3} Am^2kg^{-1}$).

An example M_{RS} value from F80 at 117 cm is $10.792*10^{-3}$ Am^2kg^{-1}. The background correction of $0.7*10^{-3}$ Am^2kg^{-1} provides us with a magnetosomal contribution to M_{RS} of $10.092*10^{-3}$ Am^2kg^{-1} (=0.010092 Am^2kg^{-1})

According to single-domain theory, M_{RS}/M_S = 0.5. Thus, the magnetosomal contribution to M_S is: 0.010092/0.5 = 0.0202 Am^2kg^{-1}

And $M_S/\mu_{ferri} = f_{ferri}$, which provides us with,

= 0.0202/59 = 0.000342

The "parts per thousand" concentration is then based on:
$c_{ferri}=10^3*f_{ferri}$ (eq. 6 in Lascu et al. 2010)
$c_{ferri}=10^3*0.000342=0.342$ g/kg → **0.342 g bacterial greigite/kg sediments**

The atomic weight for Fe=55.8 amu and S=32.1 amu
This give 55.8*3=167.4 amu Fe and 32.1*4=128.4 amu S bound as greigite

To provide % of Fe and S we use the following:
0.342 g greigite/kg (167.4/(167.4+128.4))*100
And

0.342 g greigite/kg (128.4/(167.4+128.4))*100

This results in:

=56.5% is Fe =0.342*0.565=0.194 g

And

=43.4% is S =0.342*0.434=0.149 g

To summarize:

0.194 g Fe bound as greigite/kg sediments

0.149 g S bound as greigite/kg sediments

To provide data for flux calculations the concentrations per volume must be known:

Fe bound as greigite/cube=0.194 g/kg* 0,00192225 kg=0.000372 g=0.372*10^{-3} g (the same method for S)

Example calculated data:

Sample	Fe bound as greigite/kg sed (g)	S bound as greigite/kg sed (g)	sediment weight/cube (kg)	Fe bound as greigite /cube (10^{-3} g)	S bound as greigite /cube (10^{-3} g)
F80 117 cm	0.194	0.149	0,00192225	0.372	0.285

The standard area of each 1 cm thich slice of sediment was 7.22 cm^2.

Fe bound as greigite=0.372*10^{-3} g/cube/7.22=0.0515*10^{-3} g/cm^2 (the same method for S)

The timescale of Lougheed et al. (2012) was transferred to F80 (and LL19 and LZGB2) via common LOI features, which provides the number of years that each sediment slice represents. The cm slice taken at 117 cm depth in F80 was deposited in 18.3yrs.

Fe bound per year=0.0515*10^{-3}/18.3=0.0028*10^{-3} g/cm^2/y=2.8*10^{-6} g/cm^2/y (the same method for S)

Example calculated data:

Sample	Area (cm^2)	Fe bound as greigite (10^{-3} g/cm^2)	S bound as greigite (10^{-3} g/cm^2)	**Fe bound as greigite (10^{-6} g/cm^2/y)**	**S bound as greigite (10^{-6} g/cm^2/y)**
F80 117 cm	7.22	0.0515	0.0395	**2.8**	**2.2**

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