^{14}C PLATEAU TUNING – A MISLEADING APPROACH OR TRENDSETTING TOOL FOR MARINE PALEOCLIMATE STUDIES?

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SUPPLEMENTARY MATERIALS

SUPPLEMENTARY FIGURE AND TABLE CAPTIONS

Figures S1 - S19.

Planktic ^{14}C records of sediment cores plotted vs. core depth. Core location and references to data source are given in Table S20. Planktic ^{14}C plateaus (horizontal boxes) are compared to atmospheric (atm) ^{14}C plateau suite of Lake Suigetsu (Bronk Ramsey et al., 2020), where calendar ages of plateau boundaries (and average atmospheric ^{14}C ages; Fig. S12) are given below. Local planktic reservoir ages (in blue) result from the difference between the average raw ^{14}C age of planktic ^{14}C plateaus measured in the core and the ^{14}C age of equivalent atmospheric ^{14}C plateaus numbered 1 – 10 (numbers in brackets). Top panel shows units of the 1st derivative (^{14}C yr per m core depth) and 1-σ uncertainty range, with high values indicating ^{14}C jumps and ^{14}C plateaus (numbered in red) constrained at 'half-height' by asterisks (as defined in Sarnthein et al. 2015). B/A = Bølling-Allerød; HS-1, HS-2 = Heinrich Stadial 1 and Heinrich Stadial 2; LGM = Last Glacial Maximum. Sedimentation rates are based on ages of ^{14}C plateau boundaries. Red double slash indicates sedimentation gap. Aberrant ^{14}C ages being linked to Zoophycus burrows are marked in the Fig. S8, S12, and S19.

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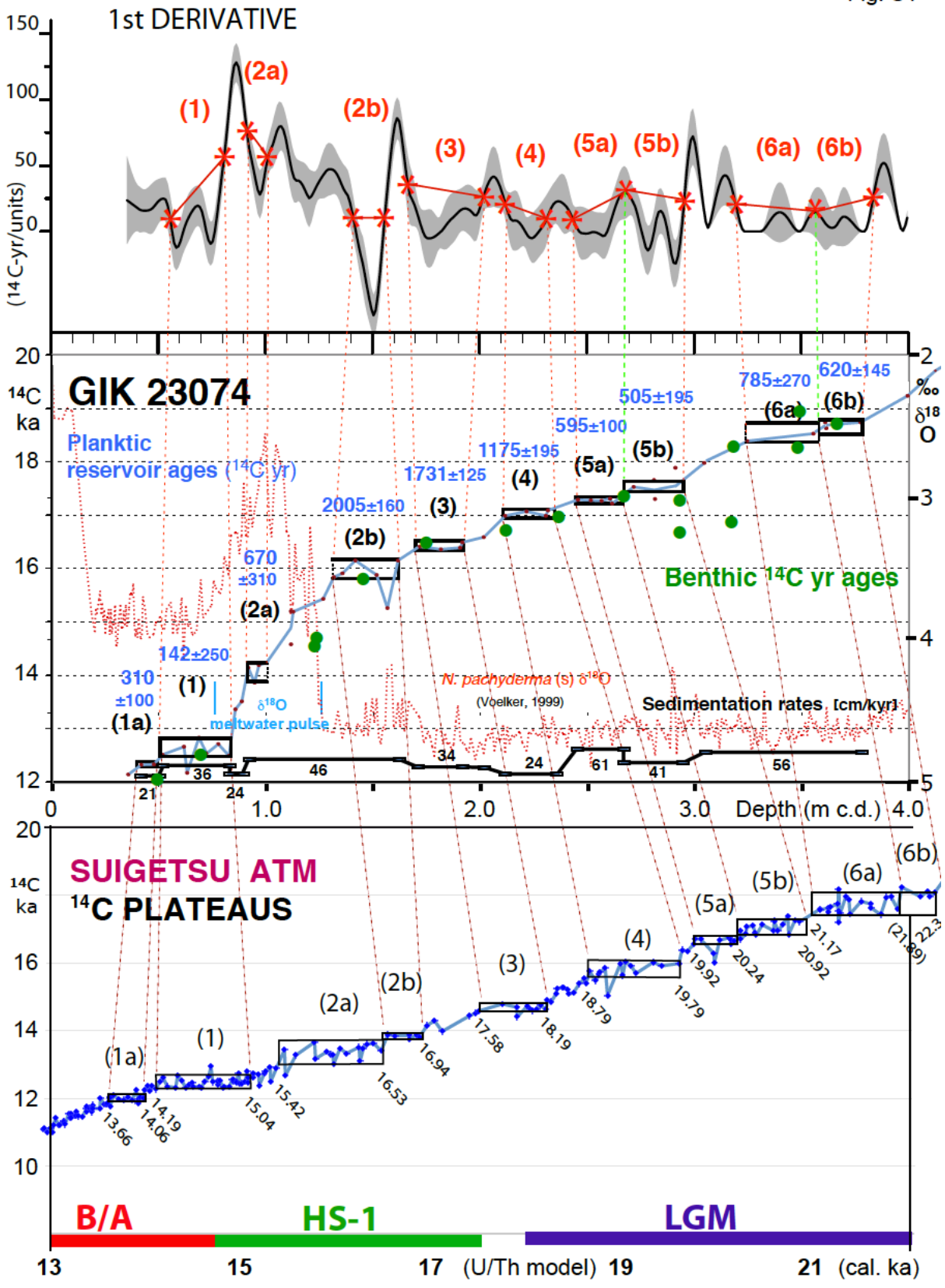
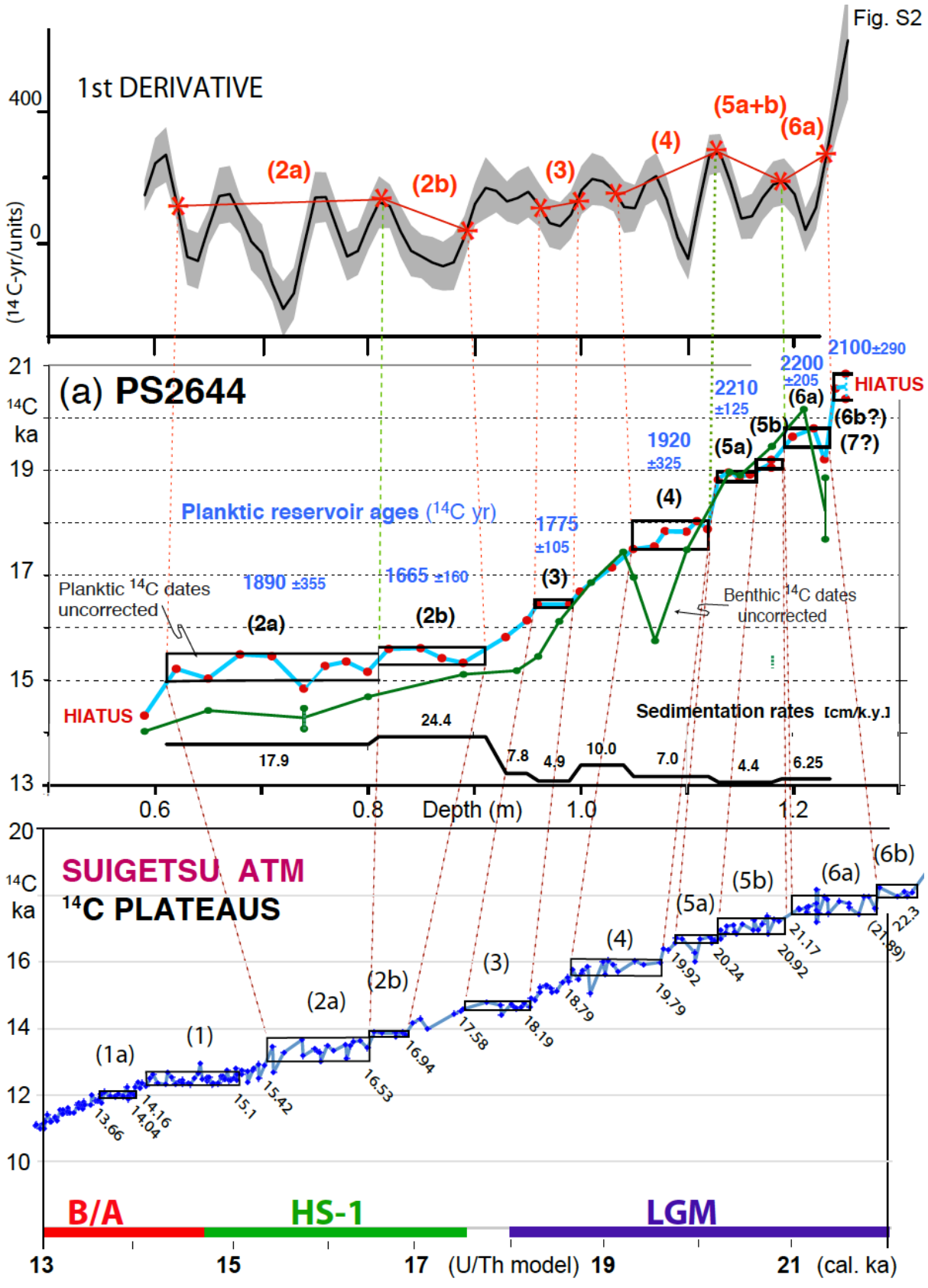
Fig. S1



27

28

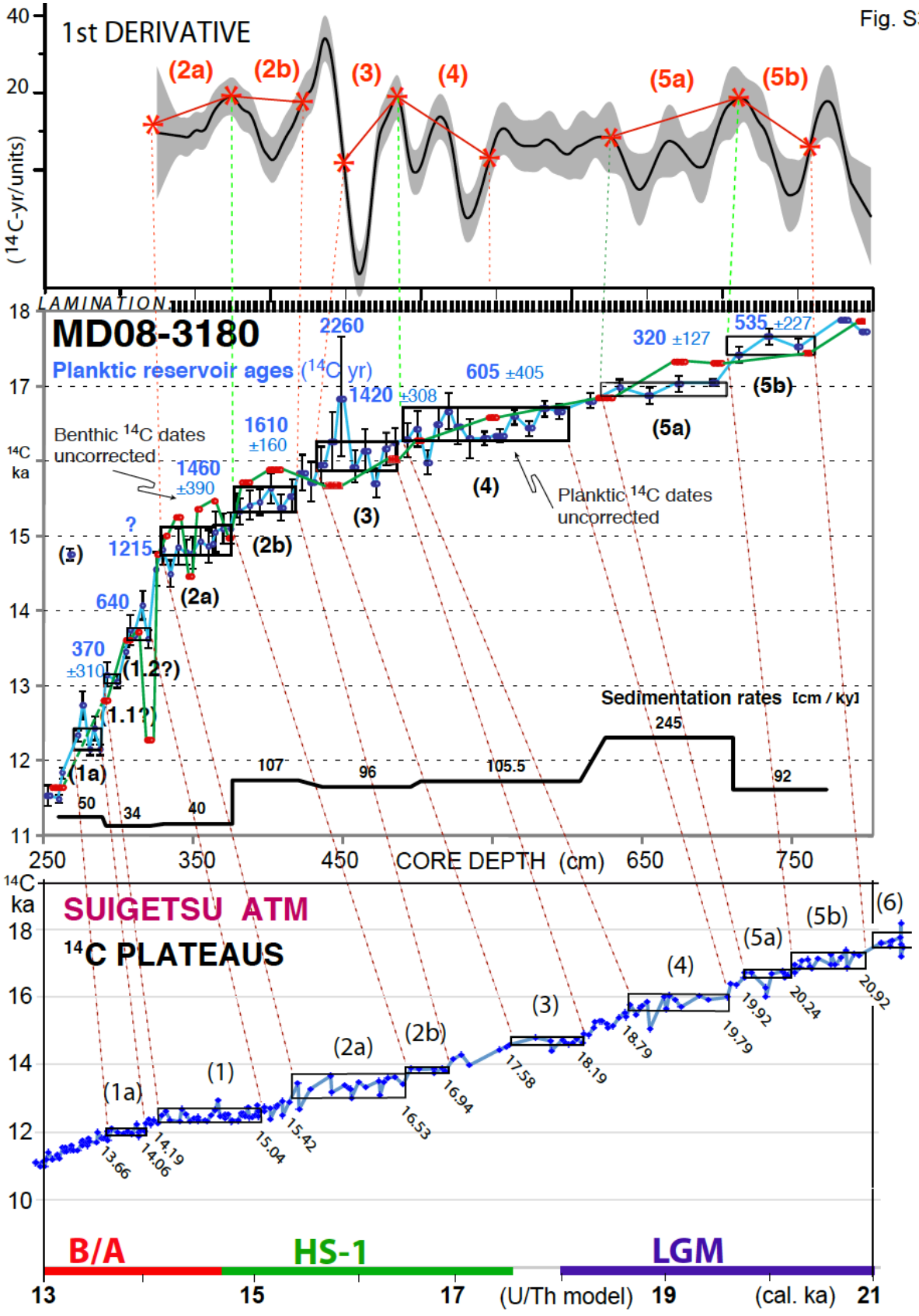
Fig. S2


1st DERIVATIVE
400
0
(14 C-yr/units)
(2a)
(2b)
(3)
(4)
(5a+b)
(6a)
(a) PS2644
14C ka
Planktic reservoir ages (14C yr)
Planktic 14C dates uncorrected
Benthic 14C dates uncorrected
1890 ±355
1665 ±160
1775 ±105
1920 ±325
2210 ±125
2200 ±205
2100±290
HIATUS
(6b?)
(7?)
(5b)
(5a)
Sedimentation rates [cm/k.y.]
24.4
17.9
7.8
4.9
10.0
7.0
4.4
6.25
Depth (m)
SUIGETSU ATM
14C PLATEAUS
(1a)
(1)
(6b)
13.66
14.16
14.04
15.1
15.42
16.53
16.94
17.58
18.19
18.79
19.79
19.92
20.24
21.17
20.92
22.3
(21.89)
B/A
HS-1
LGM
(U/Th model)
(cal. ka)

29

30

Fig. S3


1st DERIVATIVE
(2a)
(2b)
(3)
(4)
(5a)
(5b)
(14C-yr/units)
LAMINATION
MD08-3180
Planktic reservoir ages (14C yr)
Benthic 14C dates uncorrected
Planktic 14C dates uncorrected
2260
1420 ±308
1610 ±160
1460 ±390
1215
640
370 ±310
605 ±405
320 ±127
535 ±227
(1a)
(1.1?)
(1.2?)
Sedimentation rates [cm / ky]
50
34
40
107
96
105.5
245
92
14C ka
CORE DEPTH (cm)
SUIGETSU ATM
14C PLATEAUS
(1)
13.66
14.06
14.19
15.04
15.42
16.53
16.94
17.58
18.19
18.79
19.79
19.92
20.24
20.92
(6)
B/A
HS-1
LGM
(U/Th model)
(cal. ka)

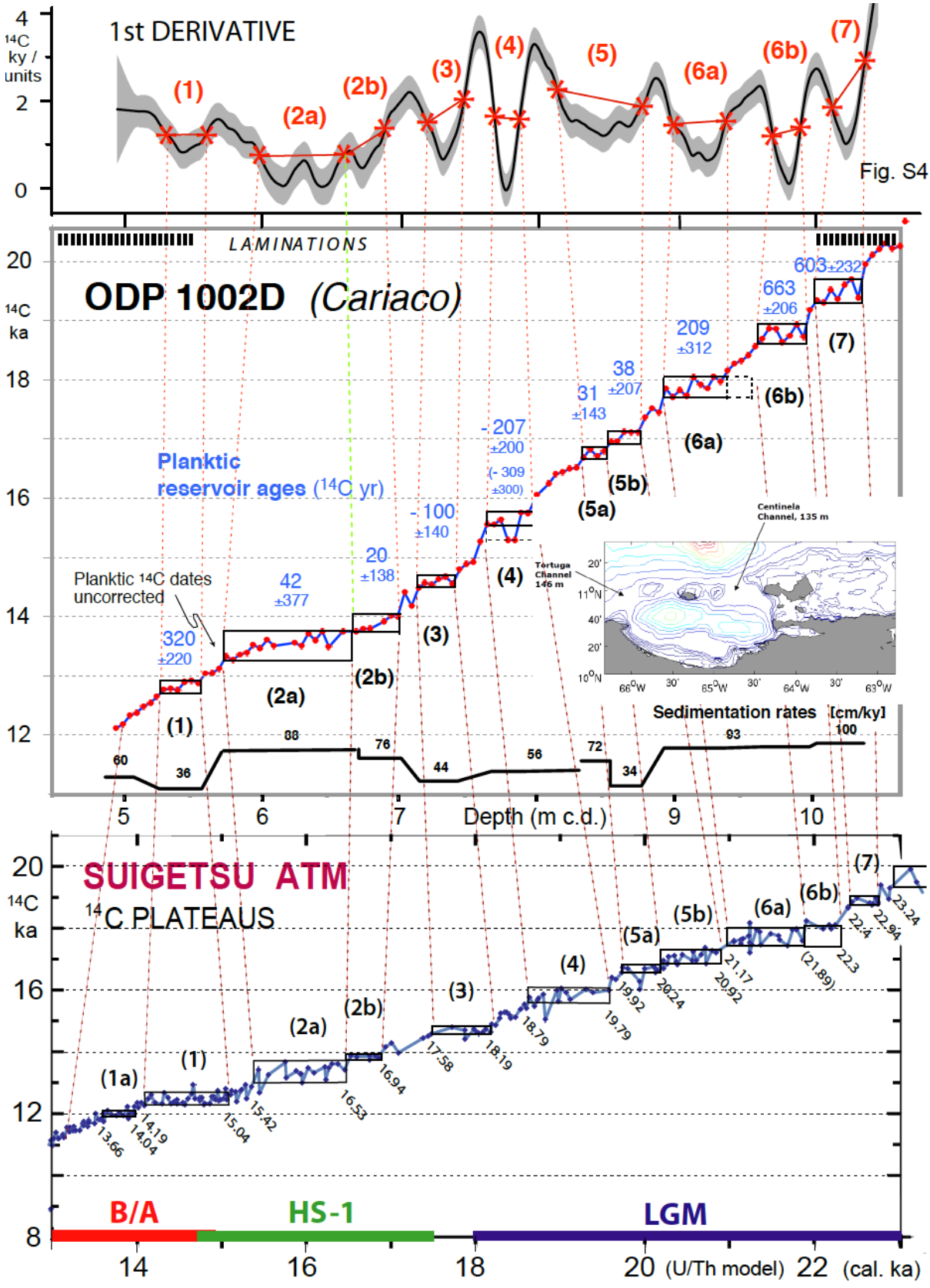
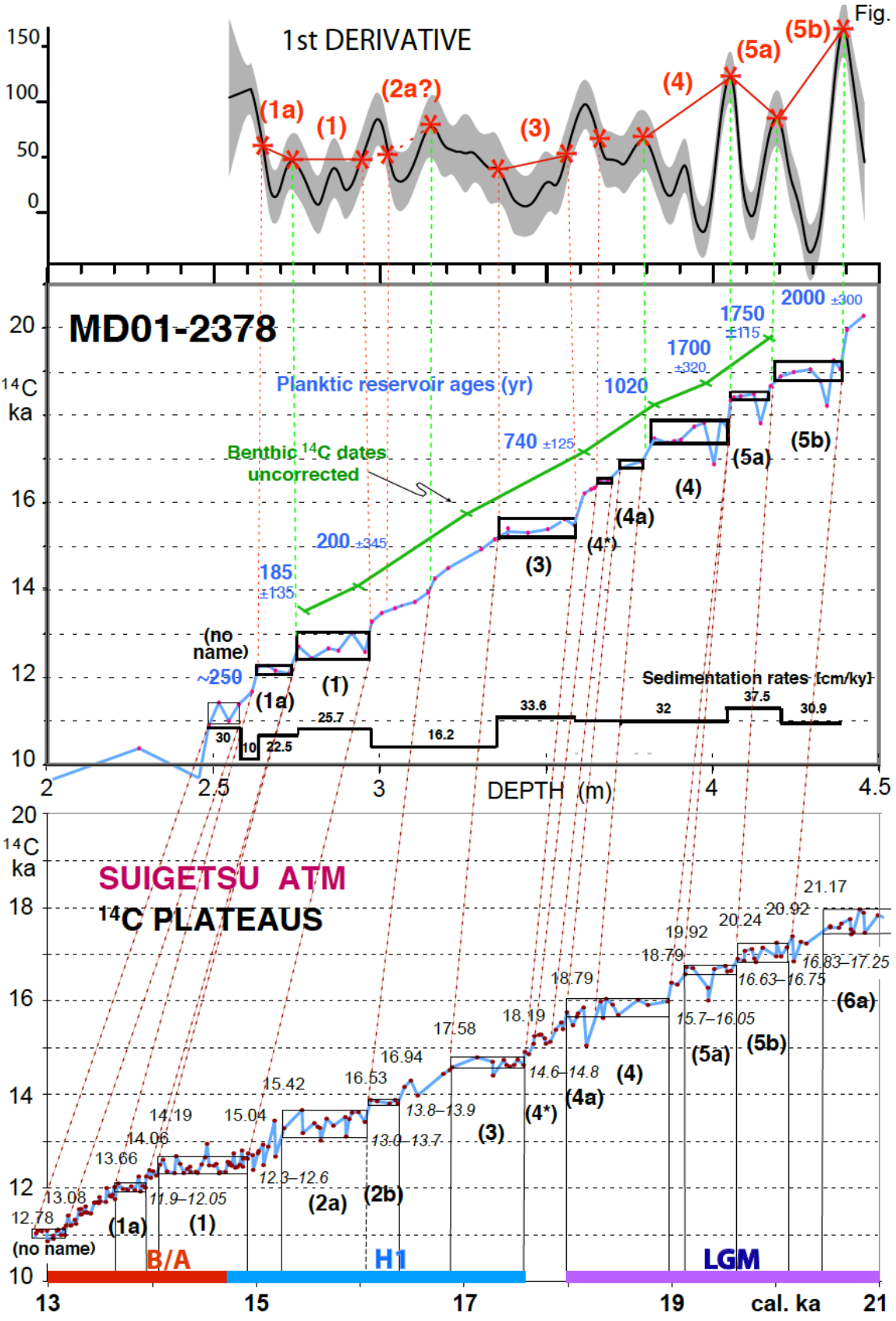

1st DERIVATIVE
14C ky / units
(1)
(2a)
(2b)
(3)
(4)
(5)
(6a)
(6b)
(7)
Fig. S4
LAMINATIONS
ODP 1002D (Cariaco)
14C ka
Planktic reservoir ages (14C yr)
Planktic 14C dates uncorrected
320 ±220
42 ±377
20 ±138
-100 ±140
-207 ±200
(-309 ±300)
31 ±143
38 ±207
209 ±312
663 ±206
603±232
Tortuga Channel 146 m
Centinela Channel, 135 m
Sedimentation rates [cm/ky]
60
36
88
76
44
56
72
34
93
100
Depth (m c.d.)
SUIGETSU ATM
14C PLATEAUS
(1a)
13.66
14.04
14.19
15.04
15.42
16.53
16.94
17.58
18.19
18.79
19.79
19.92
20.24
21.17
20.92
(21.89)
22.3
22.4
22.94
23.24
B/A
HS-1
LGM
(U/Th model)
(cal. ka)

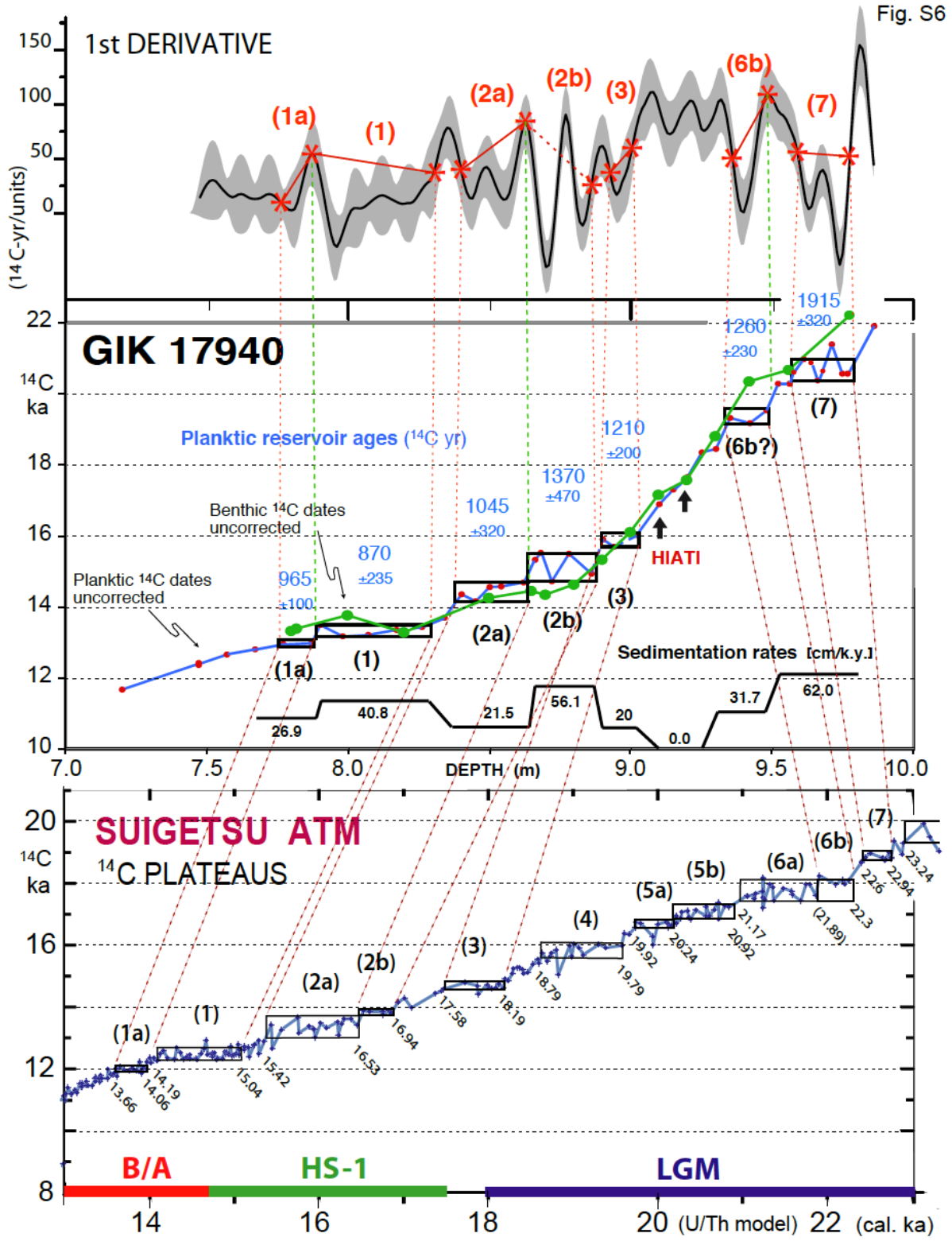
Fig. S5


1st DERIVATIVE
150
100
50
0
(1a)
(1)
(2a?)
(3)
(4)
(5a)
(5b)
MD01-2378
^{14}C ka
Planktic reservoir ages (yr)
Benthic ^{14}C dates uncorrected
2000 ±300
1750 ±115
1700 ±320
1020
740 ±125
200 ±345
185 ±135
~250
(no name)
(1a)
(1)
(3)
(4*)
(4a)
(4)
(5a)
(5b)
Sedimentation rates [cm/ky]
30
10
22.5
25.7
16.2
33.6
32
37.5
30.9
2
2.5
3
DEPTH (m)
4
4.5
SUIGETSU ATM
^{14}C PLATEAUS
12.78
13.08
13.66
14.06
14.19
15.04
15.42
16.53
16.94
17.58
18.19
18.79
18.79
19.92
20.24
20.92
21.17
11.9–12.05
12.3–12.6
13.0–13.7
13.8–13.9
14.6–14.8
15.7–16.05
16.63–16.75
16.83–17.25
(no name)
(1a)
(1)
(2a)
(2b)
(3)
(4*)
(4a)
(4)
(5a)
(5b)
(6a)
B/A
H1
LGM
13
15
17
19
cal. ka
21

34

35

Fig. S6


1st DERIVATIVE
(14C-yr/units)
150
100
50
0
(1a)
(1)
(2a)
(2b)
(3)
(6b)
(7)
GIK 17940
14C ka
Planktic reservoir ages (14C yr)
Benthic 14C dates uncorrected
Planktic 14C dates uncorrected
965 ±100
870 ±235
1045 ±320
1370 ±470
1210 ±200
1260 ±230
1915 ±320
(6b?)
HIATI
Sedimentation rates [cm/k.y.]
26.9
40.8
21.5
56.1
20
0.0
31.7
62.0
DEPTH (m)
SUIGETSU ATM
14C PLATEAUS
(5a)
(5b)
(6a)
13.66
14.19
14.06
15.04
15.42
16.53
16.94
17.58
18.19
18.79
19.79
19.92
20.24
20.92
21.17
(21.89)
22.3
22.6
22.94
23.24
B/A
HS-1
LGM
(U/Th model)
(cal. ka)

36

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Fig. S7

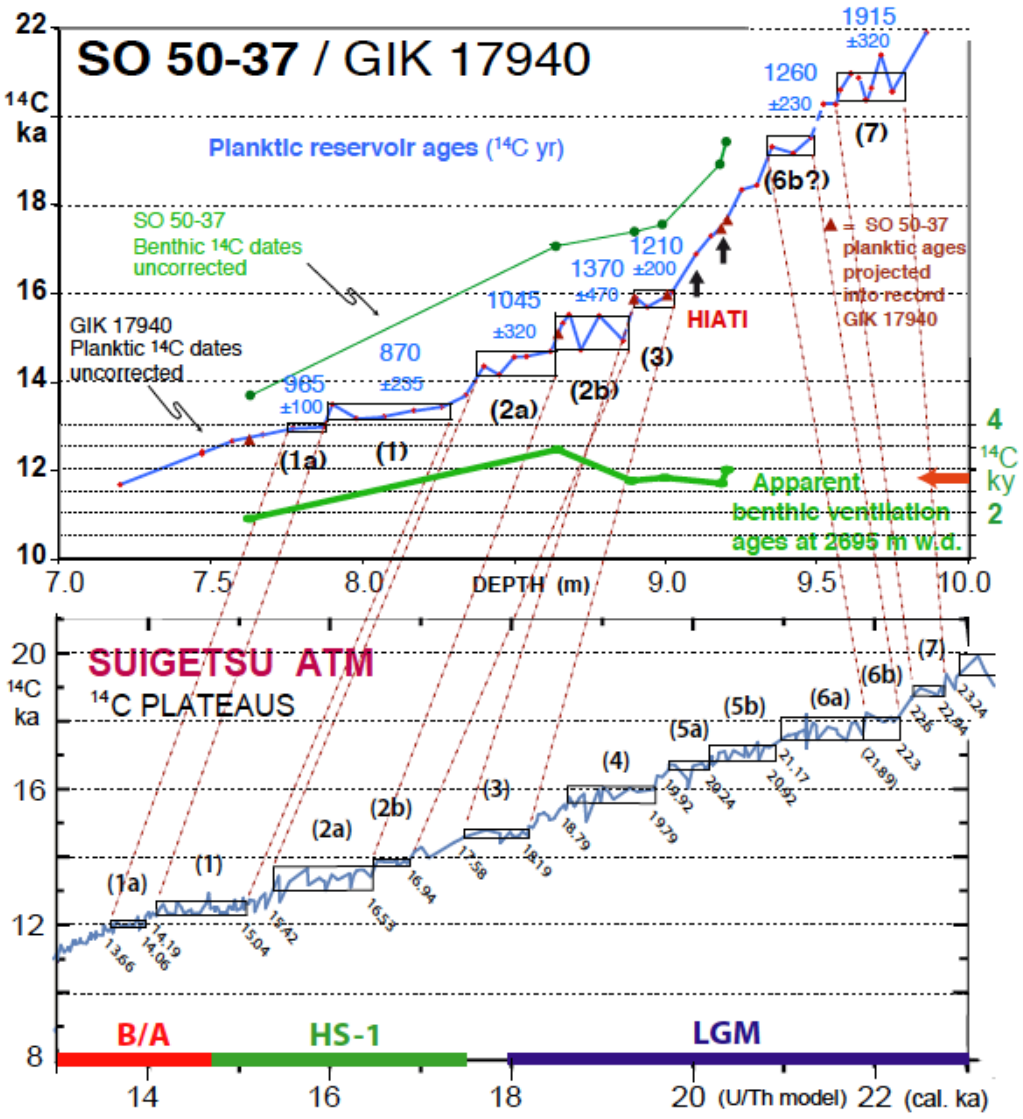
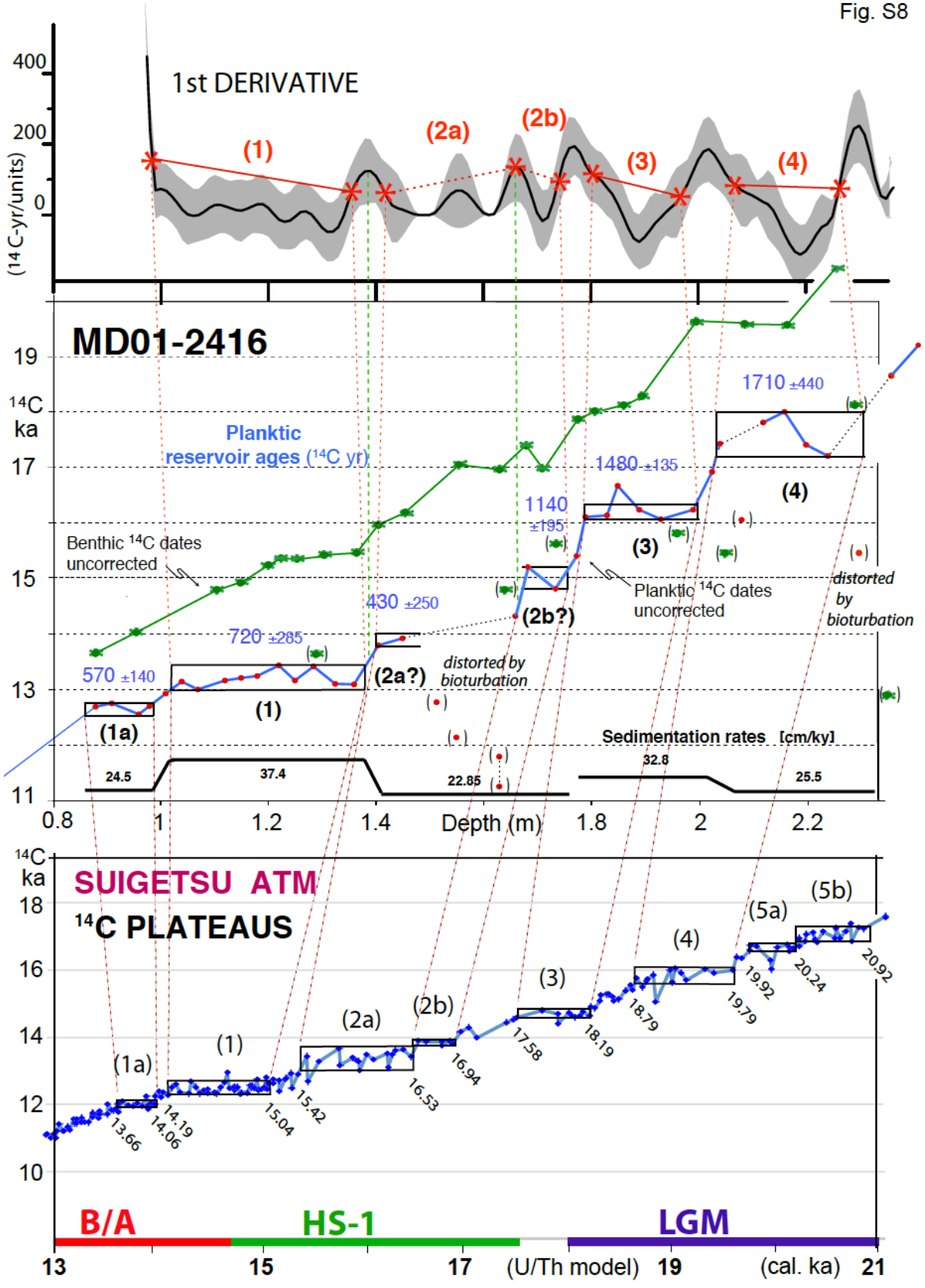

SO 50-37 / GIK 17940
Planktic reservoir ages (14C yr)
SO 50-37
Benthic 14C dates
uncorrected
GIK 17940
Planktic 14C dates
uncorrected
HIATI
▲ = SO 50-37
planktic ages
projected
into record
GIK 17940
Apparent
benthic ventilation
ages at 2695 m w.d.
DEPTH (m)
14C ka
14C ky
SUIGETSU ATM
14C PLATEAUS
B/A
HS-1
LGM
(U/Th model)
(cal. ka)

Fig. S8


1st DERIVATIVE
(14 C-yr/units)
400
200
0
(1)
(2a)
(2b)
(3)
(4)
MD01-2416
14C ka
Planktic reservoir ages (14C yr)
Benthic 14C dates uncorrected
Planktic 14C dates uncorrected
distorted by bioturbation
570 ±140
720 ±285
430 ±250
1140 ±195
1480 ±135
1710 ±440
(1a)
(1)
(2a?)
(2b?)
(3)
(4)
Sedimentation rates [cm/ky]
24.5
37.4
22.85
32.8
25.5
Depth (m)
SUIGETSU ATM
14C PLATEAUS
(5a)
(5b)
13.66
14.06
14.19
15.04
15.42
16.53
16.94
17.58
18.19
18.79
19.79
19.92
20.24
20.92
B/A
HS-1
LGM
(U/Th model)
(cal. ka)

39

40

Fig. S9

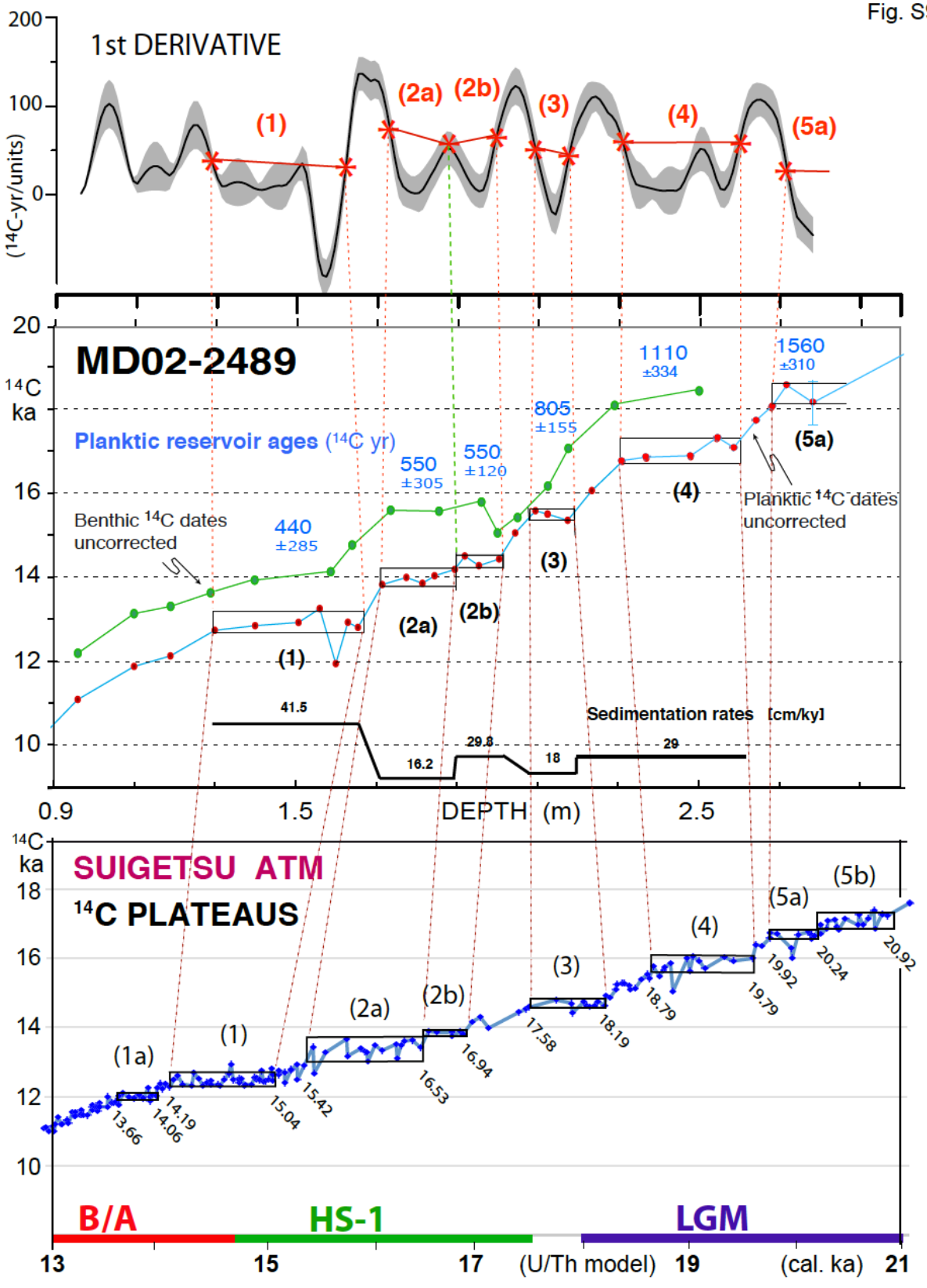
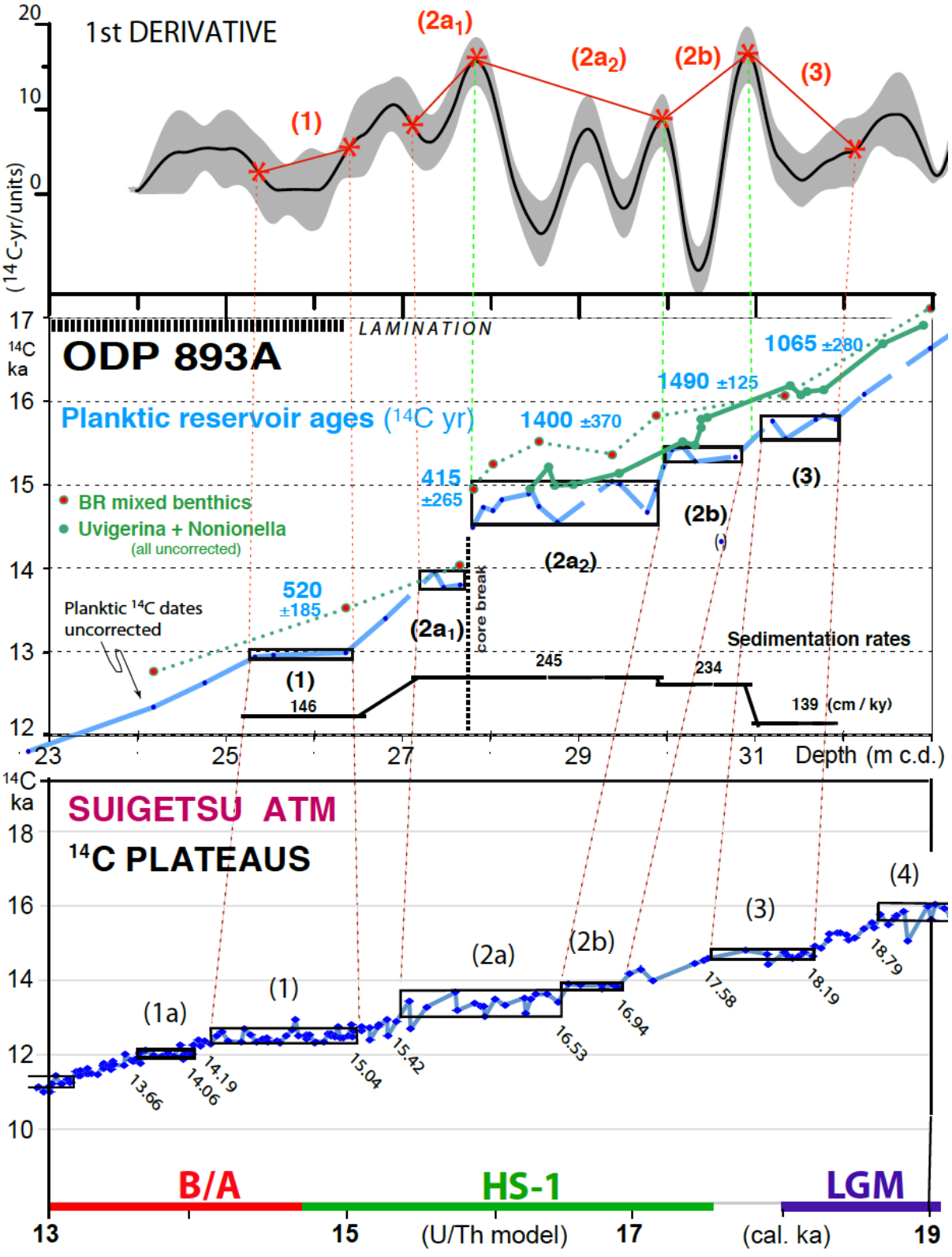

1st DERIVATIVE
(14C-yr/units)
200
100
0
(1)
(2a)
(2b)
(3)
(4)
(5a)
MD02-2489
14C ka
Planktic reservoir ages (14C yr)
Benthic 14C dates uncorrected
Planktic 14C dates uncorrected
440 ±285
550 ±305
550 ±120
805 ±155
1110 ±334
1560 ±310
Sedimentation rates [cm/ky]
41.5
16.2
29.8
18
29
DEPTH (m)
SUIGETSU ATM
14C PLATEAUS
(1a)
(5b)
13.66
14.06
14.19
15.04
15.42
16.53
16.94
17.58
18.19
18.79
19.79
19.92
20.24
20.92
B/A
HS-1
LGM
(U/Th model)
(cal. ka)

Fig. S10


1st DERIVATIVE
(2a1)
(2a2)
(2b)
(3)
(1)
(14C-yr/units)
LAMINATION
ODP 893A
Planktic reservoir ages (14C yr)
1065 ±280
1490 ±125
1400 ±370
415 ±265
BR mixed benthics
Uvigerina + Nonionella
(all uncorrected)
520 ±185
Planktic 14C dates uncorrected
core break
Sedimentation rates
245
234
146
139 (cm / ky)
Depth (m c.d.)
SUIGETSU ATM
14C PLATEAUS
(1a)
(2a)
13.66
14.19
14.06
15.04
15.42
16.53
16.94
17.58
18.19
18.79
B/A
HS-1
LGM
(U/Th model)
(cal. ka)

43

44

Fig. S11

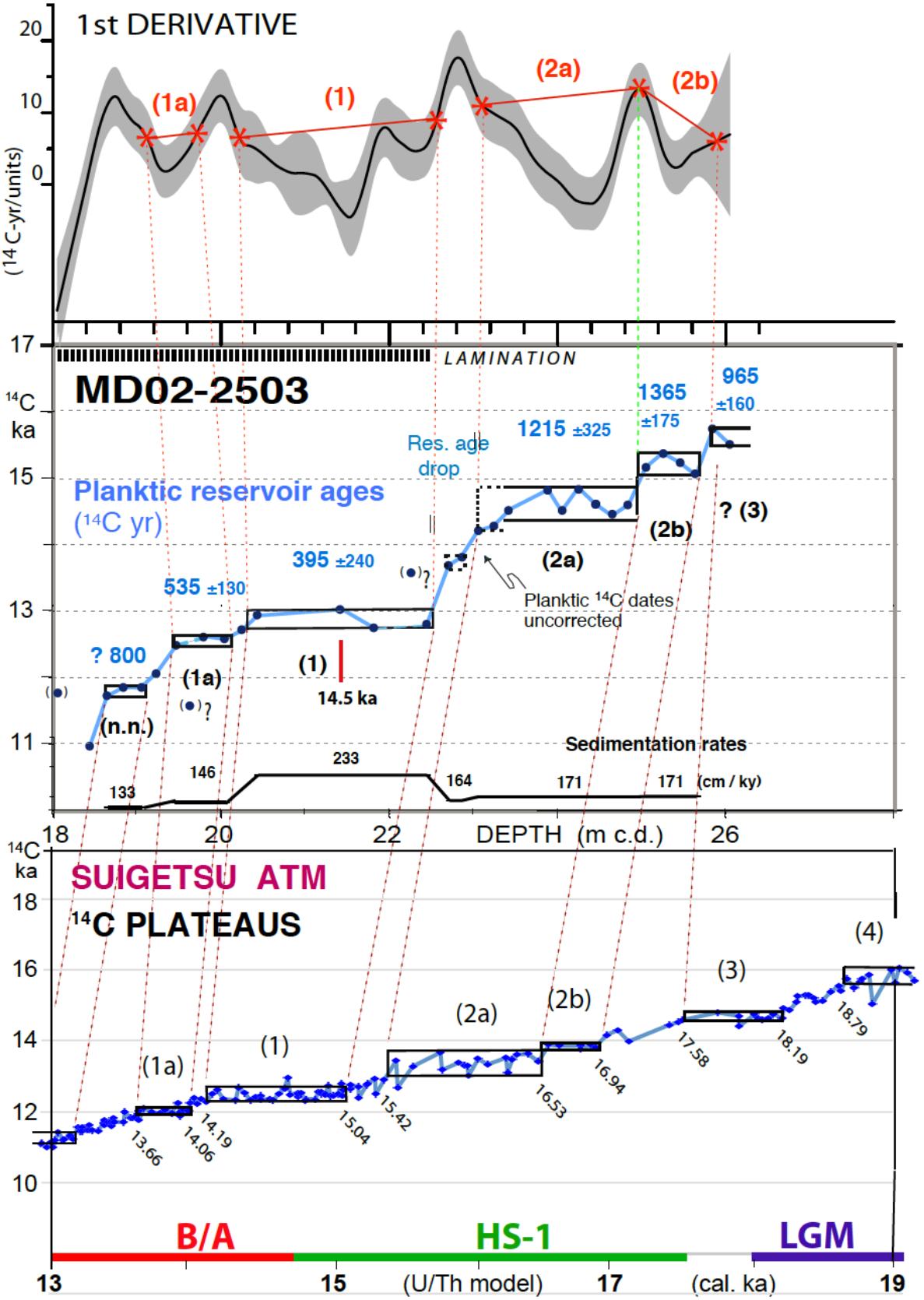
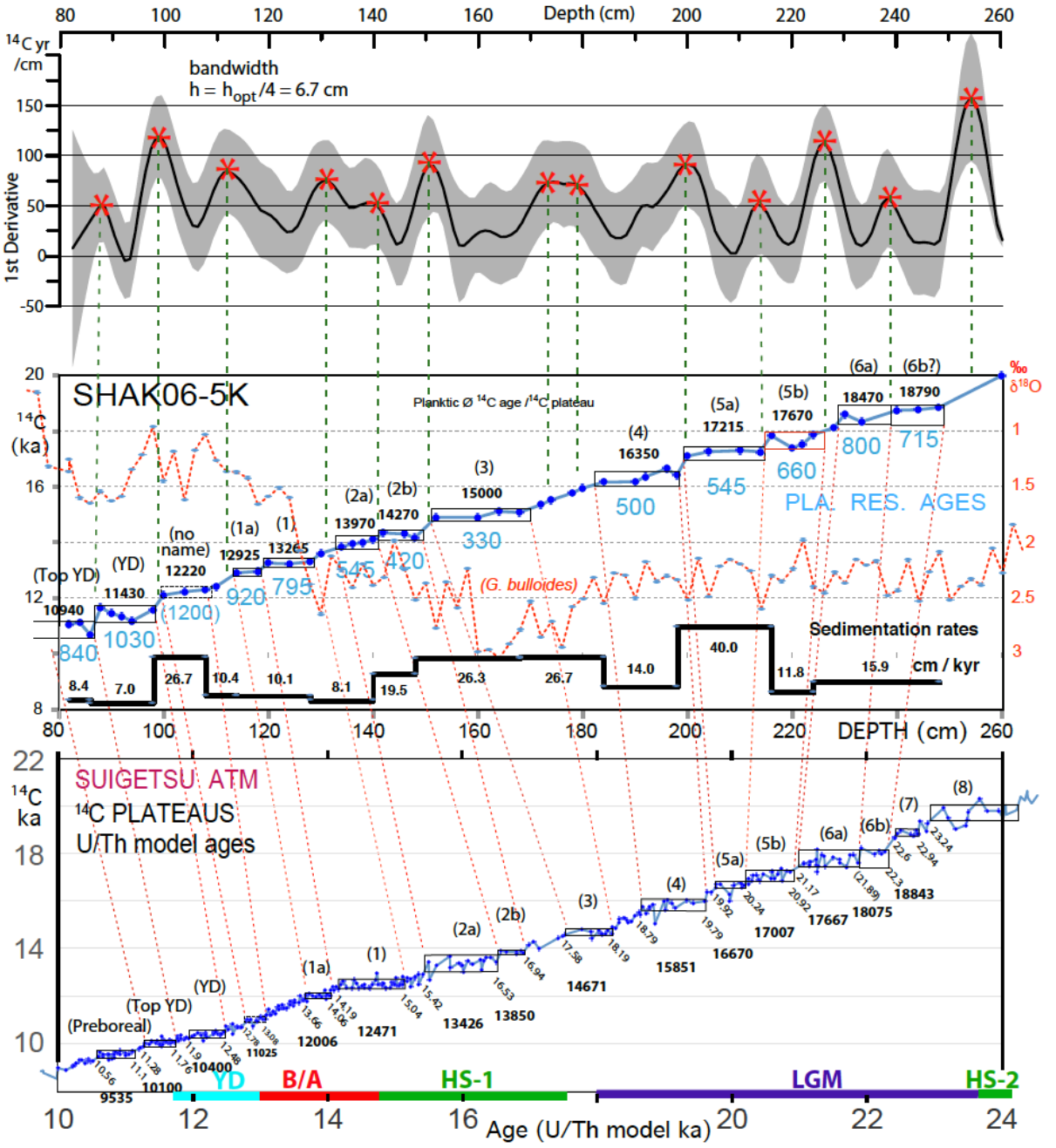

1st DERIVATIVE
(14 C-yr/units)
(1a)
(1)
(2a)
(2b)
LAMINATION
MD02-2503
14C ka
Planktic reservoir ages
(14C yr)
Res. age drop
1215 ±325
1365 ±175
965 ±160
? (3)
(2b)
(2a)
395 ±240
535 ±130
? 800
(1a)
(n.n.)
(1)
14.5 ka
Planktic 14C dates uncorrected
Sedimentation rates
133
146
233
164
171
171
(cm / ky)
DEPTH (m c.d.)
SUIGETSU ATM
14C PLATEAUS
(4)
(3)
(2b)
(2a)
(1)
(1a)
13.66
14.06
14.19
15.04
15.42
16.53
16.94
17.58
18.19
18.79
B/A
HS-1
LGM
(U/Th model)
(cal. ka)

Fig. S12


Depth (cm)
14C yr /cm
bandwidth
h = hopt/4 = 6.7 cm
1st Derivative
SHAK06-5K
Planktic Ø 14C age /14C plateau
14C (ka)
(G. bulloides)
PLA. RES. AGES
Sedimentation rates
cm / kyr
DEPTH (cm)
SUIGETSU ATM
14C PLATEAUS
U/Th model ages
(Preboreal)
(Top YD)
(YD)
(no name)
(1200)
YD
B/A
HS-1
LGM
HS-2
Age (U/Th model ka)

47

48

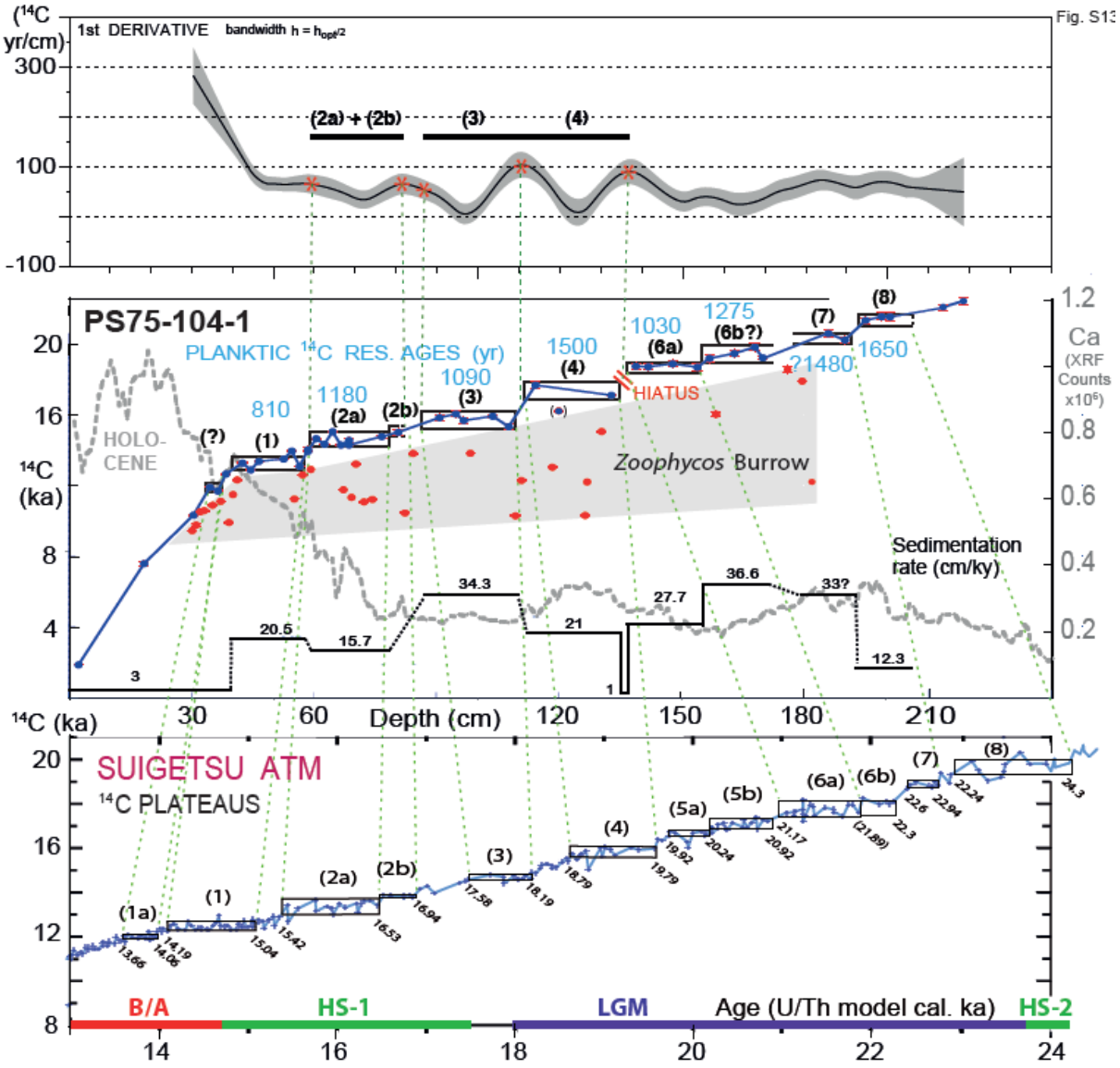
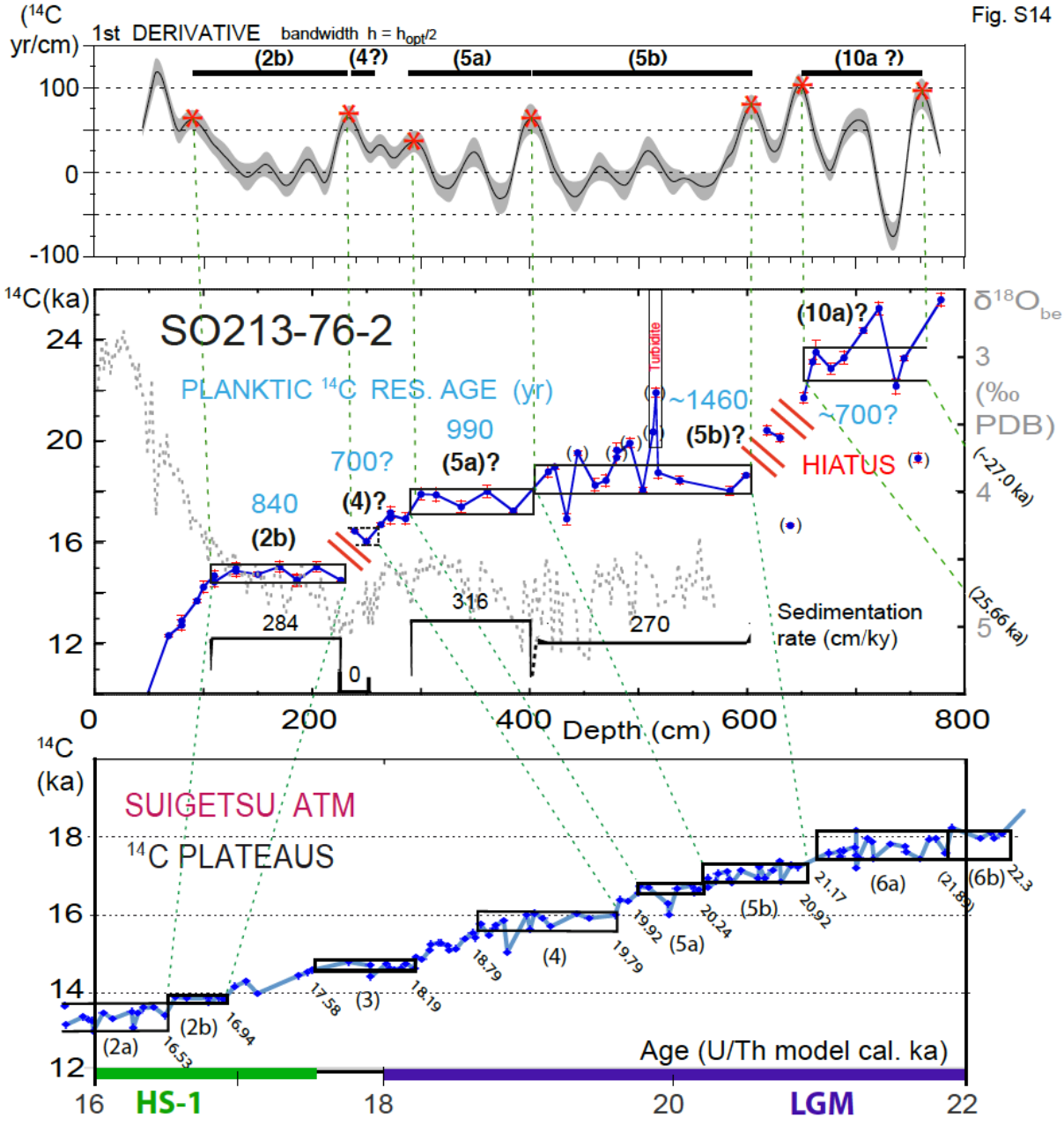


Fig. S13
(14C yr/cm)
1st DERIVATIVE
bandwidth h = hopt/2
300
100
-100
(2a) + (2b)
(3)
(4)
PS75-104-1
PLANKTIC 14C RES. AGES (yr)
HOLO-CENE
810
1180
1090
1500
1030
1275
21480
1650
HIATUS
Zoophycos Burrow
Sedimentation rate (cm/ky)
14C (ka)
Depth (cm)
Ca (XRF Counts x10^6)
SUIGETSU ATM
14C PLATEAUS
B/A
HS-1
LGM
HS-2
Age (U/Th model cal. ka)

49

50

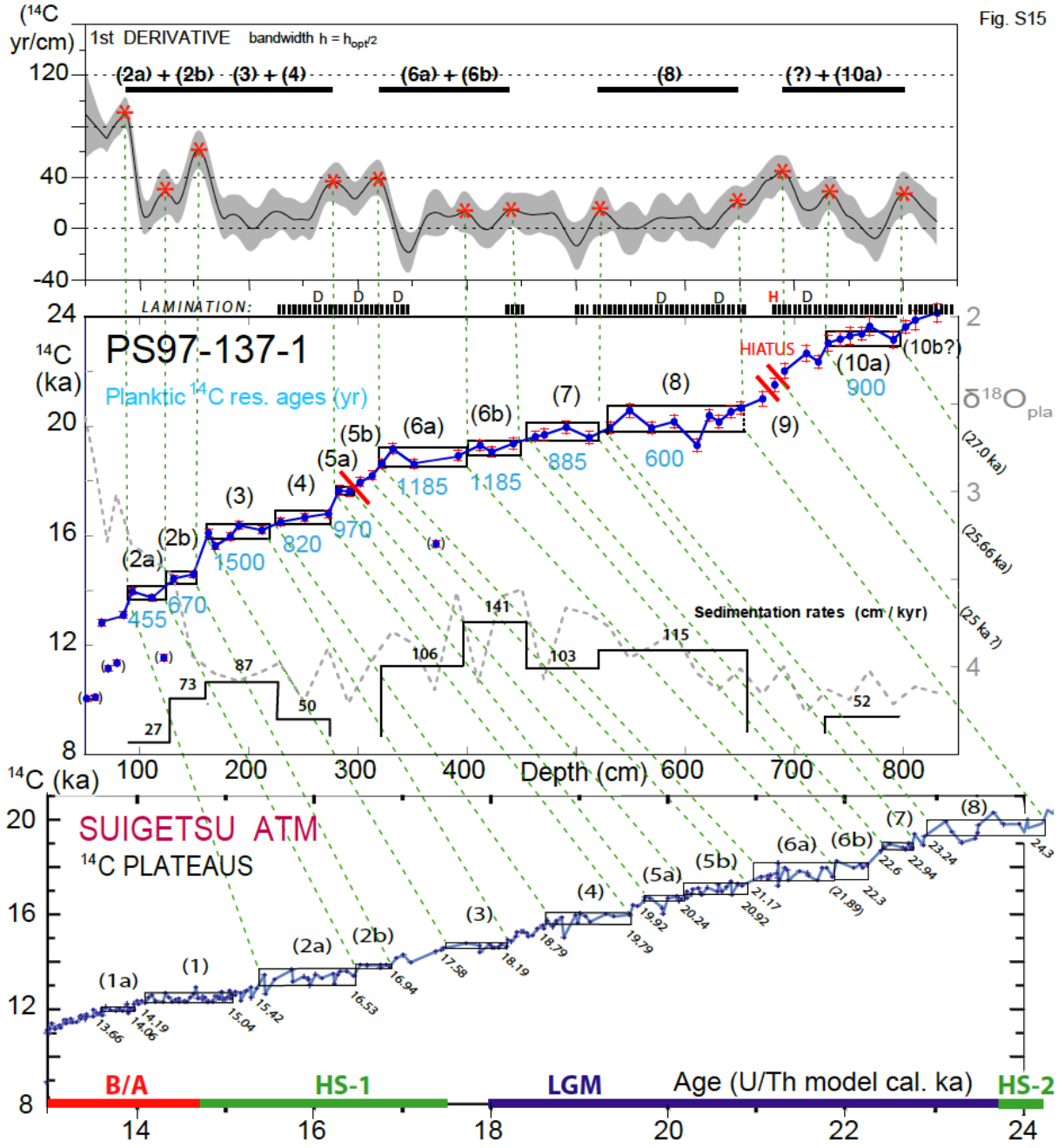
Fig. S14


(14C yr/cm)
1st DERIVATIVE bandwidth h = hopt/2
(2b)
(4?)
(5a)
(5b)
(10a ?)
100
0
-100
14C(ka)
SO213-76-2
PLANKTIC 14C RES. AGE (yr)
840
(2b)
700?
(4)?
990
(5a)?
~1460
(5b)?
~700?
(10a)?
HIATUS
Turbidite
284
316
270
0
Sedimentation rate (cm/ky)
δ18Obe
3
(‰ PDB)
4
5
(~27.0 ka)
(25.66 ka)
24
20
16
12
0
200
400
600
800
Depth (cm)
14C (ka)
SUIGETSU ATM
14C PLATEAUS
18
16
14
12
(2a)
16.53
(2b)
16.94
17.58
(3)
18.19
18.79
(4)
19.79
19.92
(5a)
20.24
(5b)
20.92
21.17
(6a)
(21.89)
(6b)
22.3
Age (U/Th model cal. ka)
16
HS-1
18
20
LGM
22

51

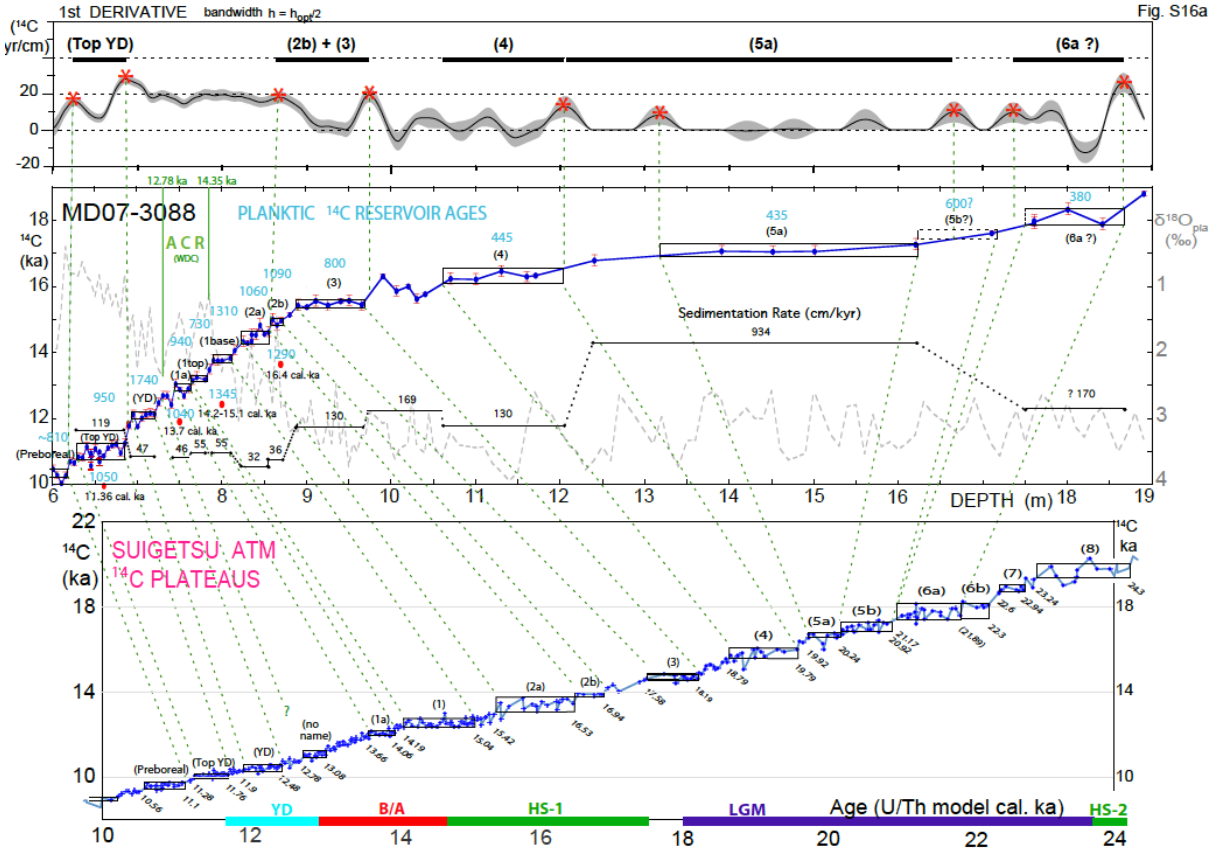
52

Fig. S15


(14C yr/cm)
1st DERIVATIVE bandwidth h = hopt/2
(2a) + (2b)
(3) + (4)
(6a) + (6b)
(8)
(?) + (10a)
LAMINATION:
PS97-137-1
14C (ka)
Planktic 14C res. ages (yr)
HIATUS
(10b?)
(10a)
900
(9)
(8)
(7)
(6b)
(6a)
(5b)
(5a)
(4)
(3)
(2b)
(2a)
455
670
1500
820
970
1185
1185
885
600
Sedimentation rates (cm / kyr)
27
73
87
50
106
141
103
115
52
δ18Opla
(27.0 ka)
(25.66 ka)
(25 ka ?)
Depth (cm)
14C (ka)
SUIGETSU ATM
14C PLATEAUS
(1a)
(1)
(2a)
(2b)
(3)
(4)
(5a)
(5b)
(6a)
(6b)
(7)
(8)
13.66
14.19
14.06
15.04
15.42
16.53
16.94
17.58
18.19
18.79
19.79
19.92
20.24
20.92
21.17
(21.89)
22.3
22.6
22.94
23.24
24.3
B/A
HS-1
LGM
Age (U/Th model cal. ka)
HS-2

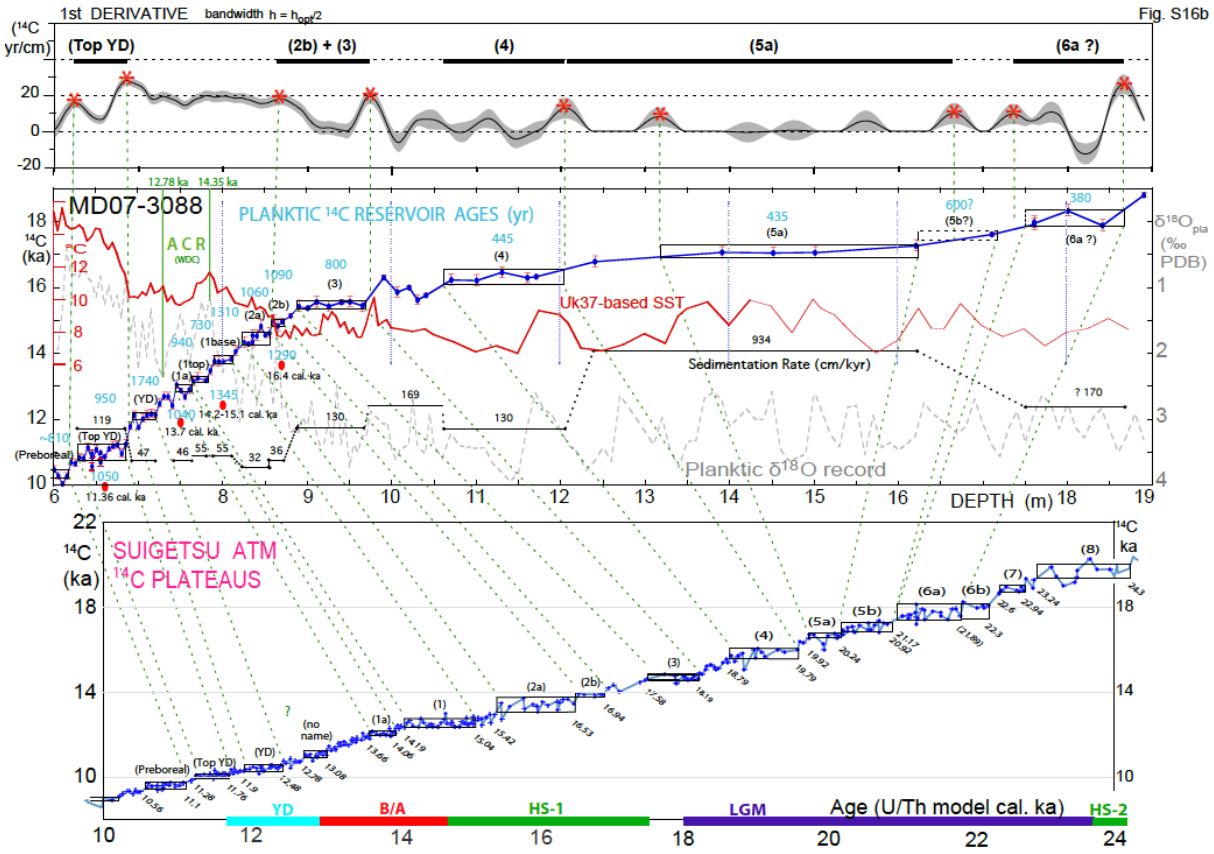
53

54


1st DERIVATIVE bandwidth h = hopt/2
Fig. S16a
(14C yr/cm)
(Top YD)
(2b) + (3)
(4)
(5a)
(6a ?)
MD07-3088
PLANKTIC 14C RESERVOIR AGES
ACR
(WDC)
12.78 ka 14.35 ka
14C (ka)
δ18Opla (‰)
Sedimentation Rate (cm/kyr)
934
? 170
DEPTH (m)
SUIGETSU ATM
14C PLATEAUS
(Preboreal)
(Top YD)
(YD)
(no name)
YD
B/A
HS-1
LGM
HS-2
Age (U/Th model cal. ka)

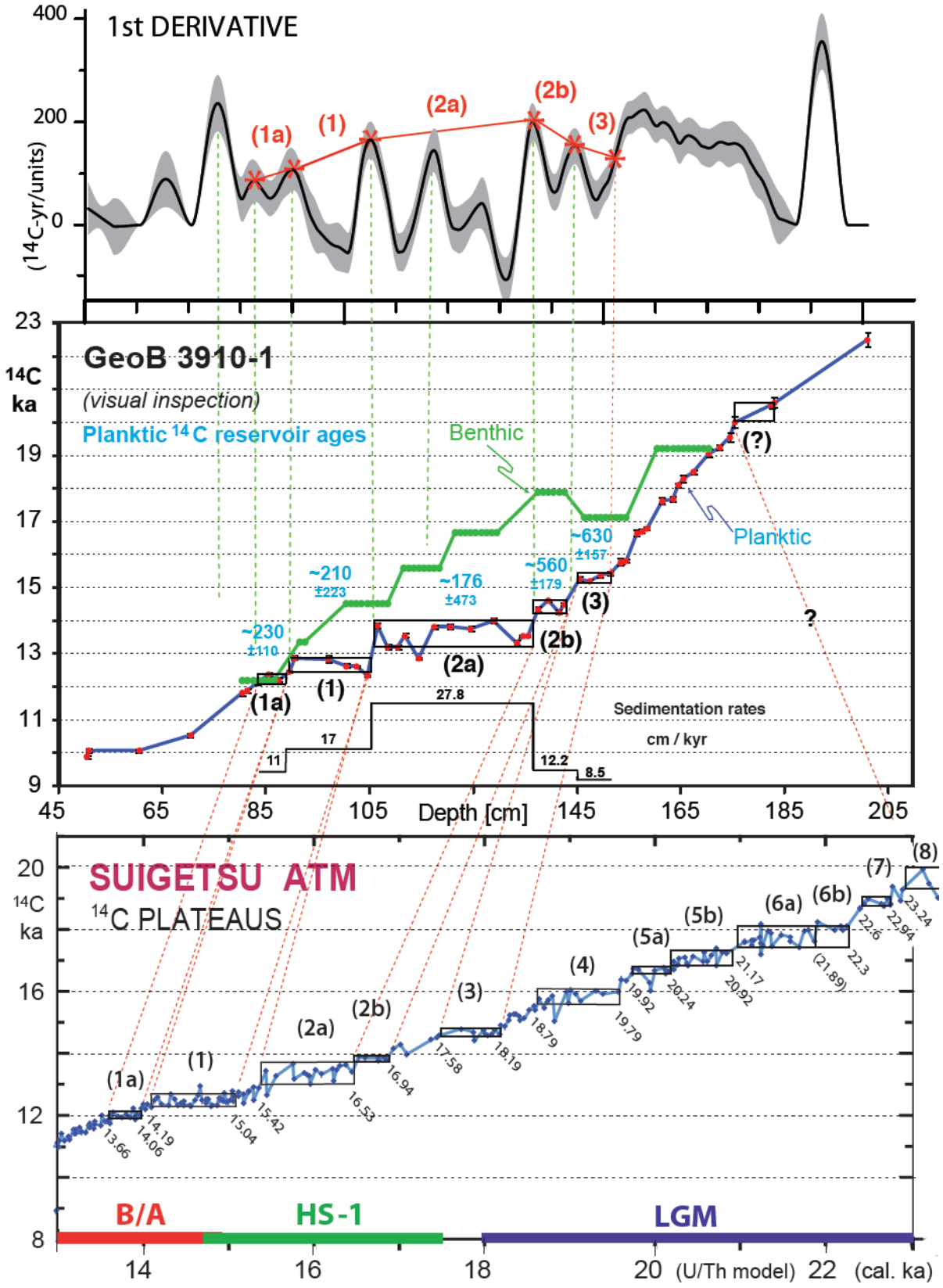
55

56


1st DERIVATIVE bandwidth h = hopt/2
Fig. S16b
(14C yr/cm)
(Top YD)
(2b) + (3)
(4)
(5a)
(6a ?)
MD07-3088
PLANKTIC 14C RESERVOIR AGES (yr)
ACR
(WDC)
12.78 ka 14.35 ka
14C (ka)
δ18Opla (‰ PDB)
Uk37-based SST
°C
Sedimentation Rate (cm/kyr)
934
? 170
Planktic δ18O record
DEPTH (m)
SUIGETSU ATM
14C PLATEAUS
(Preboreal)
(Top YD)
(YD)
(no name)
YD
B/A
HS-1
LGM
HS-2
Age (U/Th model cal. ka)

57

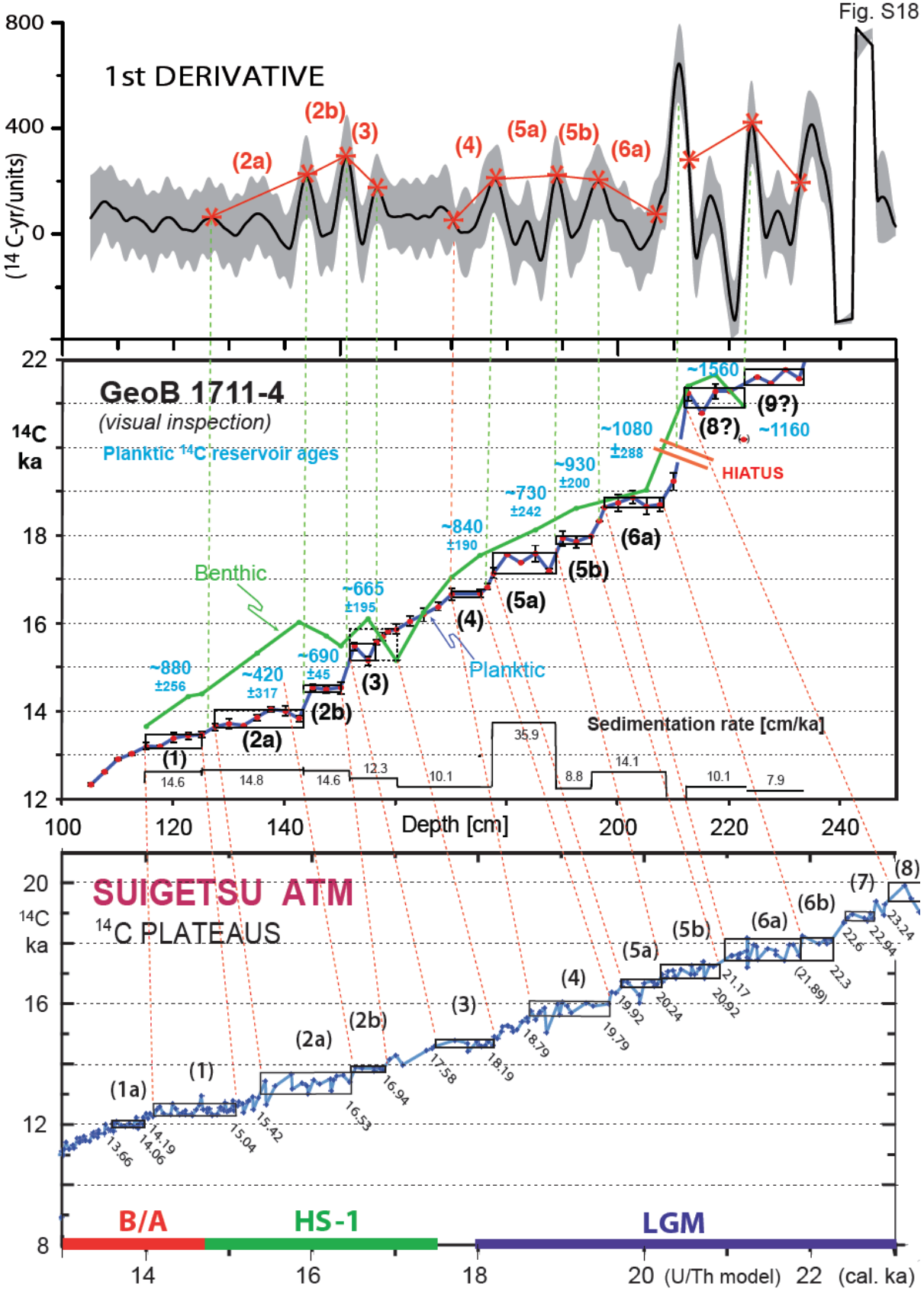
Fig. S17


1st DERIVATIVE
(14C-yr/units)
400
200
0
(1a)
(1)
(2a)
(2b)
(3)
GeoB 3910-1
(visual inspection)
Planktic 14C reservoir ages
Benthic
Planktic
14C ka
23
19
17
15
13
11
9
~230 ±110
~210 ±223
~176 ±473
~560 ±179
~630 ±157
(?)
?
27.8
17
11
12.2
8.5
Sedimentation rates
cm / kyr
45
65
85
105
Depth [cm]
145
165
185
205
SUIGETSU ATM
14C PLATEAUS
20
16
12
8
14
16
18
20
22
(U/Th model)
(cal. ka)
(1a)
(1)
(2a)
(2b)
(3)
(4)
(5a)
(5b)
(6a)
(6b)
(7)
(8)
13.66
14.06
14.19
15.04
15.42
16.53
16.94
17.58
18.19
18.79
19.79
19.92
20.24
20.92
21.17
(21.89)
22.3
22.6
22.94
23.24
B/A
HS-1
LGM

58

59

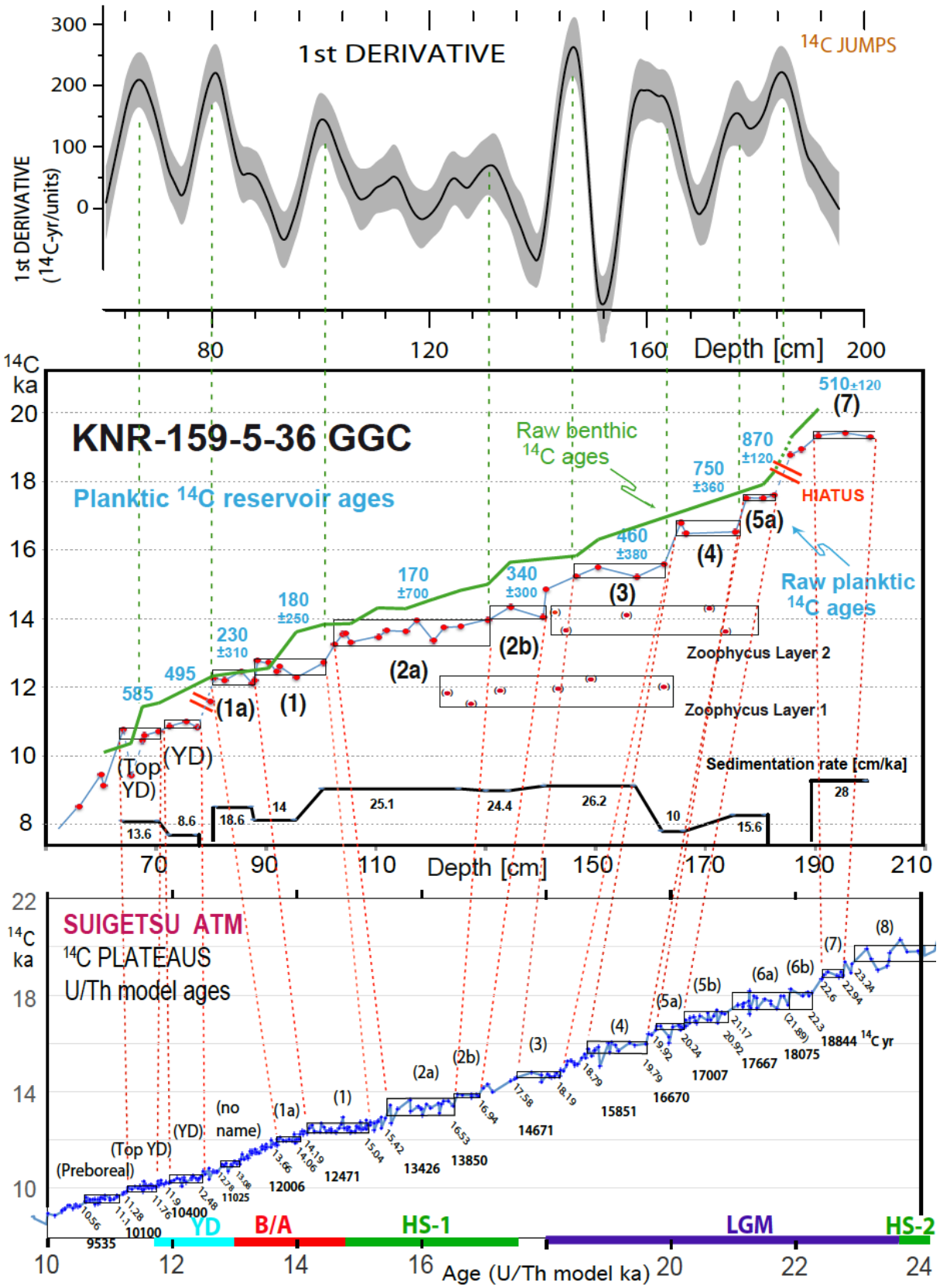
Fig. S18


1st DERIVATIVE
(14 C-yr/units)
800
400
0
(2a)
(2b)
(3)
(4)
(5a)
(5b)
(6a)
GeoB 1711-4
(visual inspection)
Planktic 14C reservoir ages
14C ka
Benthic
Planktic
~880 ±256
~420 ±317
~690 ±45
~665 ±195
~840 ±190
~730 ±242
~930 ±200
~1080 ±288
~1560
(1)
(2a)
(2b)
(3)
(4)
(5a)
(5b)
(6a)
(8?)
(9?)
~1160
HIATUS
Sedimentation rate [cm/ka]
14.6
14.8
14.6
12.3
10.1
35.9
8.8
14.1
10.1
7.9
Depth [cm]
SUIGETSU ATM
14C PLATEAUS
(1a)
(1)
(2a)
(2b)
(3)
(4)
(5a)
(5b)
(6a)
(6b)
(7)
(8)
13.66
14.06
14.19
15.04
15.42
16.53
16.94
17.58
18.19
18.79
19.79
19.92
20.24
20.92
21.17
(21.89)
22.3
22.6
22.94
23.24
B/A
HS-1
LGM
(U/Th model)
(cal. ka)

60

61

Fig. S19


1st DERIVATIVE
14C JUMPS
1st DERIVATIVE (14C-yr/units)
Depth [cm]
KNR-159-5-36 GGC
Planktic 14C reservoir ages
Raw benthic 14C ages
Raw planktic 14C ages
HIATUS
Zoophycus Layer 2
Zoophycus Layer 1
Sedimentation rate [cm/ka]
(Top YD)
(YD)
(1a)
(1)
(2a)
(2b)
(3)
(4)
(5a)
(7)
SUIGETSU ATM
14C PLATEAUS
U/Th model ages
(Preboreal)
(no name)
(5b)
(6a)
(6b)
(8)
14C yr
YD
B/A
HS-1
LGM
HS-2
Age (U/Th model ka)

Suppl. Tables S1 - S19.

Planktic and benthic ^{14}C ages measured in 19 ocean sediment cores. All cal. ages (yr BP) were deduced by means of ^{14}C plateau tuning and adjusted to the IntCal20 U/Th-based model time scale of Bronk Ramsey et al. (2020). Core locations and data sources are listed in Table S20.

Suppl. Table S 20. Core locations and data sources (and references) for 19 core sites from key positions in the world ocean, used for generating a PT-based time scale for planktic and benthic ^{14}C ages displayed in Tables S1 - S19.

Table S20

Number of Suppl. Table and Figure	Sediment Core U/Th-based model age 14C Plateau (Pl.) no.	Latitude	Longitude	Water depth (m)	DATA Source	Comments
	ATLANTIC O.					
S1	PS2644	67°52.02'N	21°45.92'W	777	Sarnthein et al. 2015	Benthic data suppl.
S2	GIK 23074	66°66.67'N	4°90'E	1157	Sarnthein et al. 2015	Benthic data suppl.
S3	MD08-3180	38°N	31°13.45'W	3064	Balmer et al. 2018	
S12	SHAK06-5K	37°34'N	10°09'W	2646	Ausin et al., 2021	
S4	ODP 1002	10°42.37'N	65°10.18'W	893	Sarnthein et al. 2015	
S17	GeoB 3910-1	4°15'S	36°21'W	2361	Balmer et al. 2016	
S18	GeoB 1711-4	23°17'S	12°23'W	1976	Balmer et al. 2016	
S19	KNR 159-5-36GGC	27°31'S	46°48'W	1268	Balmer et al. 2016	Benthic data of Sotor & Lund, 2011
	INDIAN O./TIMOR SEA					
S5	MD01-2378	13°08.25'S	121°78.8'E	1783	Sarnthein et al. 2011+2015	
	PACIFIC O.					
S9	MD02-2489	54°39.07'N	148°92.13'W	3640	Sarnthein et al. 2015	
S8	MD01-2416	51°26.8'N	167°72.5'E	2317	Sarnthein et al. 2015	PT modified
S10	ODP 893A	34°17.25'N	120°02.33'W	588	Sarnthein et al. 2015	14C data suppl.
S11	MD02-2503	34°16.6'N	120°01.6'W	580	Sarnthein et al. 2015	
S6	GIK 17940	20°07.0'N	117°23.0'E	1727	Sarnthein et al. 2015	cal. ages adjusted
S7	(= SO50-37)	18°55'N	115°55'E	2655	Broecker et al. 1990	by Sarnthein et al. 2015
S13	PS75/104-1	44°46'S	174°31'E,	835	Küssner et al., 2018+2020	
	(= SO213-84)	45°7.5'S	174°34,9'E	972	Ronge et al., 2016	
S16 a+b	MD07-3088	46°S	75°W	1536	Küssner et al., 2020	suppl. by Siani et al. 2013
S14	SO213-76-2	46°13'S	178°1.7´W	4339	Küssner et al., 2020	data suppl. by Ronge et al. 2016
S15	PS97/137-1	52°39.5'S	75°33.9'E	1027	Küssner et al., 2020	data suppl.

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