The supplementary materials consists of seven figures:

Supplemental Figure Captions

Figure S1. Comparison of bulk carbonate $\delta^{18}O$ (black) and %lithic counts (red) for the upper 20 m of Site U1308. Three glacial periods were counted for IRD at Site 609 (MIS2-4) and U1308 (MIS6 and MIS8) (Obrochta et al., 2014). Note the good correspondence between increases in %lithics and decreases in bulk carbonate $\delta^{18}O$.

Figure S2. Benthic $\delta^{18}O$ minus bulk $\delta^{18}O$ for the last 3.2 Ma at Site U1308 plotted on a log scale. The divergence in benthic and bulk $\delta^{18}O$ records are indicative of IRD events and a source of carbonate to Site U1308. Selected marine isotope stages are labelled.

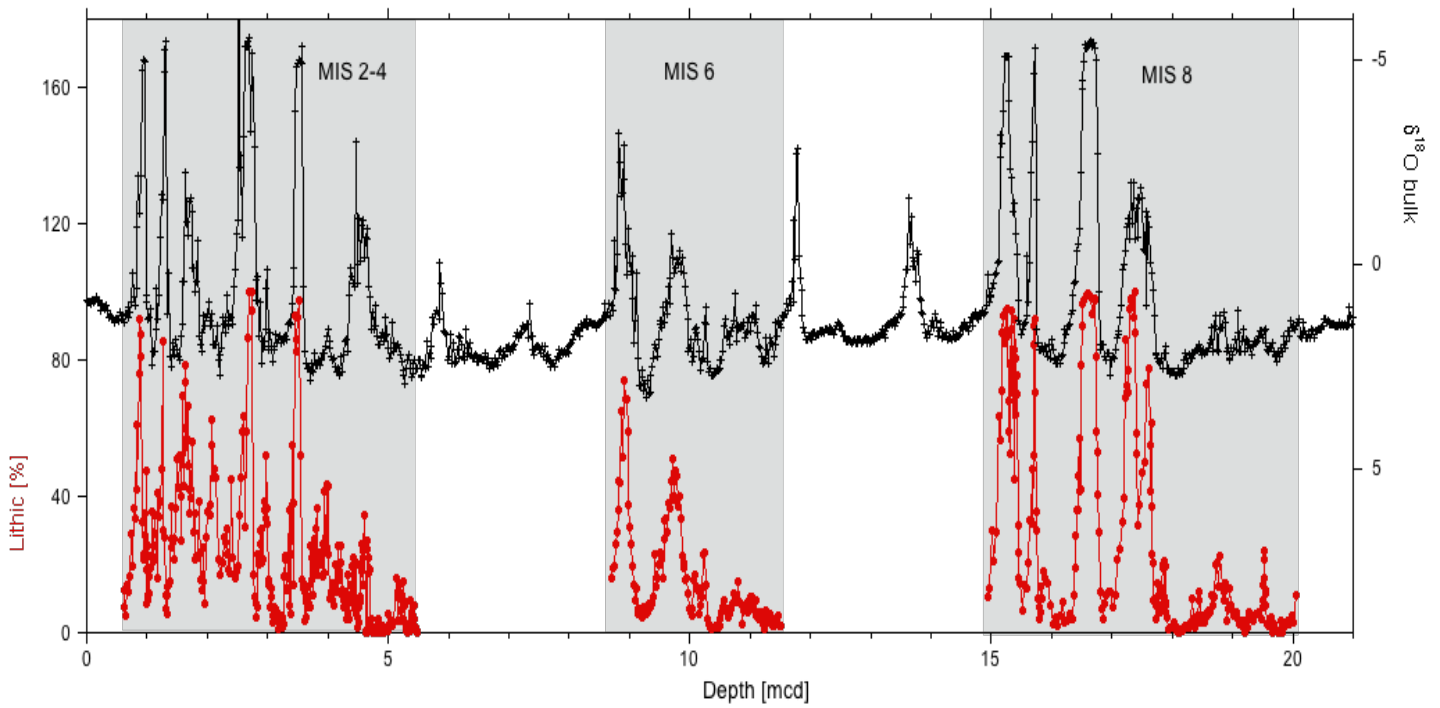
Figure S3. Comparison of bulk carbonate (red) and benthic (black) $\delta^{18}O$ for the period from 1800 to 3200 ka. Note the general parallel trends in this interval. The asterisks denote times when the bulk carbonate $\delta^{18}O$ diverges from the benthic $\delta^{18}O$ signal in glacial MIS 100, 98, 88, 86, 82, 78, 72, 70 and 68.

Figure S4. Comparison of bulk carbonate (red) and benthic (black) $\delta^{18}O$ for the period from 650 to 1800 ka. The lows in bulk carbonate $\delta^{18}O$ tend to occur on glacial terminations and inceptions.

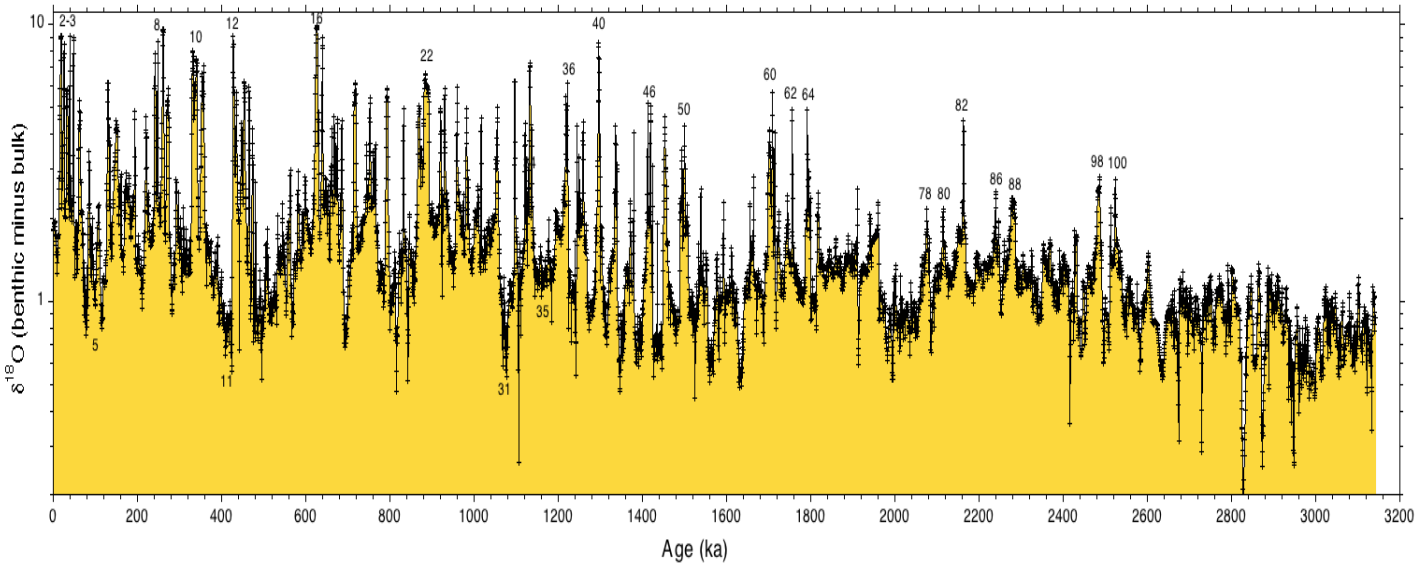
Figure S5. Comparison of bulk carbonate (red) and benthic (black) $\delta^{18}O$ for the period from 0 to 650 ka. The lows in bulk carbonate $\delta^{18}O$ that are less than -4 ‰ are associated with Heinrich layers.

Figure S6. Location of sites relative to reconstructed ice sheets for MIS 5b (a), MIS 4 (b), and MIS 2 (c) based on numerical model of Kleman et al. (2013). Thick white lines represent geological constraints of the ice sheets. Figure modified after Kleman et al. (2013).

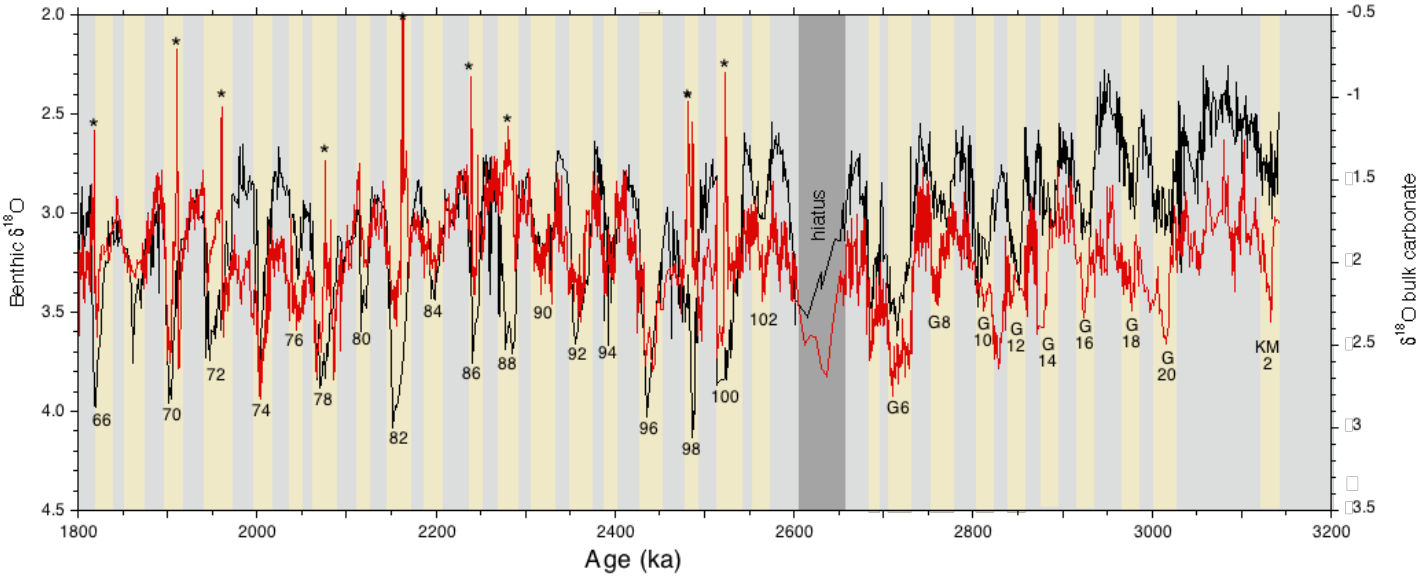
Figure S7. The position of Site U1308 (yellow dot) relative to the numerical model results of Löfverström et al. (2014). The arrows show the wind vectors in (800 hPa surface) and the 50% sea-ice margin in winter (blue) and summer (red). Model runs are for: (a) the present interglacial, (b) MIS 5b, (c) MIS 4 and (d) the last glacial maximum. Figure modified after Löfverström et al. (2014).


MIS 2-4
MIS 6
MIS 8
Lithic [%]
160
120
80
40
0
-5
0
5
δ18O bulk
0
5
10
15
20
Depth [mcd]

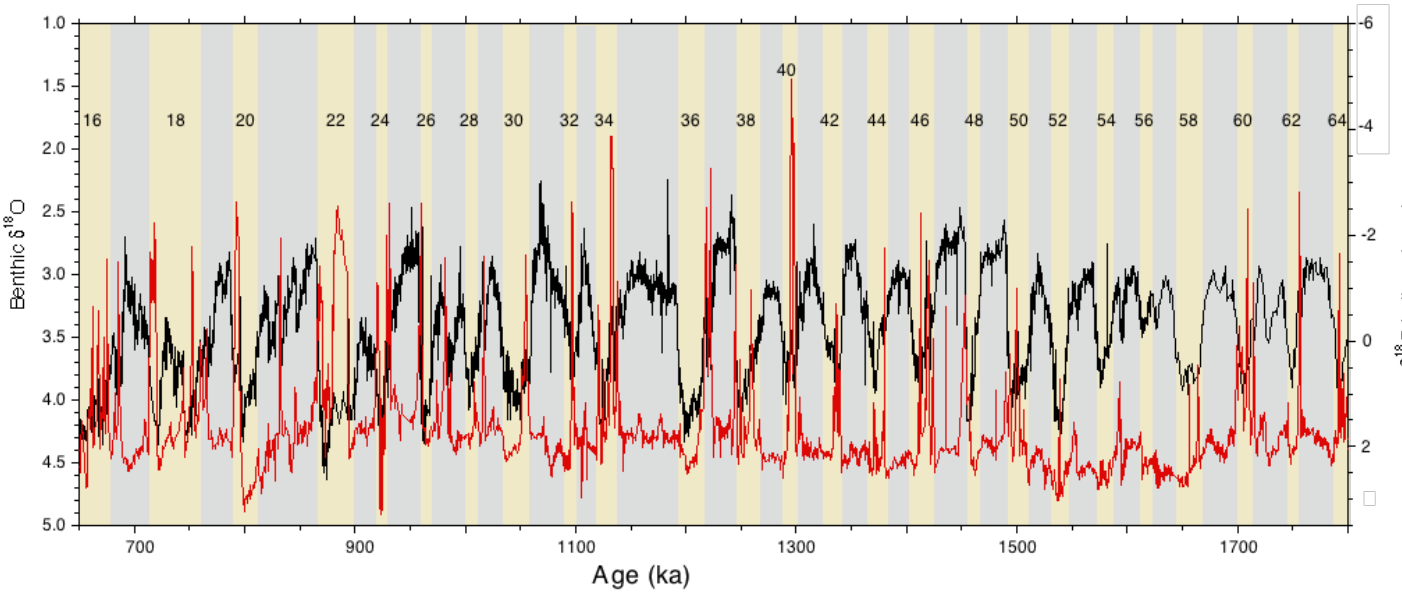
figS01


10
1
$\delta^{18}O$ (benthic minus bulk)
2-3
5
8
10
11
12
15
22
31
35
36
40
46
50
60
62
64
78
80
82
86
88
98
100
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
Age (ka)

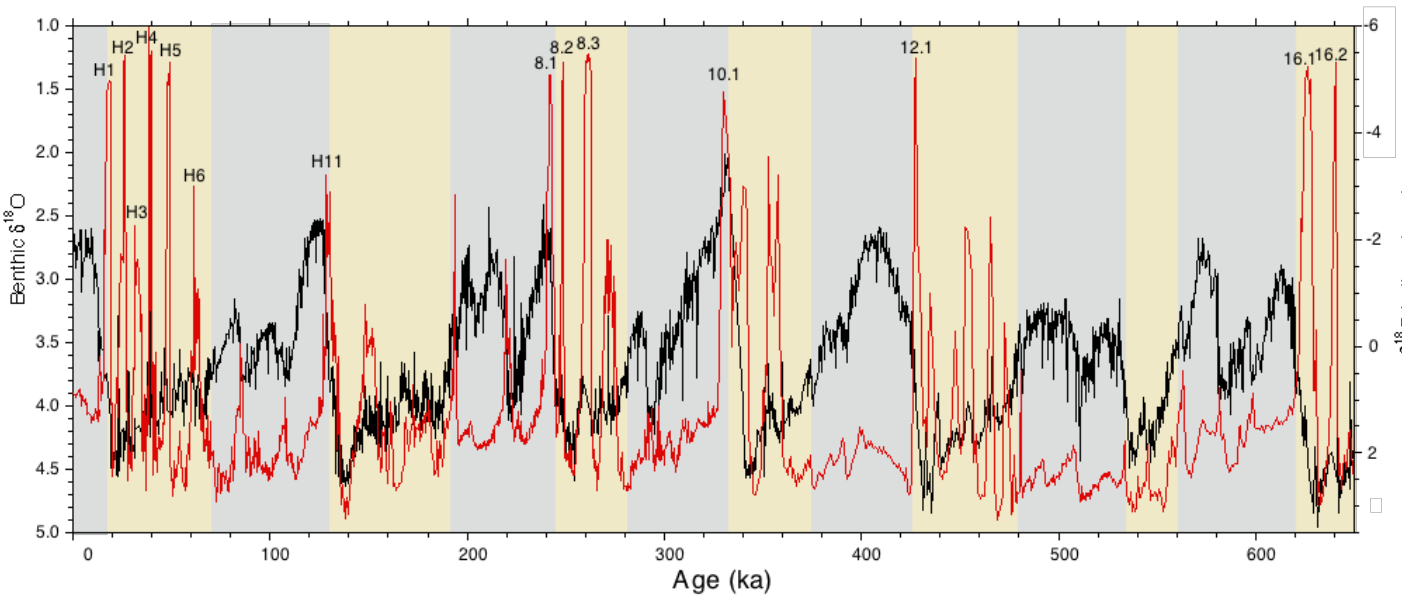
figS02


Benthic δ18O
δ18O bulk carbonate
Age (ka)
hiatus
66
70
72
74
76
78
80
82
84
86
88
90
92
94
96
98
100
102
G6
G8
G 10
G 12
G 14
G 16
G 18
G 20
KM 2

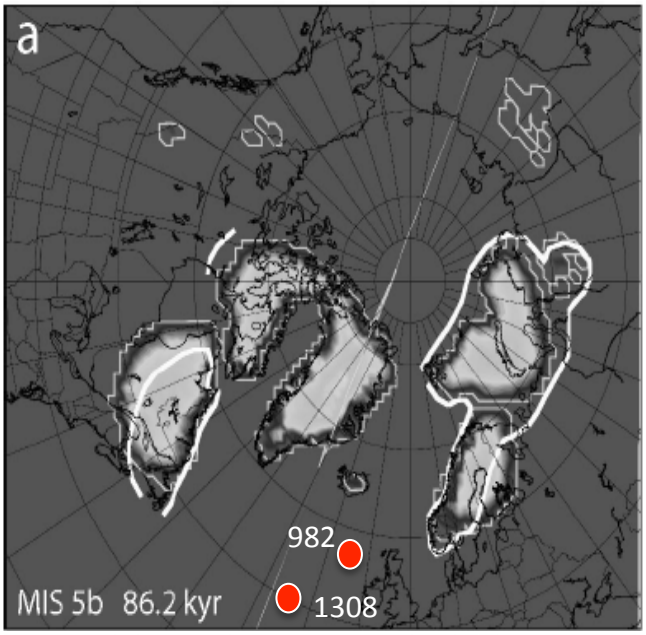
figS03

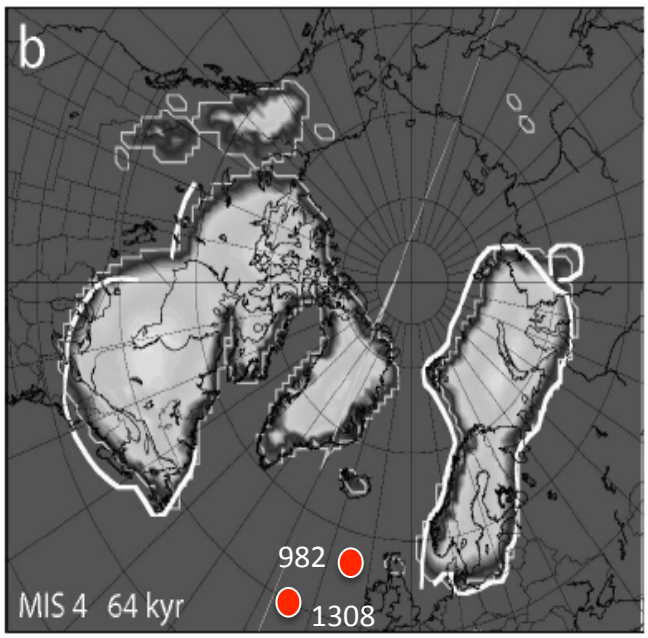

Benthic δ18O
δ18O bulk carbonate
Age (ka)
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
700
900
1100
1300
1500
1700
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
-6
-4
-2
0
2

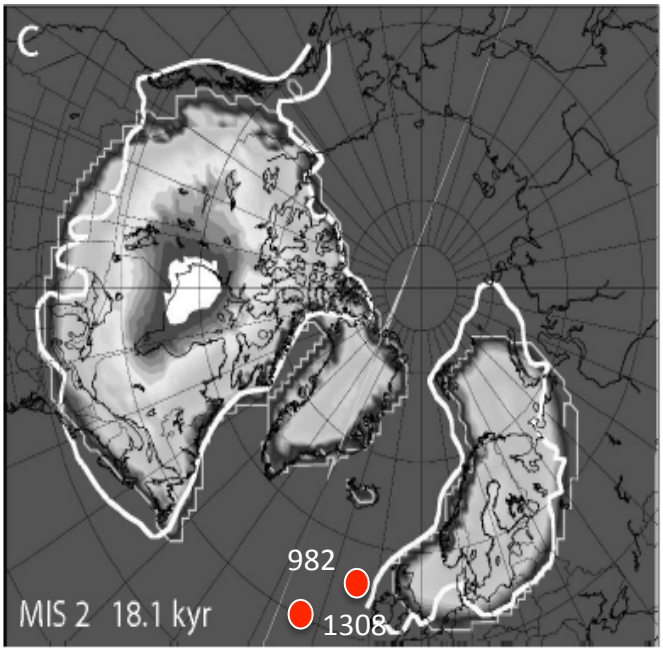
figS04


Benthic δ18O
δ18O bulk carbonate
Age (ka)
H1
H2
H3
H4
H5
H6
H11
8.1
8.2
8.3
10.1
12.1
16.1
16.2
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
6
4
2
0
-2
-4
0
100
200
300
400
500
600

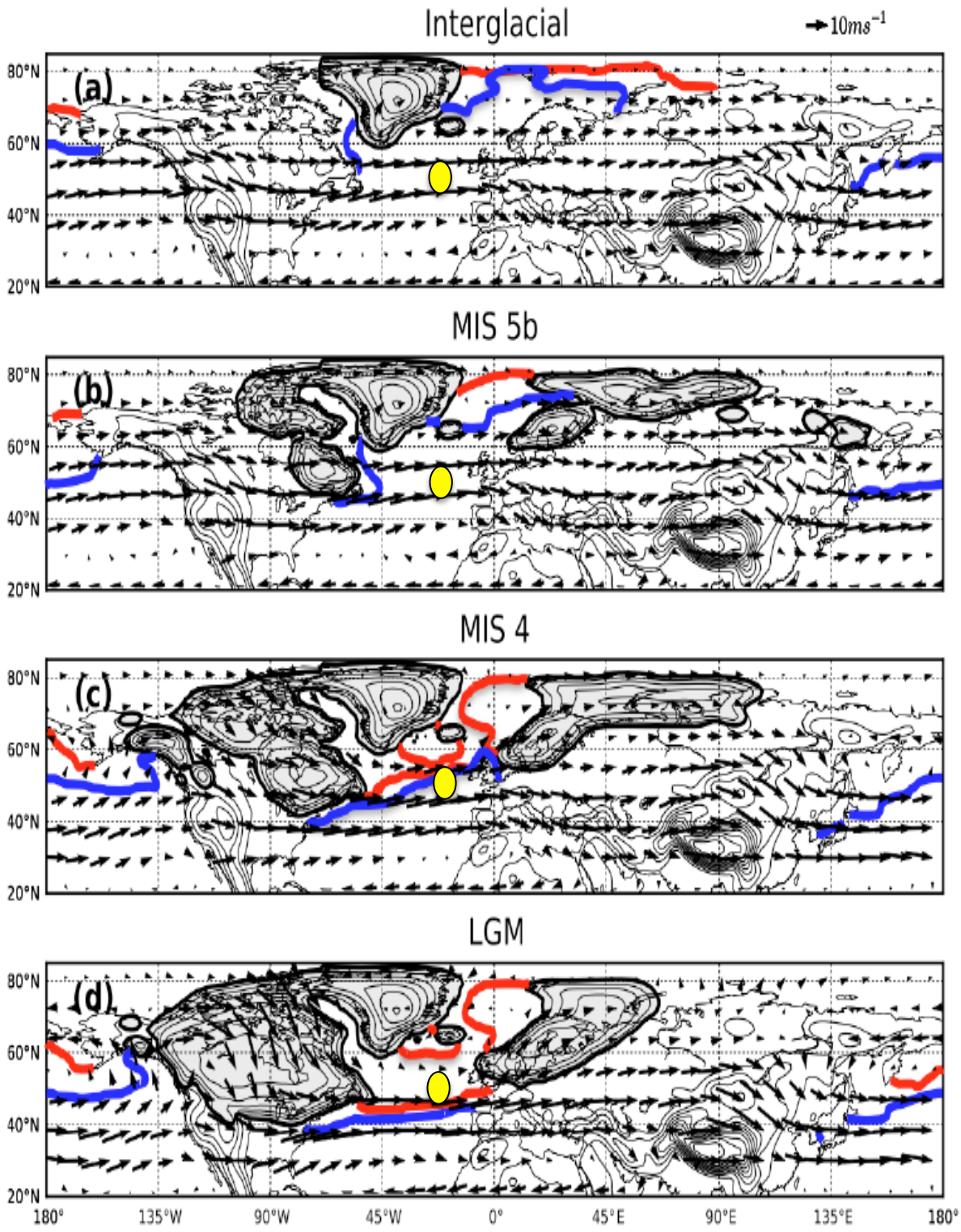
figS05


a
982
1308
MIS 5b 86.2 kyr


b
982
1308
MIS 4 64 kyr


c
982
1308
MIS 2 18.1 kyr

figS06


Interglacial
10ms⁻¹
(a)
MIS 5b
(b)
MIS 4
(c)
LGM
(d)
80°N
60°N
40°N
20°N
180°
135°W
90°W
45°W
0°
45°E
90°E
135°E
180°

figS07