Eronen et al.

Supporting information figure captions:

Figure DR1. Mean hypsodonty patterns for **A:** Early Miocene (Eurasia = 23-17 Ma, North America = 23-17.5 Ma); **B:** early Middle Miocene (Eurasia = 17-15 Ma, North America = 17.5-14.8 Ma); **C:** late Middle Miocene (Eurasia = 15-11.1 Ma, North America = 14.8-12.1 Ma); **D:** early Late Miocene (Eurasia = 11.1-8 Ma, North America = 12.1-7.6 Ma); **E:** late Late Miocene (Eurasia = 8-5.3 Ma, North America = 7.6-4.9 Ma); **F:** Pliocene (Eurasia = 5.3-1.8 Ma, North America = 4.9-1.9 Ma).

Figure DR2. Detailed high-resolution patterns of the estimated precipitation values without individual localities indicated. **A:** Early Miocene (Eurasia = 23-17 Ma, North America = 23-17.5 Ma); **B:** early Middle Miocene (Eurasia = 17-15 Ma, North America = 17.5-14.8 Ma); **C:** late Middle Miocene (Eurasia = 15-11.1 Ma, North America = 14.8-12.1 Ma); **D:** early Late Miocene (Eurasia = 11.1-8 Ma, North America = 12.1-7.6 Ma); **E:** late Late Miocene (Eurasia = 8-5.3 Ma, North America = 7.6-4.9 Ma); **F:** Pliocene (Eurasia = 5.3-1.8 Ma, North America = 4.9-1.9 Ma).

Figure DR3. Detailed high-resolution patterns of the mean hypsodonty values without individual localities indicated **A:** Early Miocene (Eurasia = 23-17 Ma, North America = 23-17.5 Ma); **B:** early Middle Miocene (Eurasia = 17-15 Ma, North America = 17.5-14.8 Ma); **C:** late Middle Miocene (Eurasia = 15-11.1 Ma, North America = 14.8-12.1 Ma); **D:** early Late Miocene (Eurasia = 11.1-8 Ma, North America = 12.1-7.6 Ma); **E:** late Late Miocene

(Eurasia = 8-5.3 Ma, North America = 7.6-4.9 Ma); **F:** Pliocene (Eurasia = 5.3-1.8 Ma, North America = 4.9-1.9 Ma).

Figure DR4. Wind field for the Late Miocene at 500 hPa pressure level. Control run with 100% ocean flux correction.

Figure DR5. Wind field for the Late Miocene at 500 hPa pressure level. Run with 75% ocean flux correction.

Figure DR6. Wind field for the Late Miocene at 500 hPa pressure level. Run with 50% ocean flux correction.

Figure DR7 (High-resolution digital version of Fig. 2): Wind field anomalies at 500 hPa pressure level (ca. 5000 m altitude) for the late Miocene (11-7 Ma) climate model run for different levels of ocean heat flux in the North Atlantic Ocean. Difference of wind fields at reduced ocean flux correction minus standard 100% condition. For ocean flux correction A: 75%, B: 50%. Unit: m/s.

Supplementary Information 1

Mean hypsodonty patterns for

a) Early Miocene (Eurasia = 23-17 Ma, North America = 23-17.5 Ma);

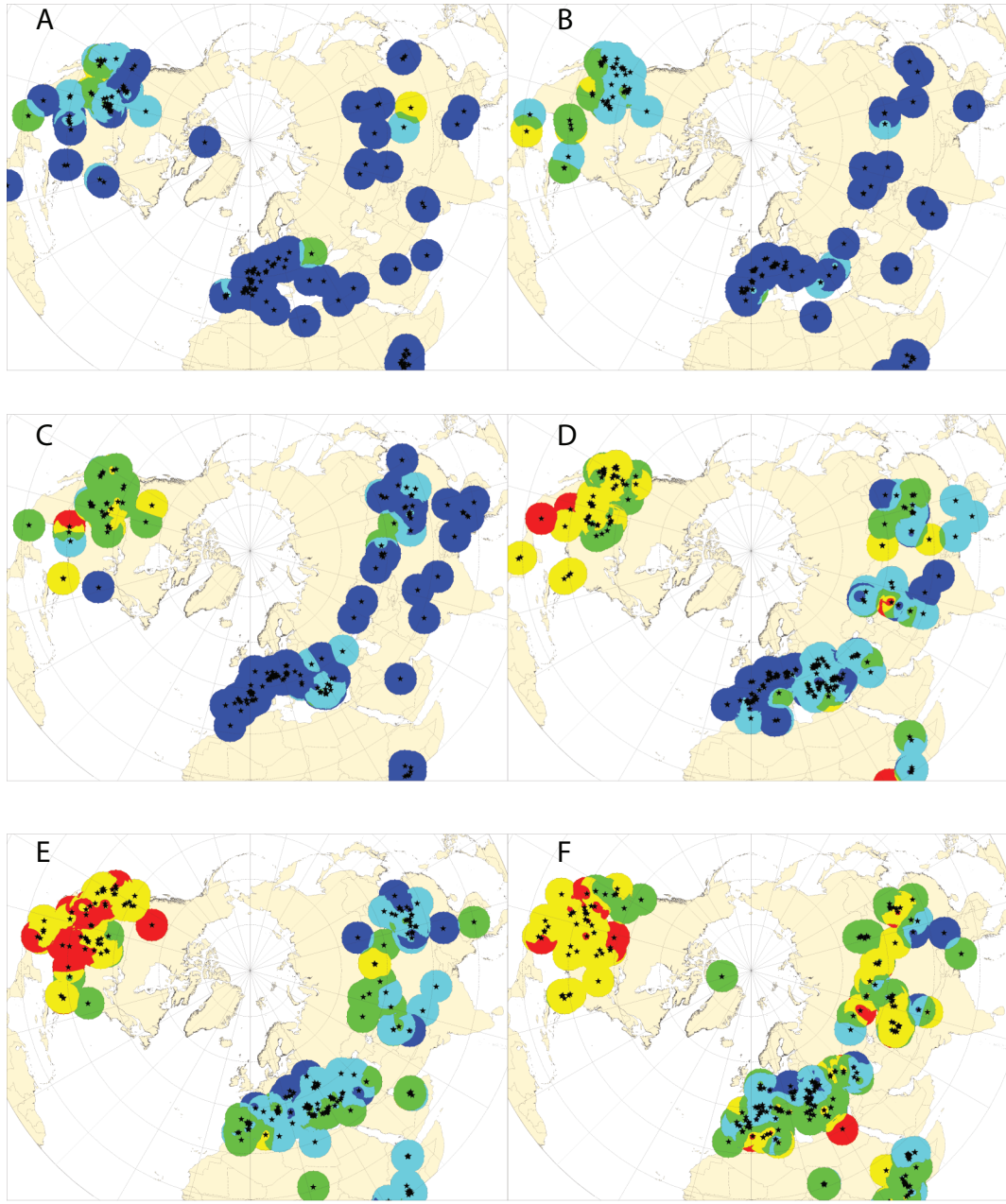
b) early Middle Miocene (Eurasia = 17-15 Ma, North America = 17.5-14.8 Ma);

c) late Middle Miocene (Eurasia = 15-11.1 Ma, North America = 14.8-12.1 Ma);

d) early Late Miocene (Eurasia = 11.1-8 Ma, North America = 12.1-7.6 Ma);

e) late Late Miocene (Eurasia = 8-5.3 Ma, North America = 7.6-4.9 Ma);

f) Pliocene (Eurasia = 5.3-1.8 Ma, North America = 4.9-1.9 Ma)



Mean ordinated hypsodonty

- 1.0-1.4
- 1.4-1.8
- 1.8-2.2
- 2.2-2.6
- 2.6-3

Supplementary Information 2

Estimated precipitation mm / Year

- 0-300
- 300-500
- 500-700
- 700-800
- 800-1200
- 1200-1500

Detailed patterns of the estimated precipitation values without individual localities indicated

a) Early Miocene (Eurasia = 23-17 Ma, North America = 23-17.5 Ma);

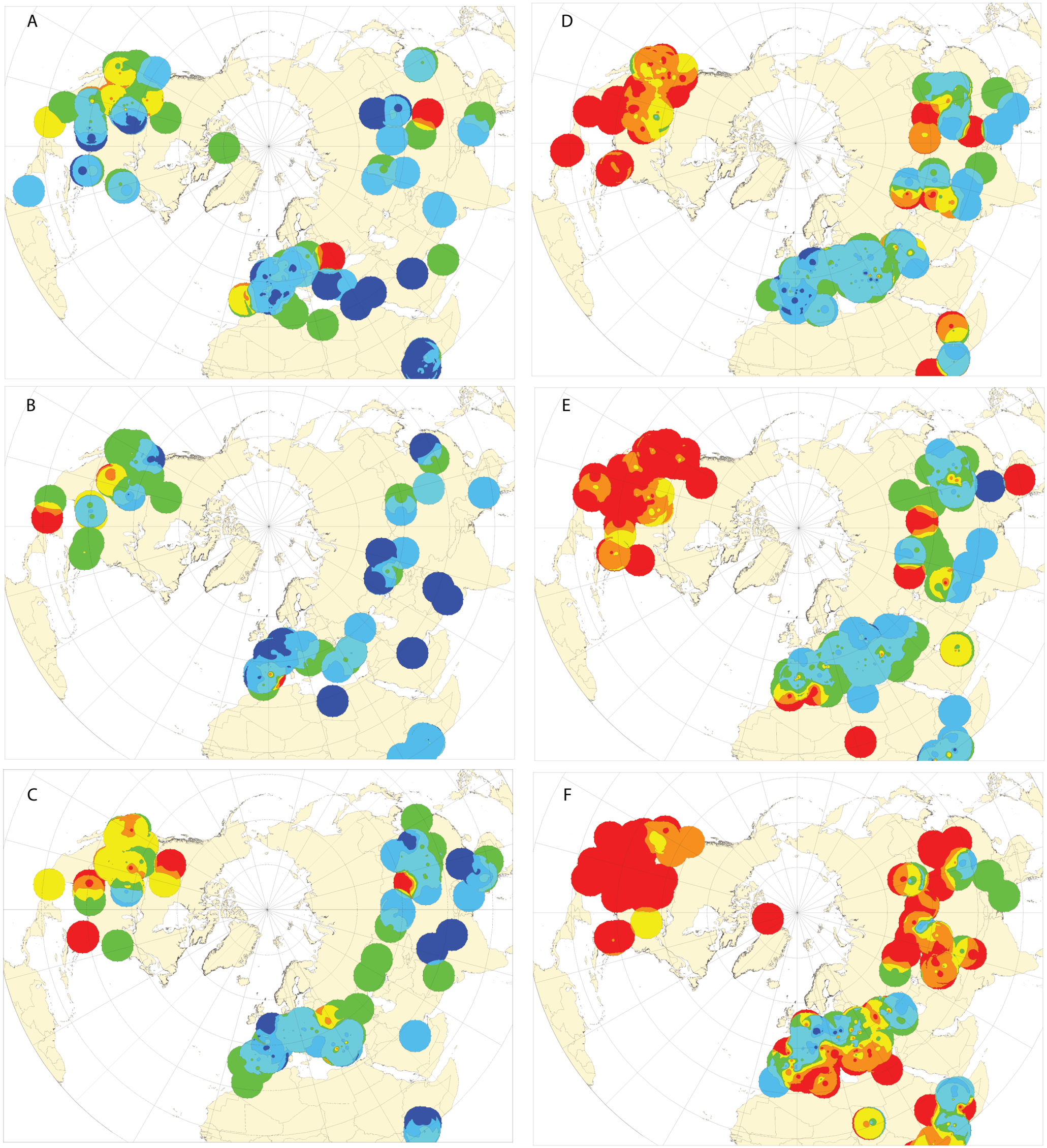
b) early Middle Miocene (Eurasia = 17-15 Ma, North America = 17.5-14.8 Ma);

c) late Middle Miocene (Eurasia = 15-11.1 Ma, North America = 14.8-12.1 Ma);

d) early Late Miocene (Eurasia = 11.1-8 Ma, North America = 12.1-7.6 Ma);

e) late Late Miocene (Eurasia = 8-5.3 Ma, North America = 7.6-4.9 Ma);

f) Pliocene (Eurasia = 5.3-1.8 Ma, North America = 4.9-1.9 Ma)



Supplementary Information 3

Detailed patterns of the mean hypsodonty values without individual localities indicated

a) Early Miocene (Eurasia = 23-17 Ma, North America = 23-17.5 Ma);

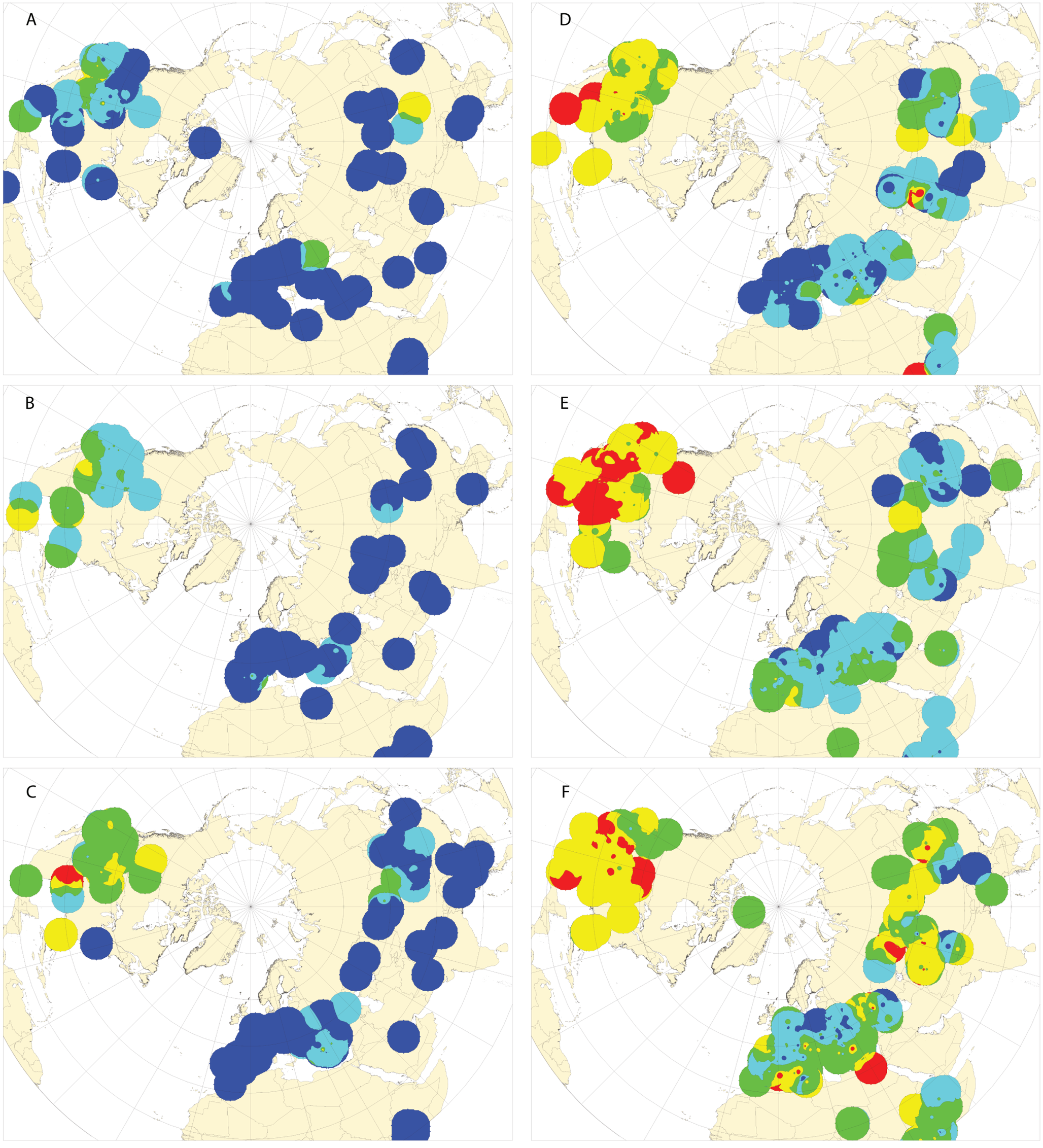
b) early Middle Miocene (Eurasia = 17-15 Ma, North America = 17.5-14.8 Ma);

c) late Middle Miocene (Eurasia = 15-11.1 Ma, North America = 14.8-12.1 Ma);

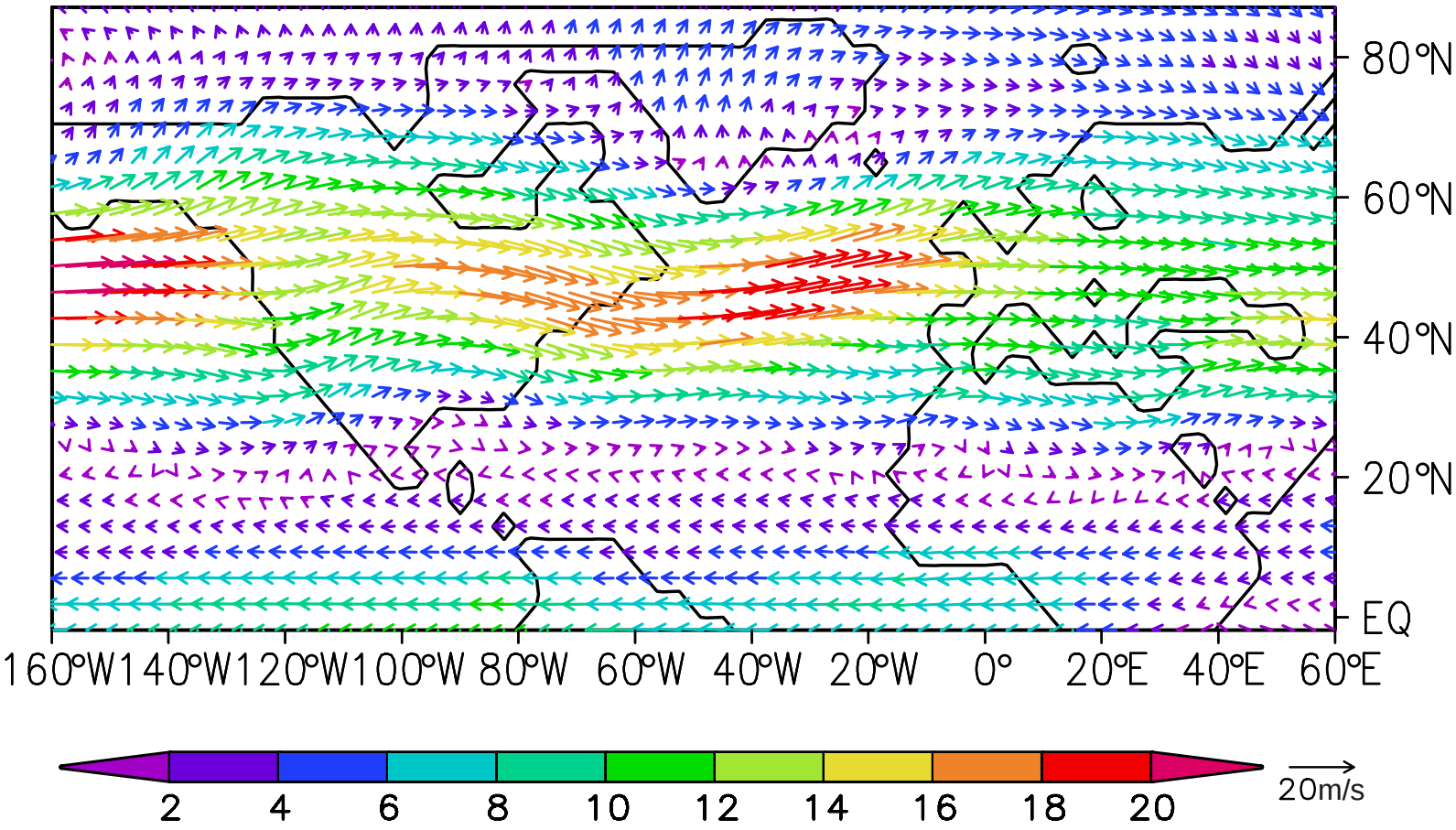
d) early Late Miocene (Eurasia = 11.1-8 Ma, North America = 12.1-7.6 Ma);

e) late Late Miocene (Eurasia = 8-5.3 Ma, North America = 7.6-4.9 Ma);

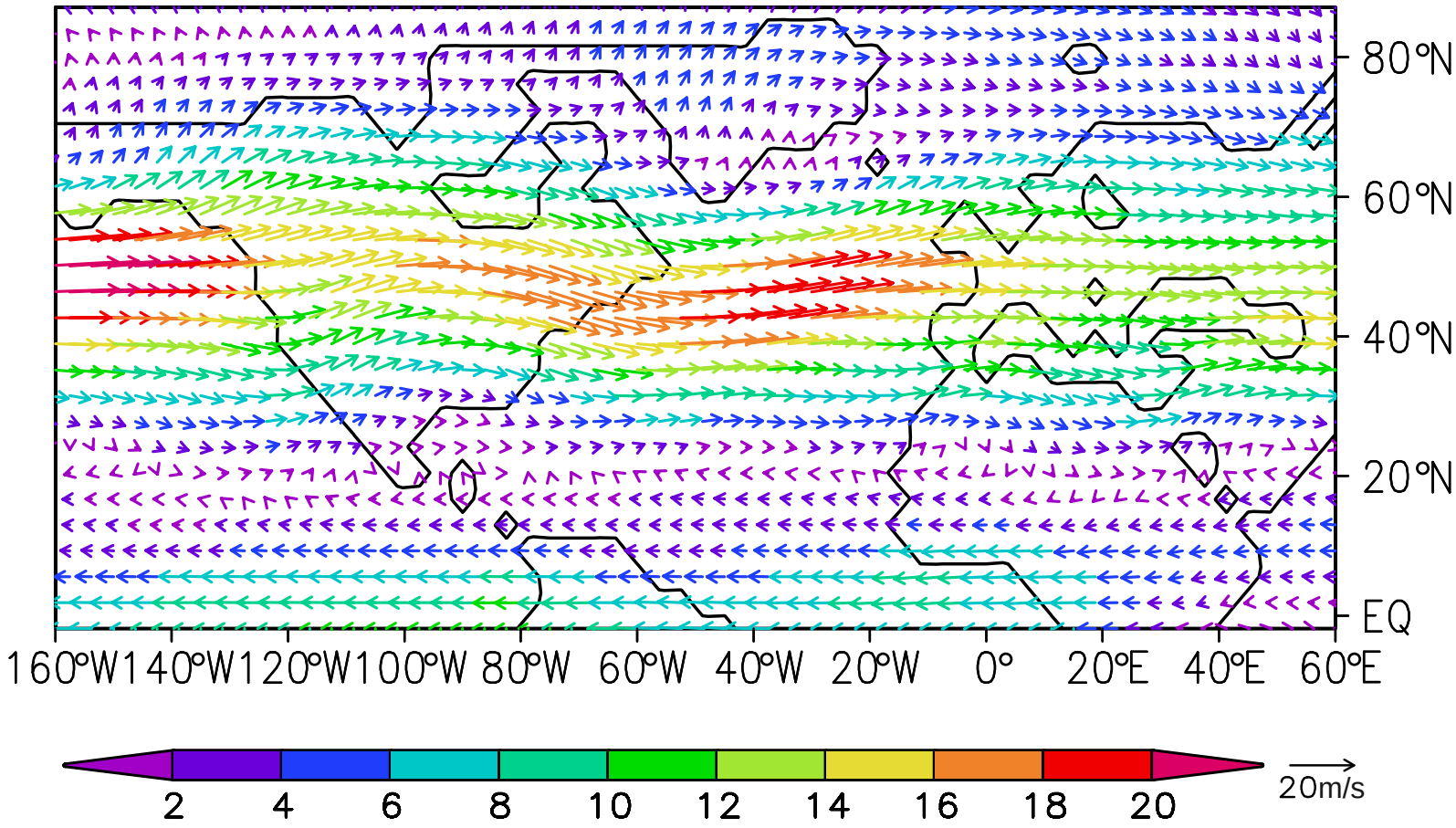
f) Pliocene (Eurasia = 5.3-1.8 Ma, North America = 4.9-1.9 Ma)



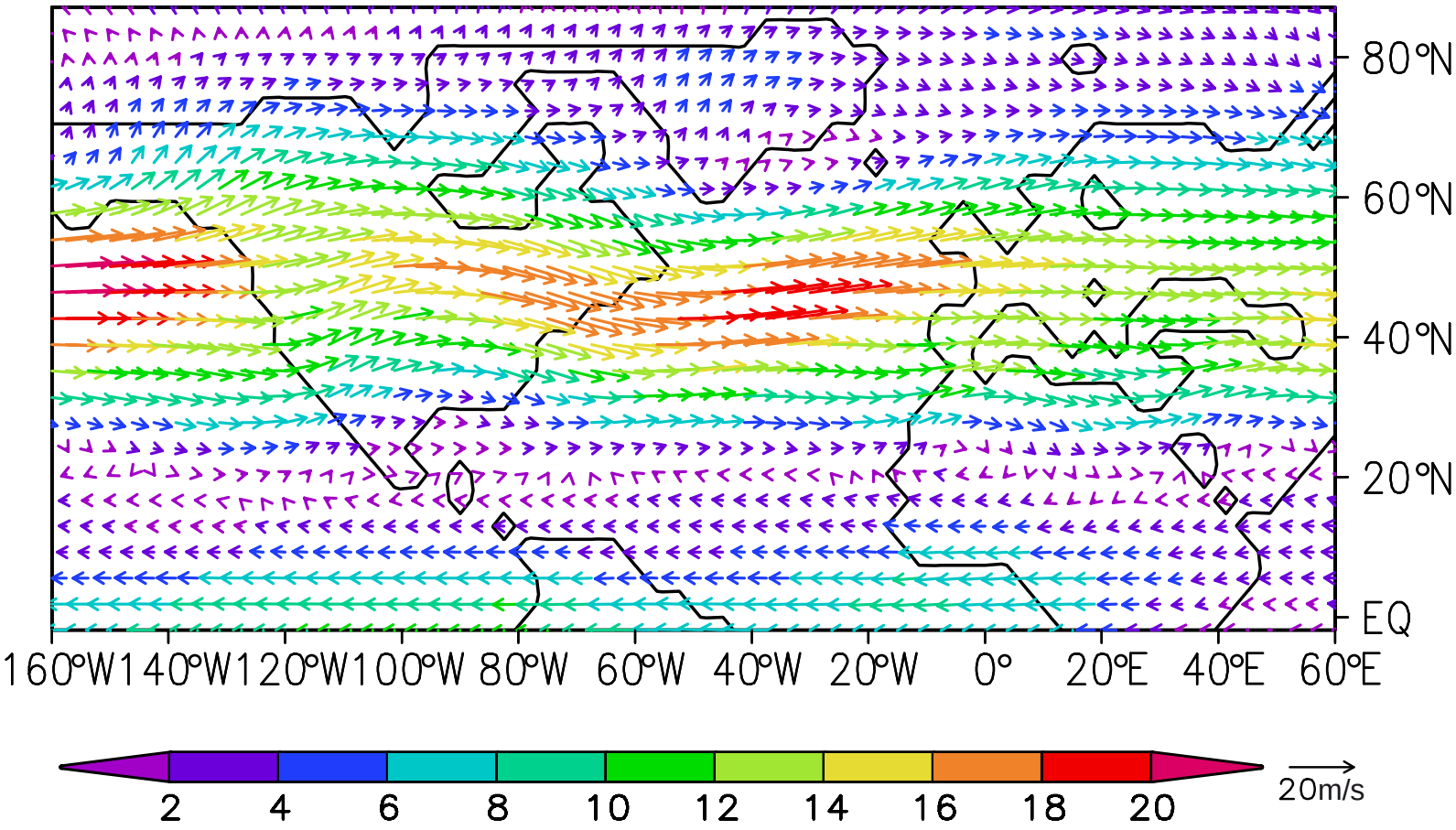
Wind field (500hPa) for Late Miocene
Control run (100% ocean flux correction)

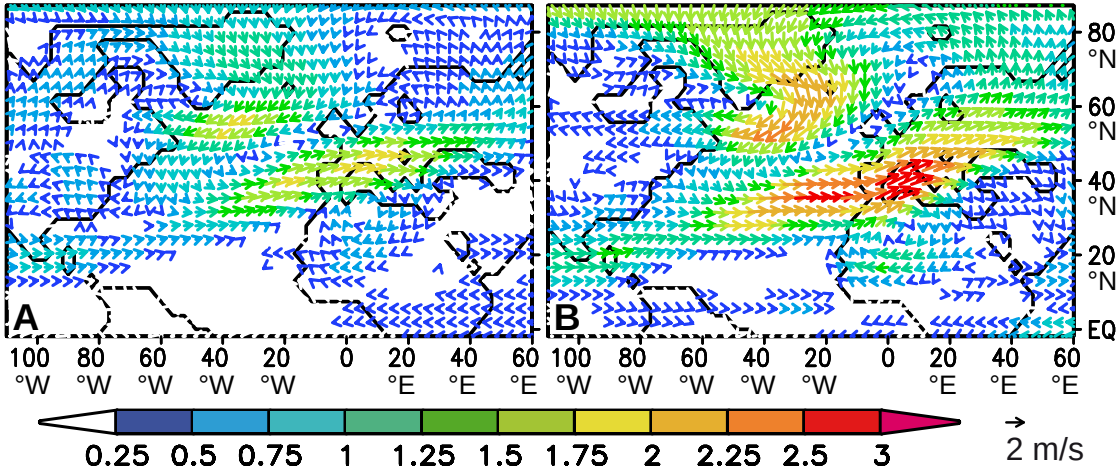


Wind field (500hPa) for Late Miocene
75% ocean flux correction



Wind field (500hPa) for Late Miocene
50% ocean flux correction




A
B
80 °N
60 °N
40 °N
20 °N
EQ
100 °W
80 °W
60 °W
40 °W
20 °W
0
20 °E
40 °E
60 °E
0.25
0.5
0.75
1
1.25
1.5
1.75
2
2.25
2.5
3
2 m/s