



Utrecht University

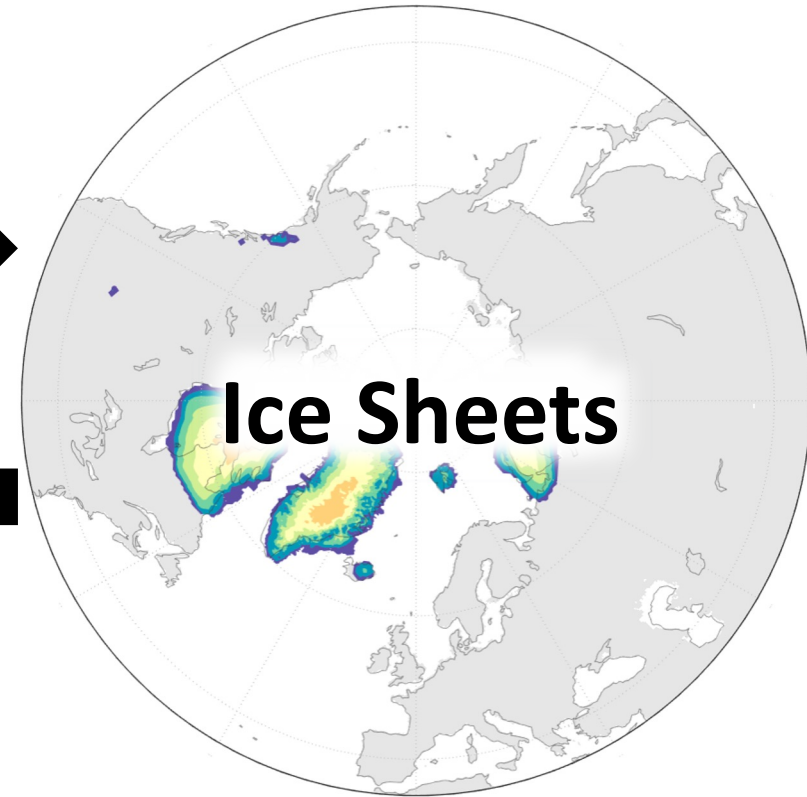
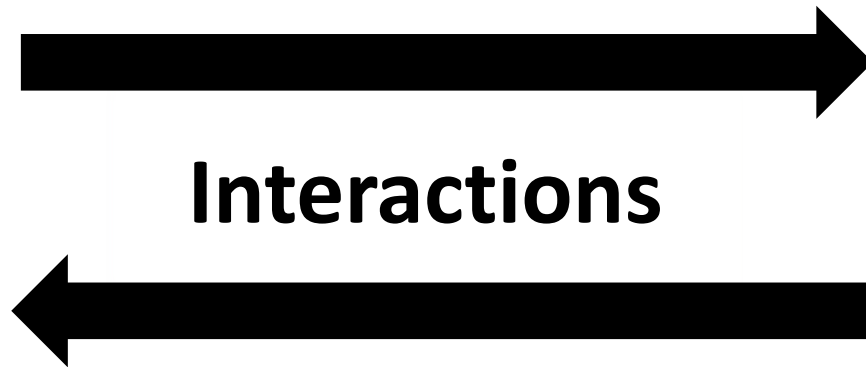
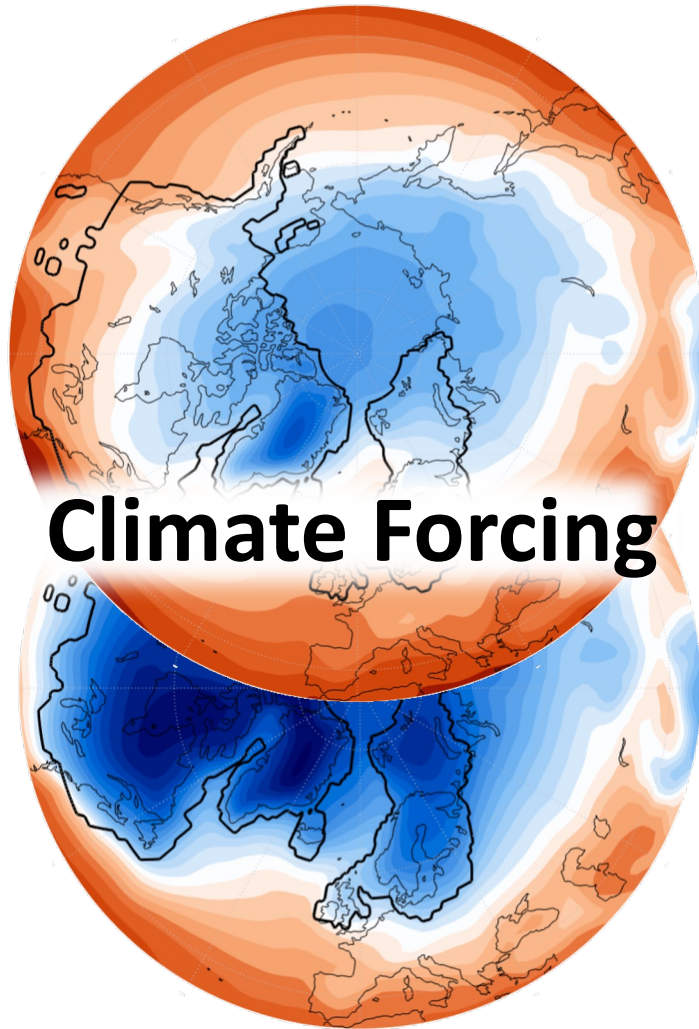
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Marine and Atmospheric
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Simulating the Last Glacial Cycle

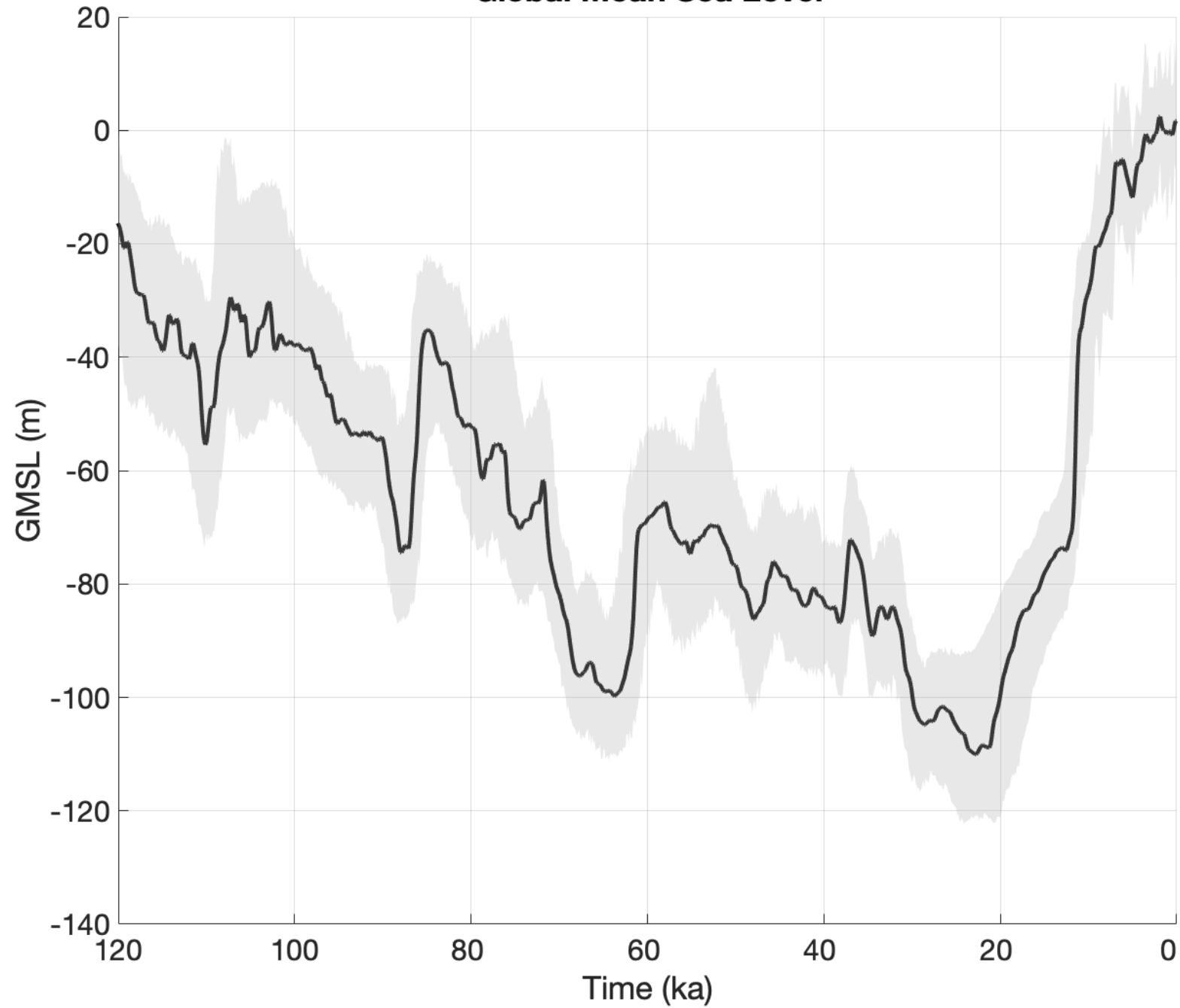
using a Glacial Index and Climate Matrix Method

EGU 2022
23 May 2022

M.D.W. Scherrenberg
C.J.Berends, L.B. Stap, R.S.W. van de Wal



Global Mean Sea Level

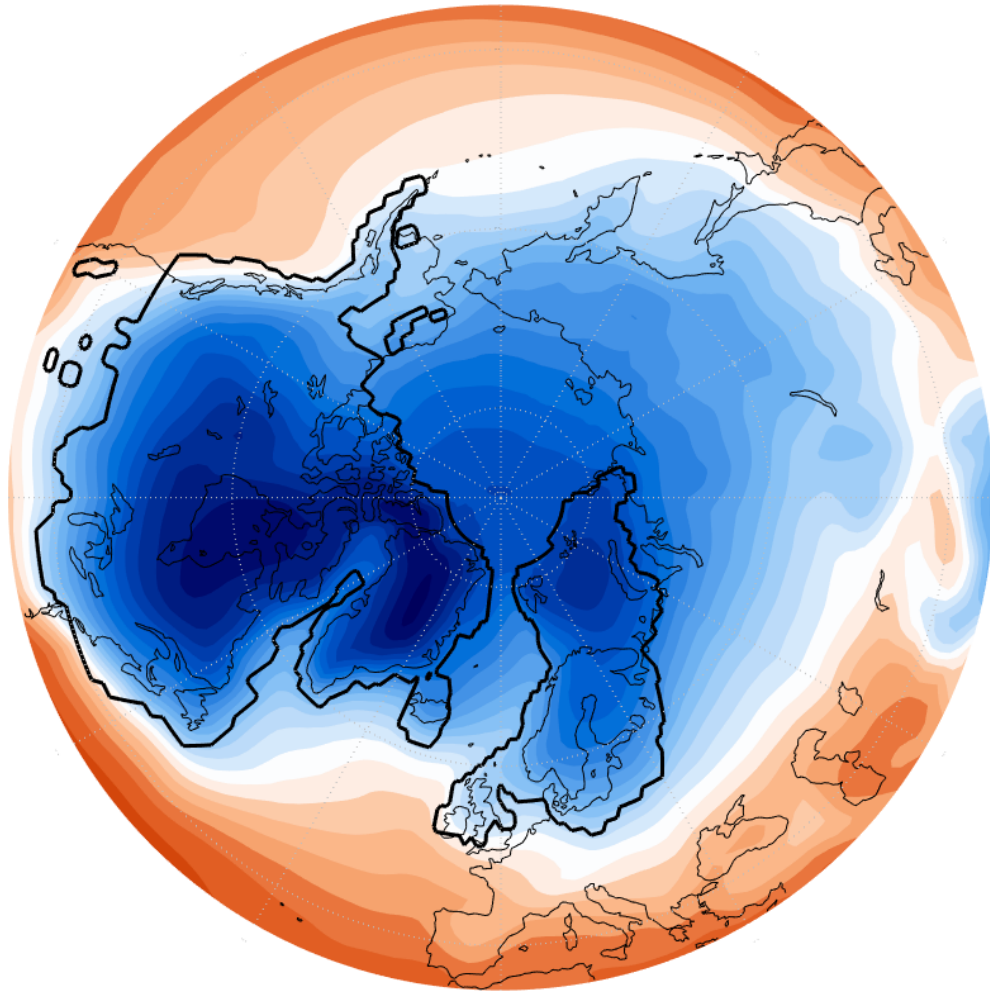


Simulate Ice Sheet-Climate Interactions

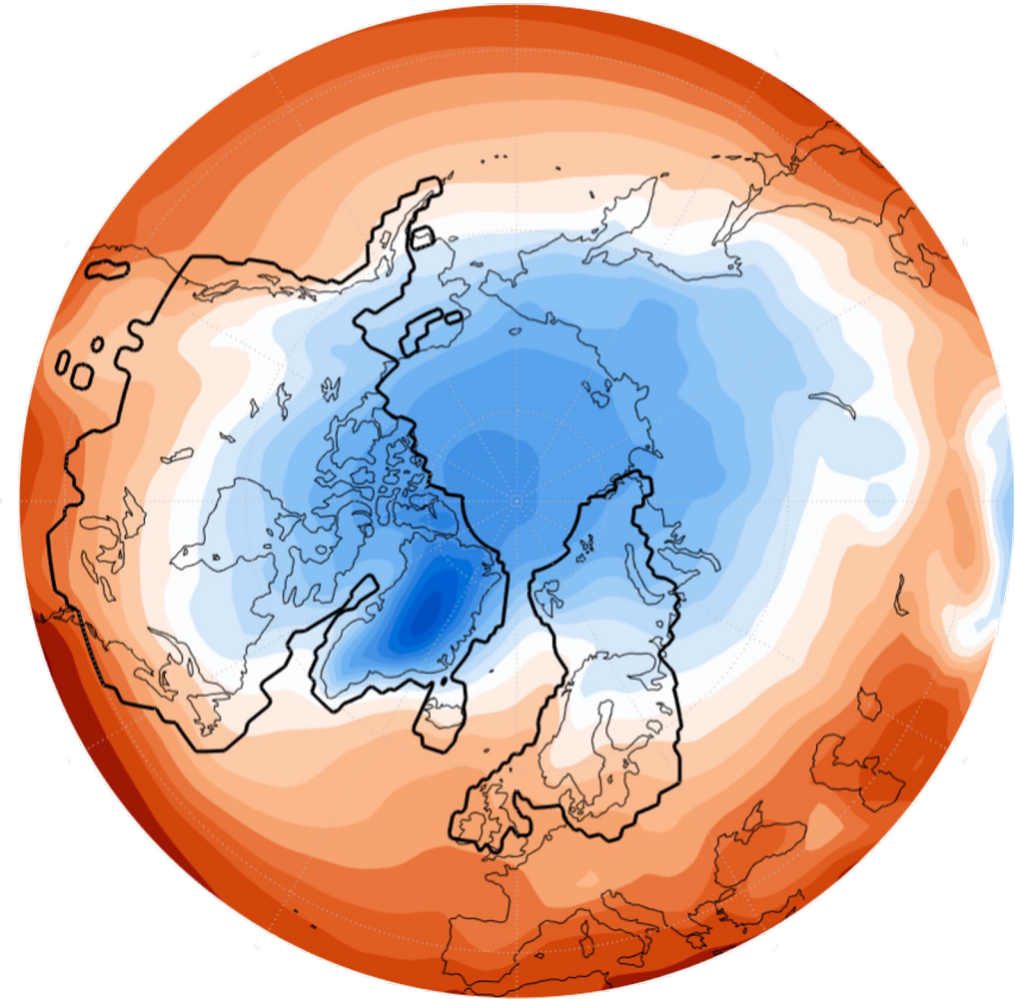
Climate Model

Runtime: *Months – Years*

Last Glacial Maximum (21 ka)



Pre-Industrial (0 ka)



20

10

0

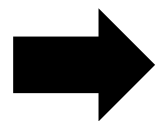
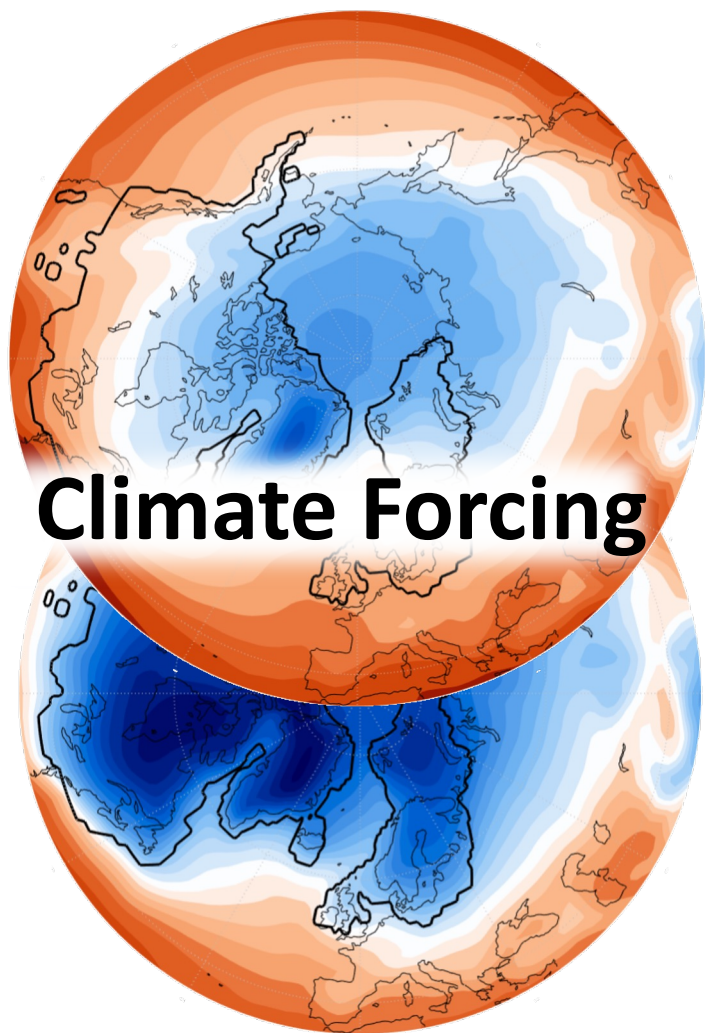
-10

-20

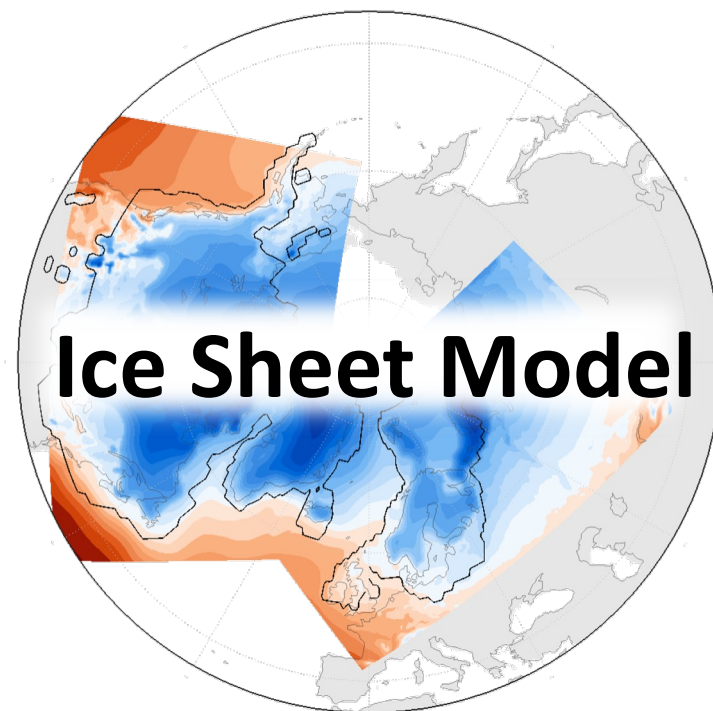
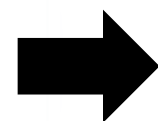
-30

-40

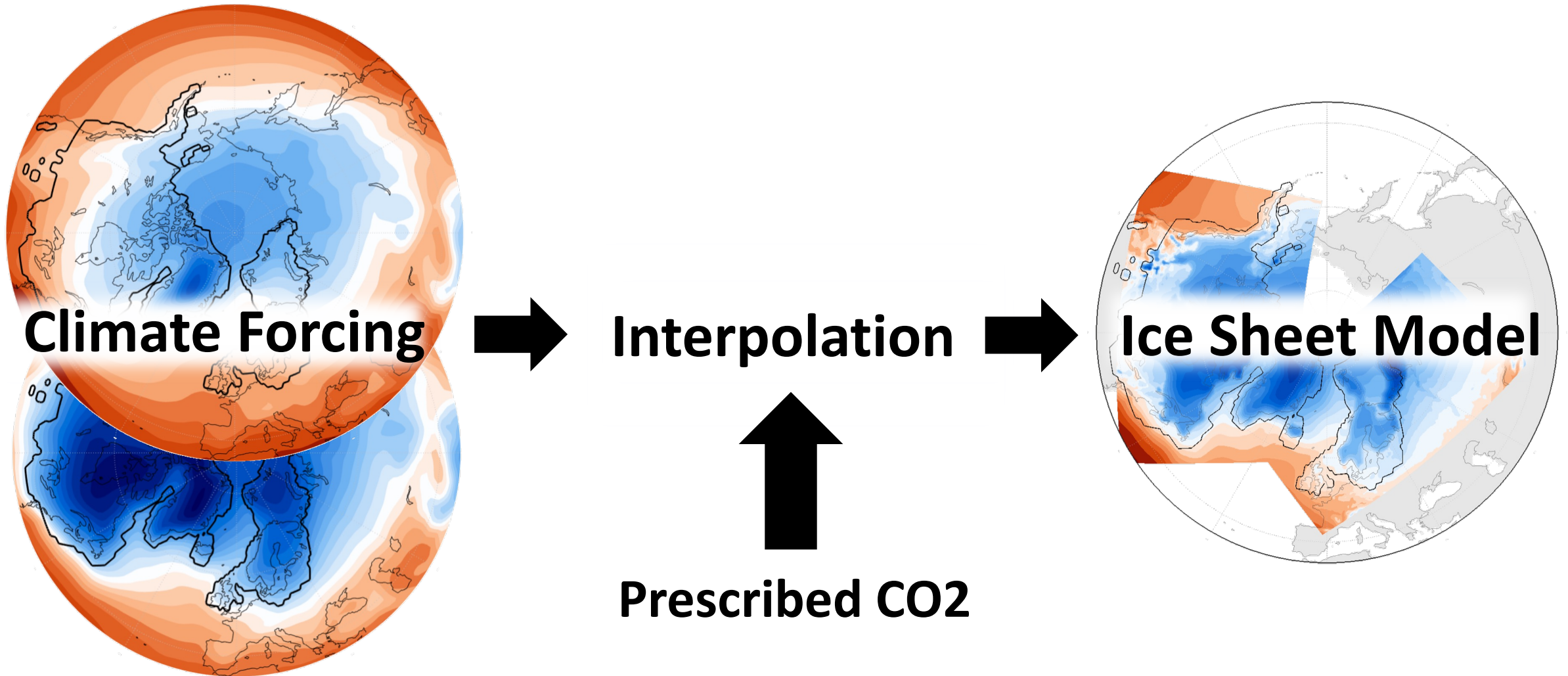
Temperature (°C)



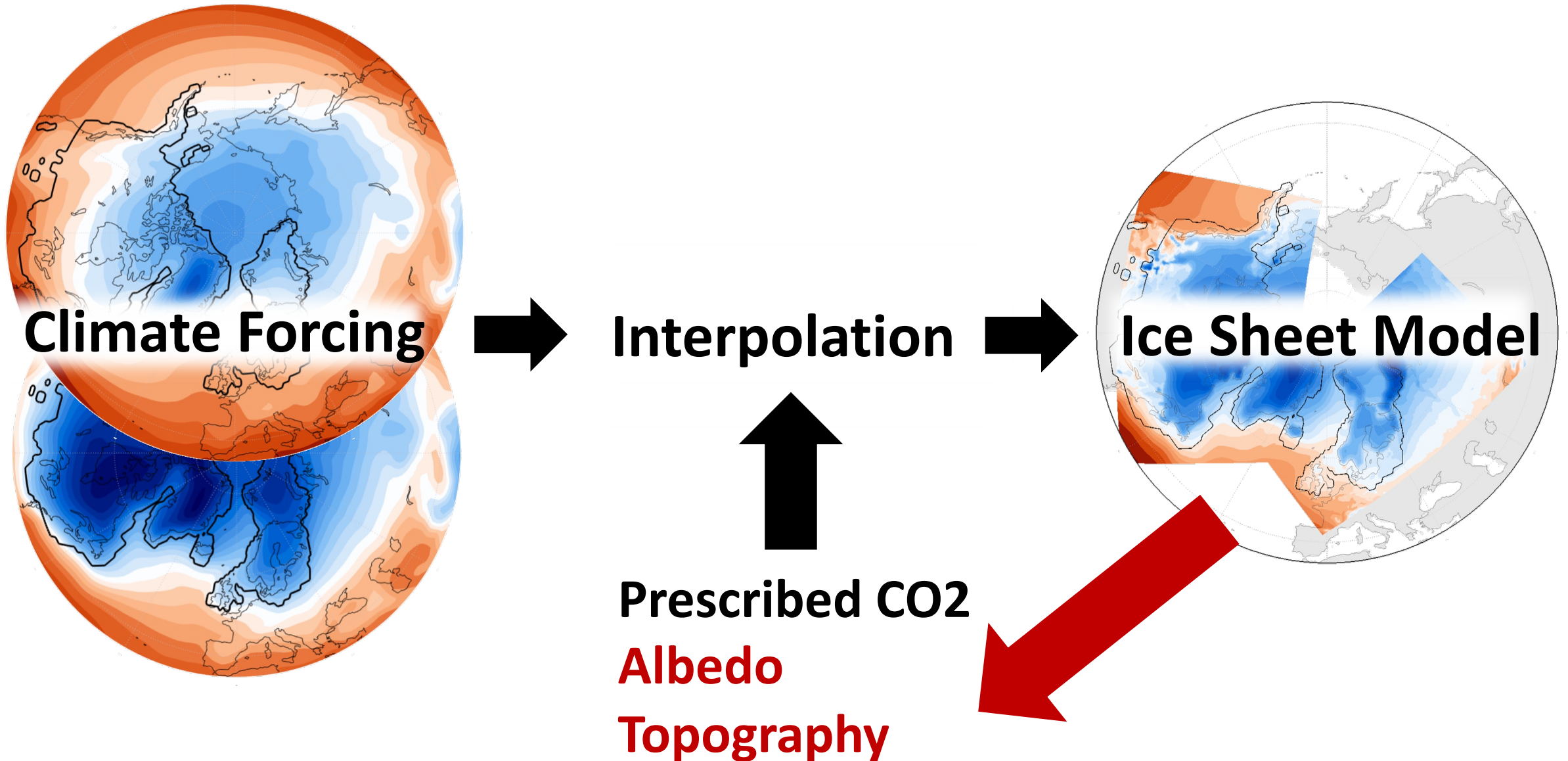
Interpolation



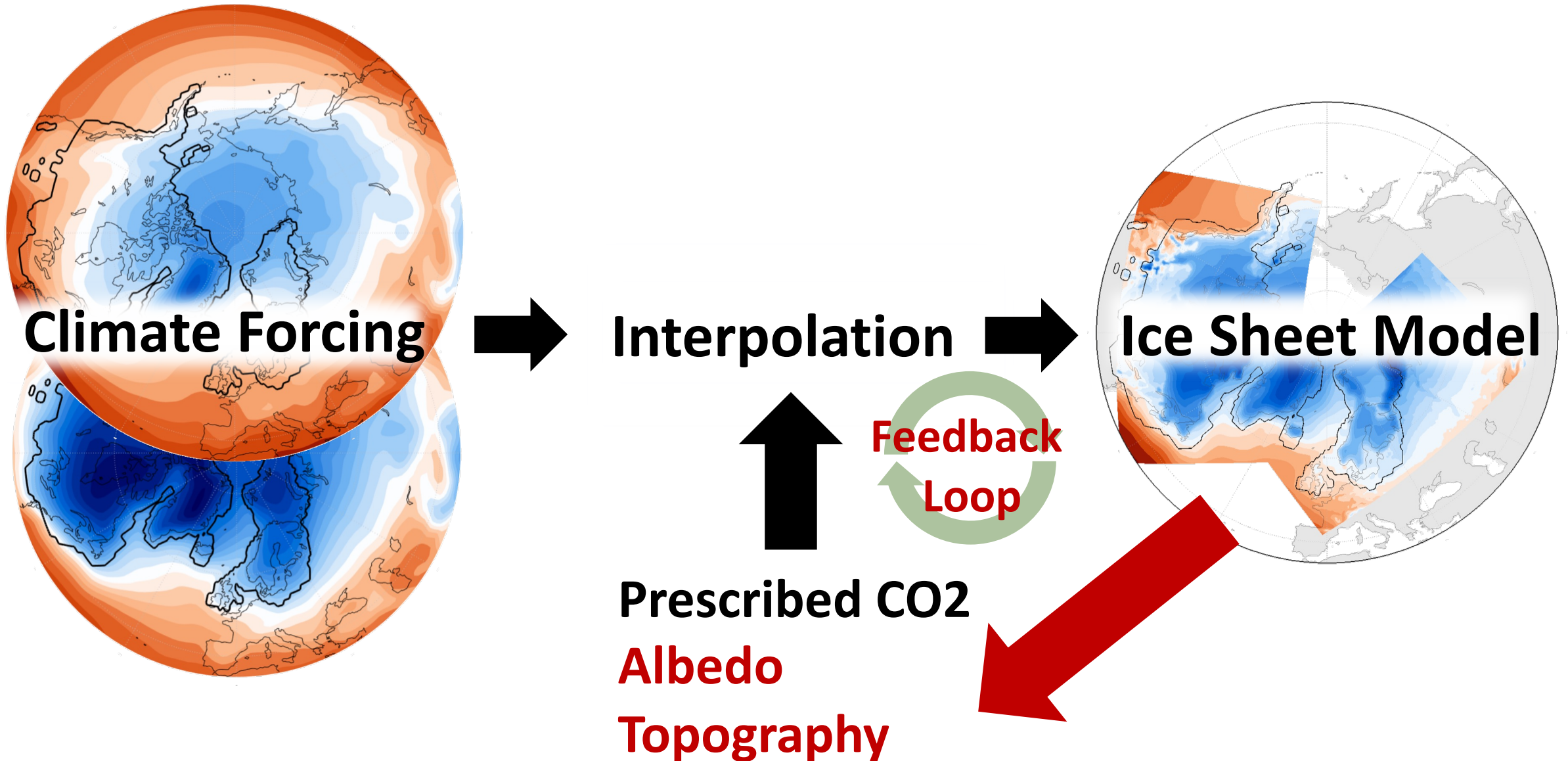
Glacial Index Method



Climate Matrix Method

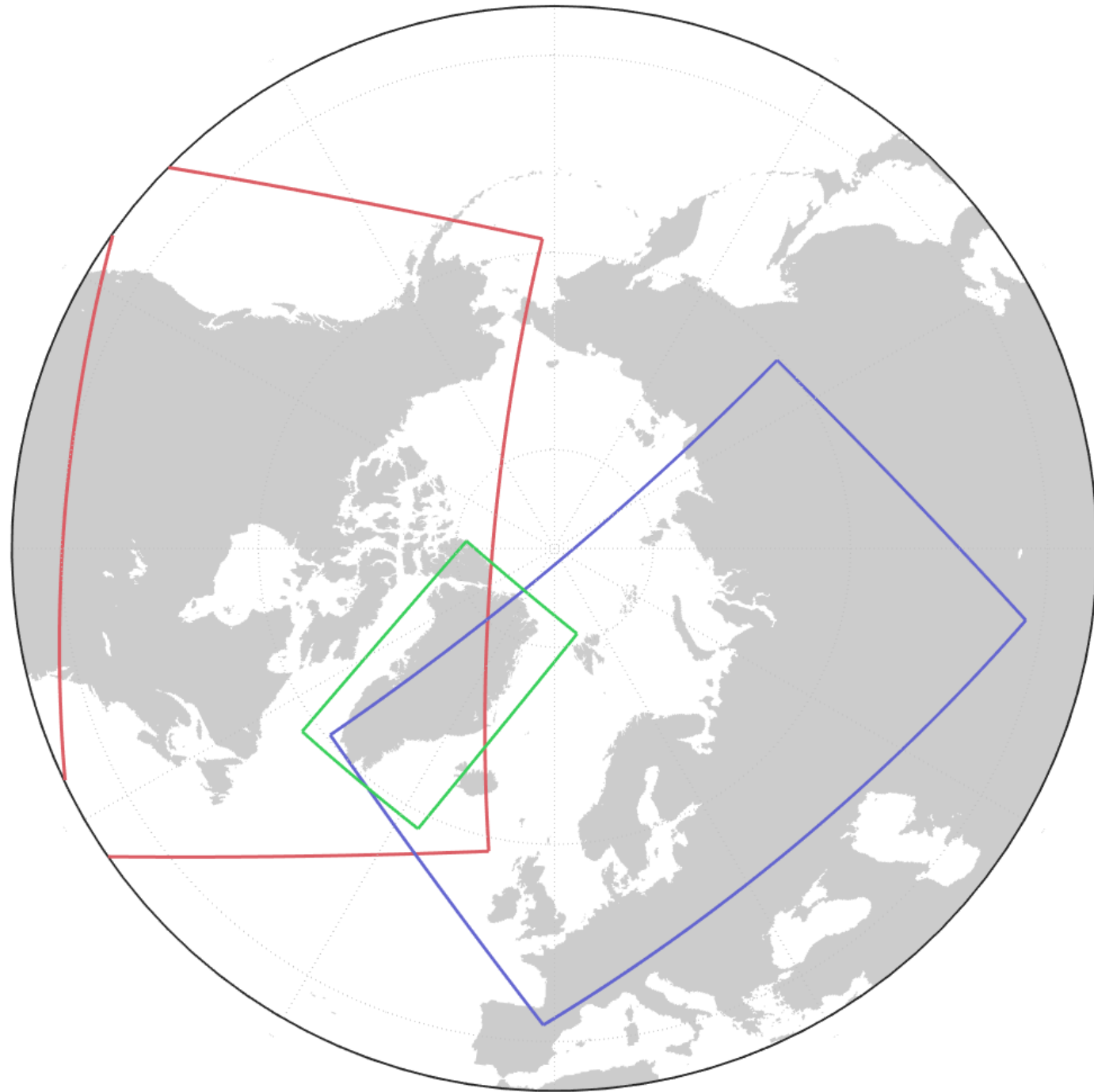


Climate Matrix Method



Ice Sheet Model:

IMAU-ICE 2.0



Ice Sheet Model:

IMAU-ICE 2.0

Climate Forcing:

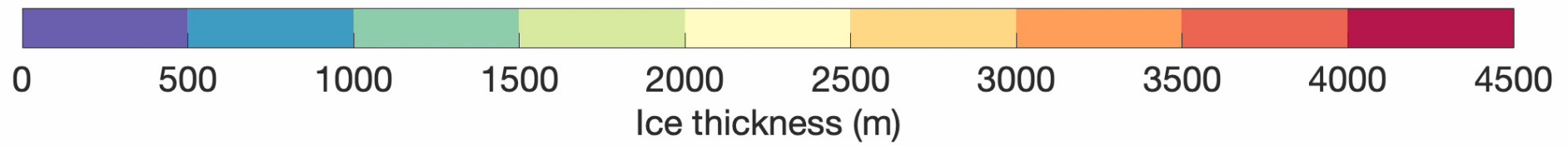
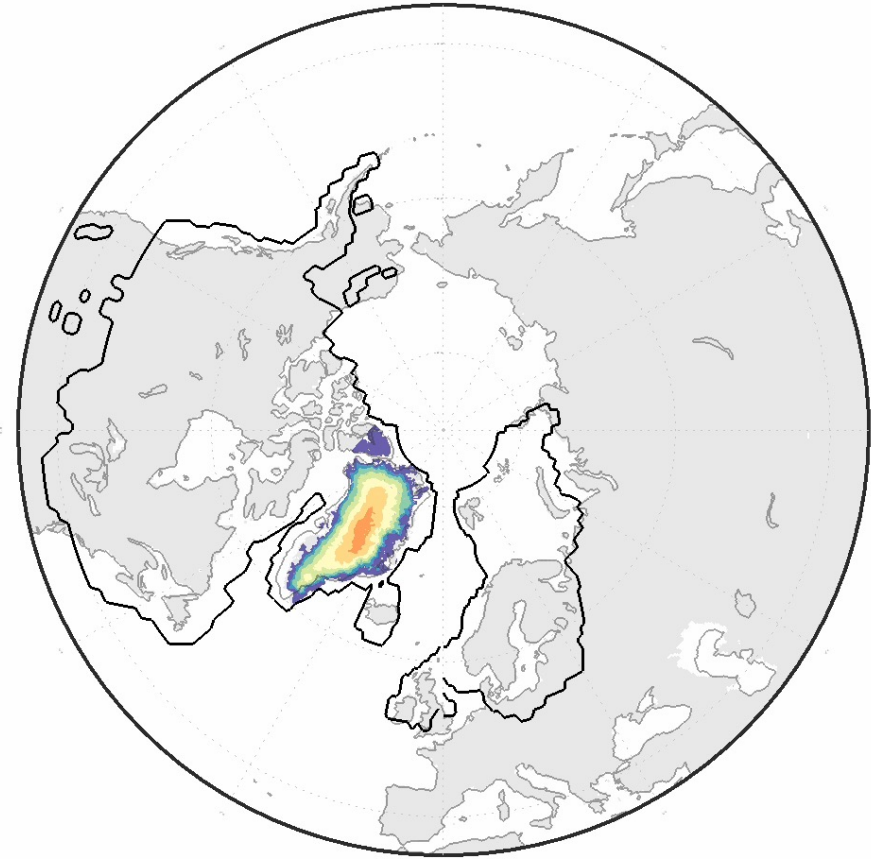
MPI-ESM-P

120 ka

v2 MPI GI



v2 MPI CM



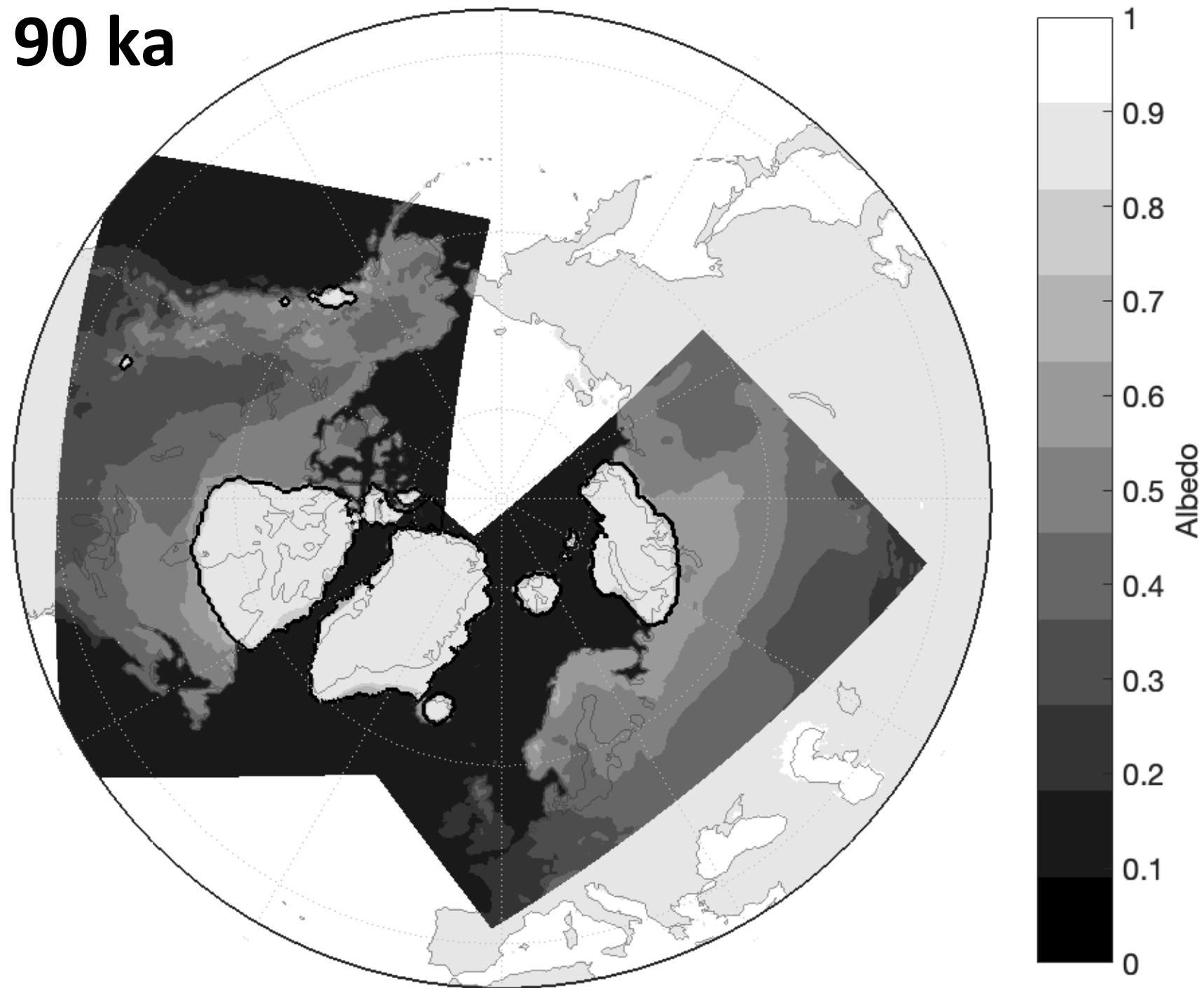
Glacial Index Method



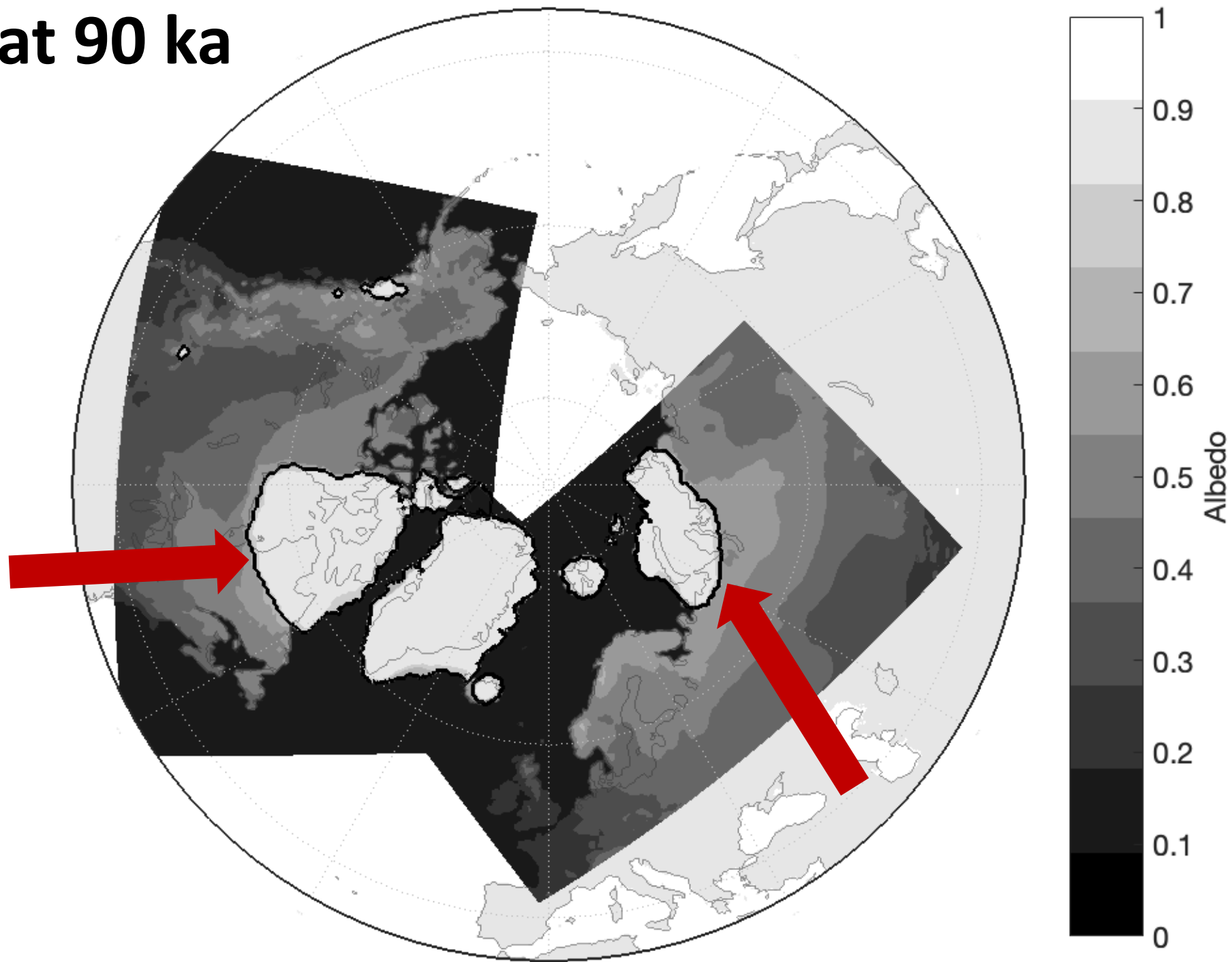
Climate Matrix Method



Albedo at 90 ka

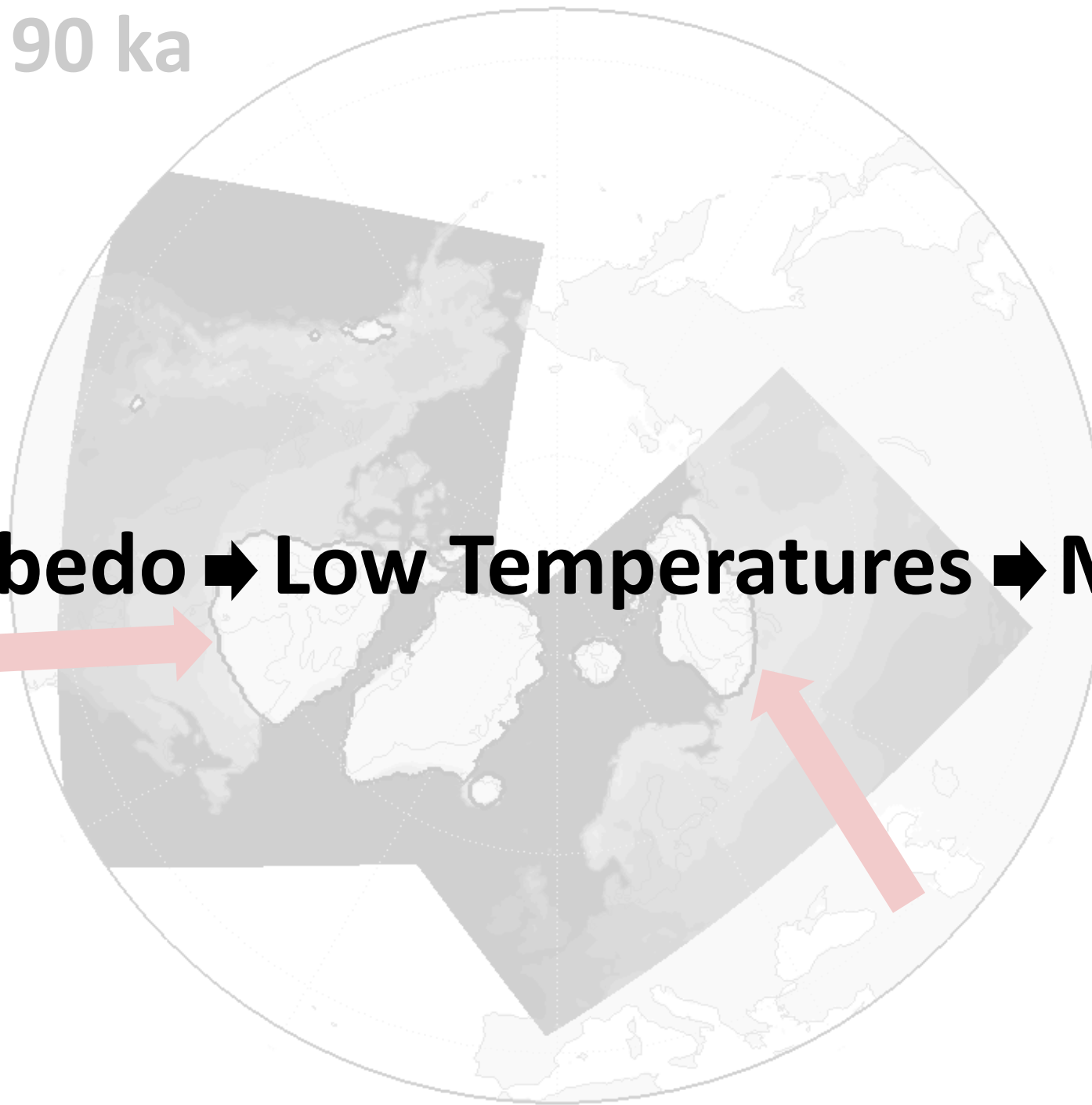


Albedo at 90 ka



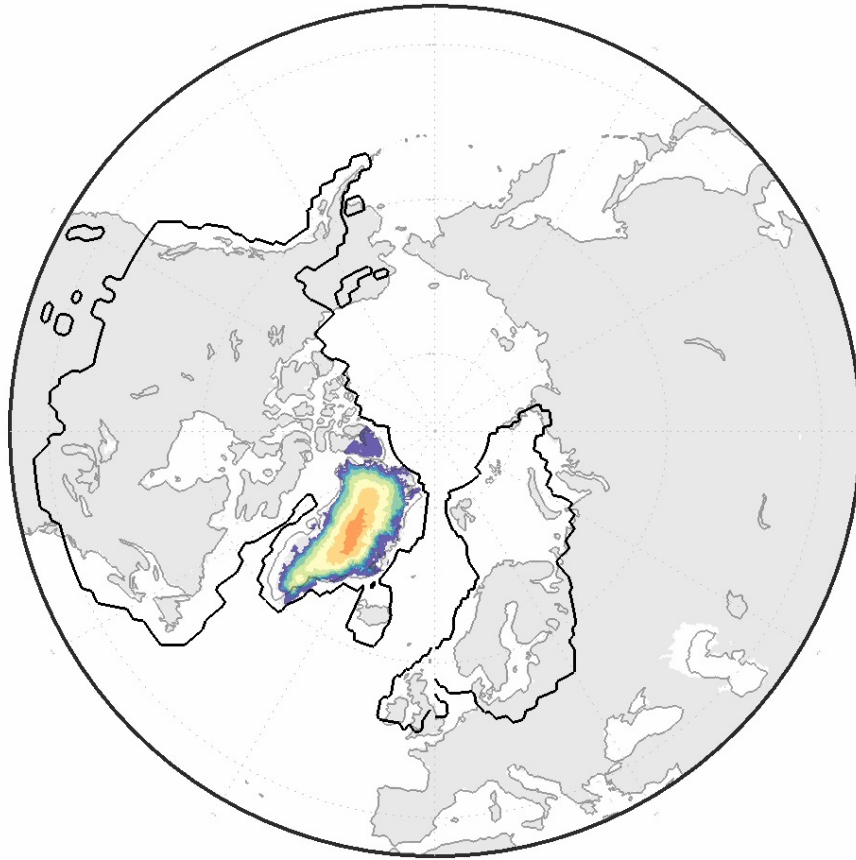
Albedo at 90 ka

High Albedo ➡ Low Temperatures ➡ More Ice

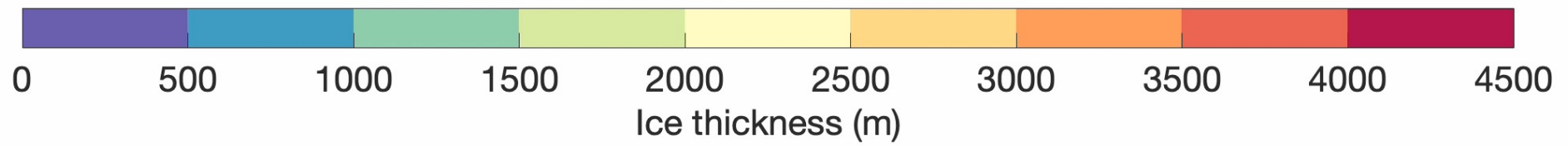
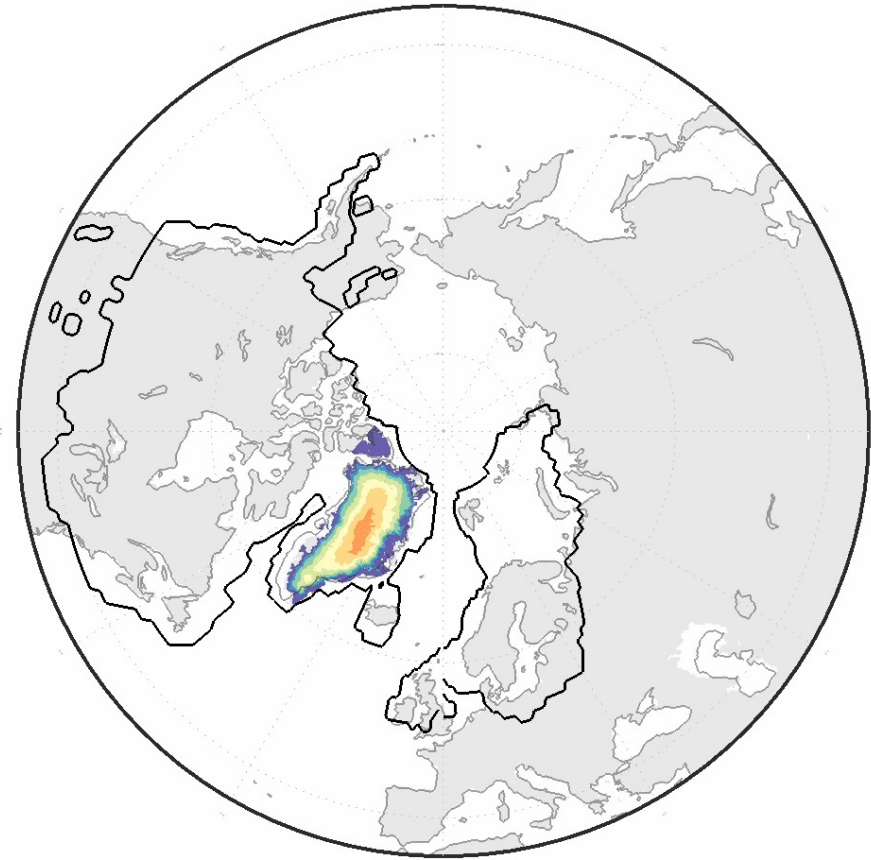


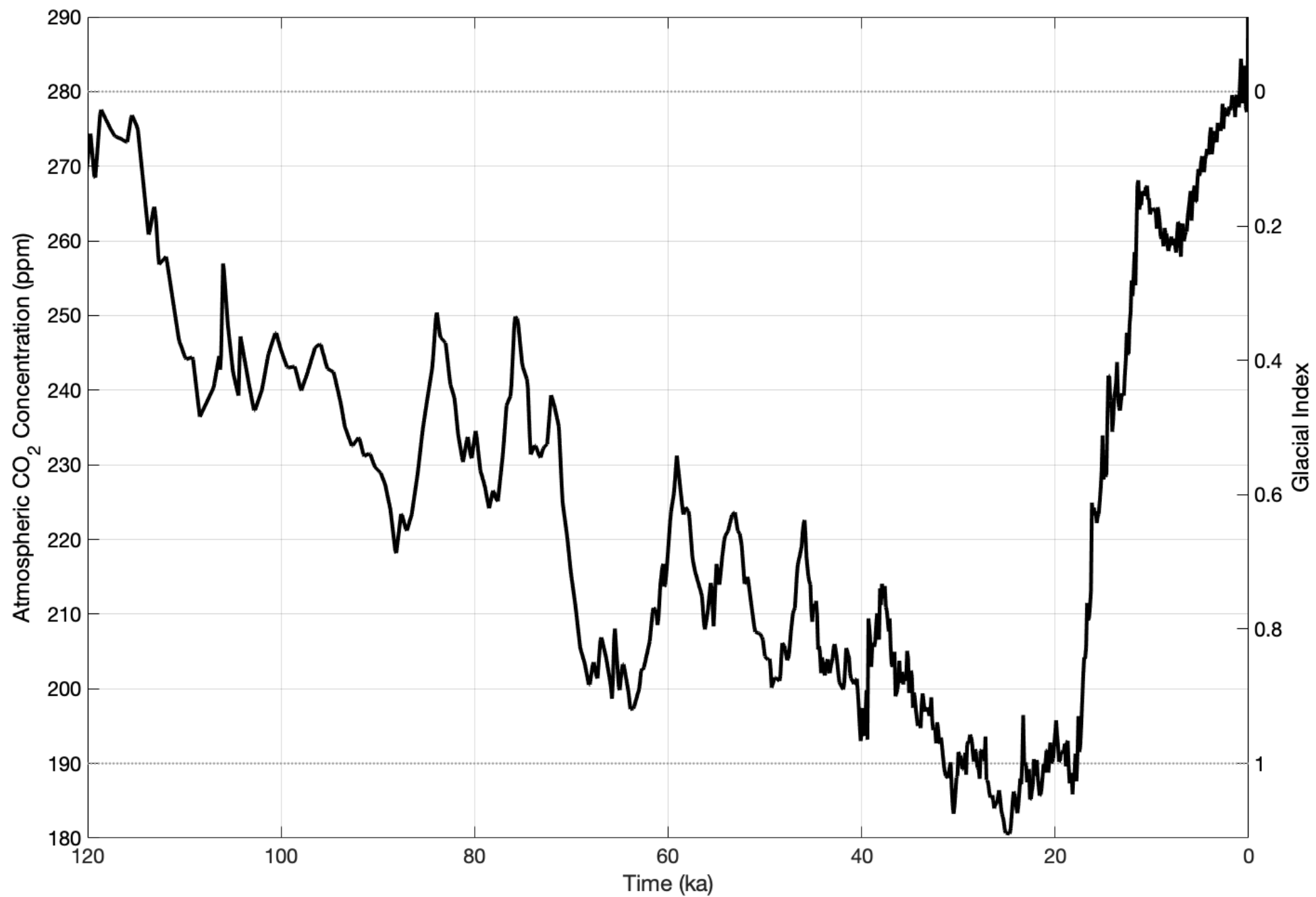
120 ka

v2 MPI GI

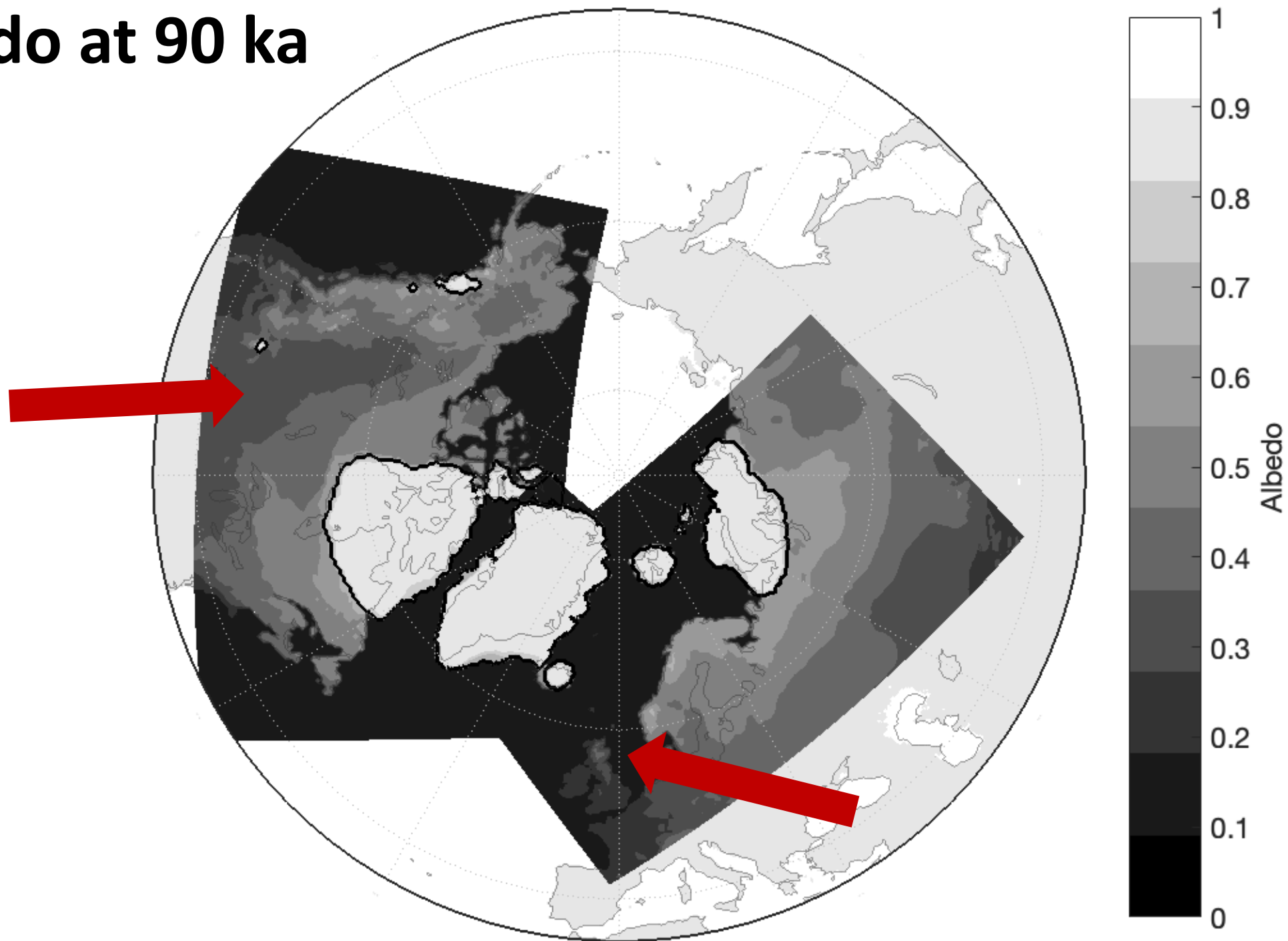


v2 MPI CM



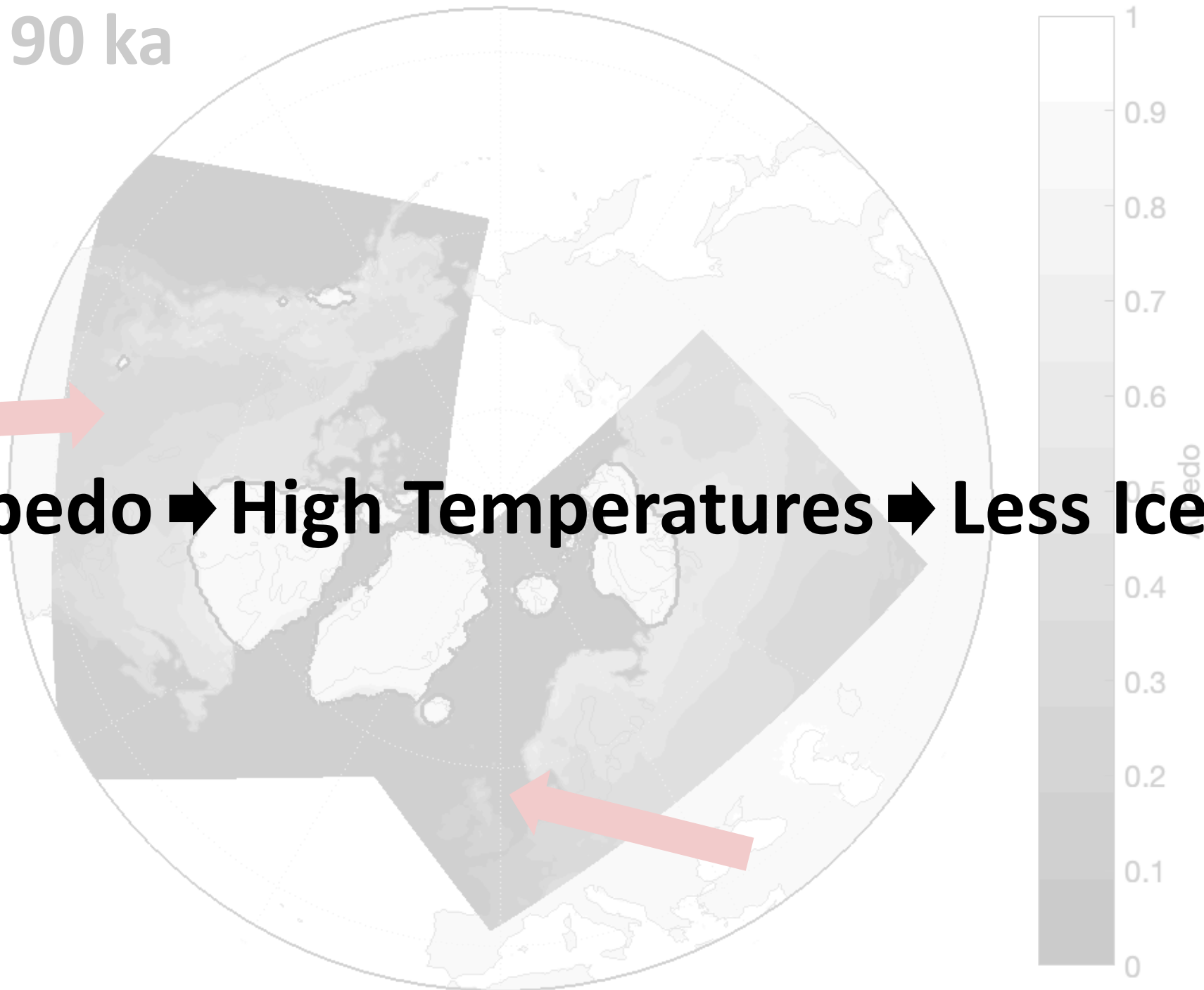


Albedo at 90 ka



Albedo at 90 ka

Low Albedo ➡ High Temperatures ➡ Less Ice





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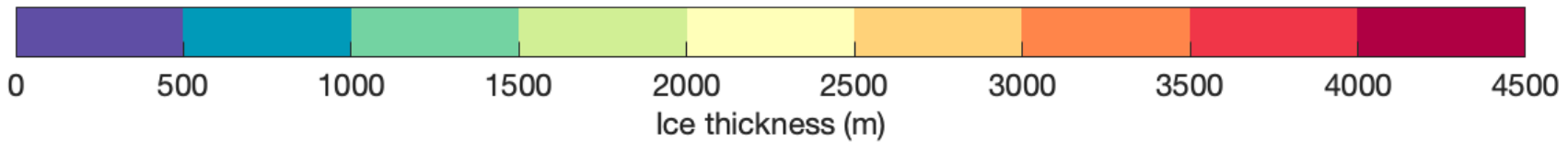
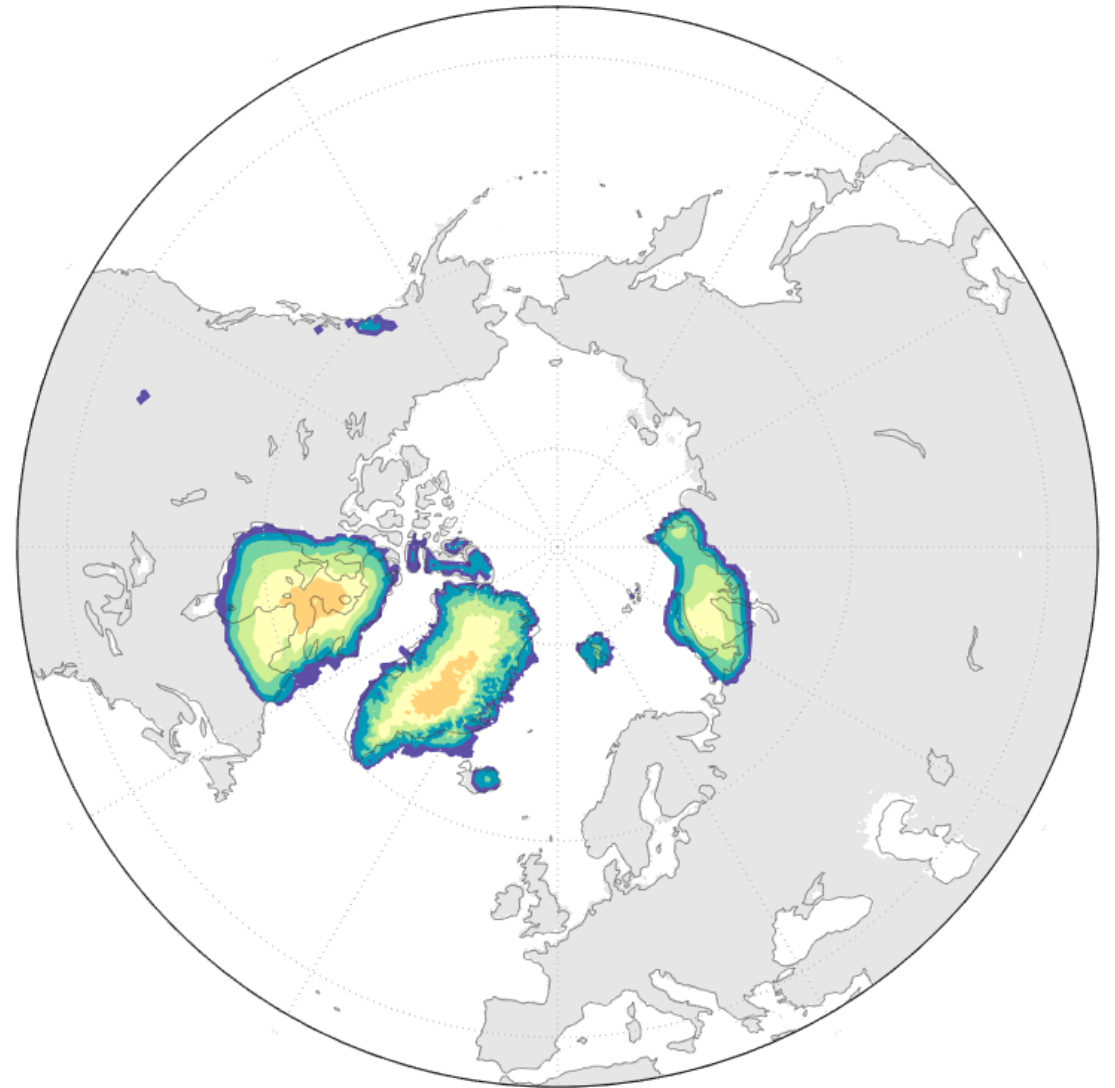
Questions / Discussions?

M.D.W.Scherrenberg@uu.nl

Glacial Index

90 ka

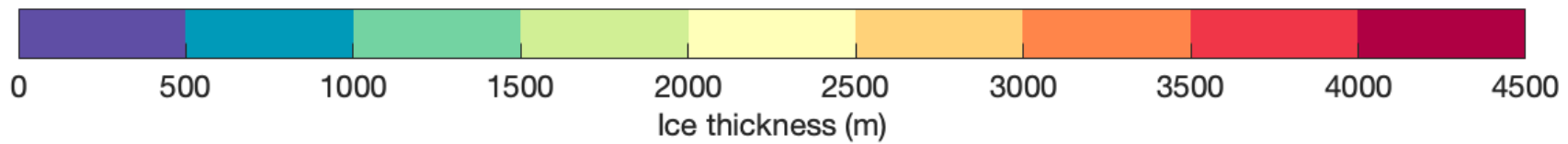
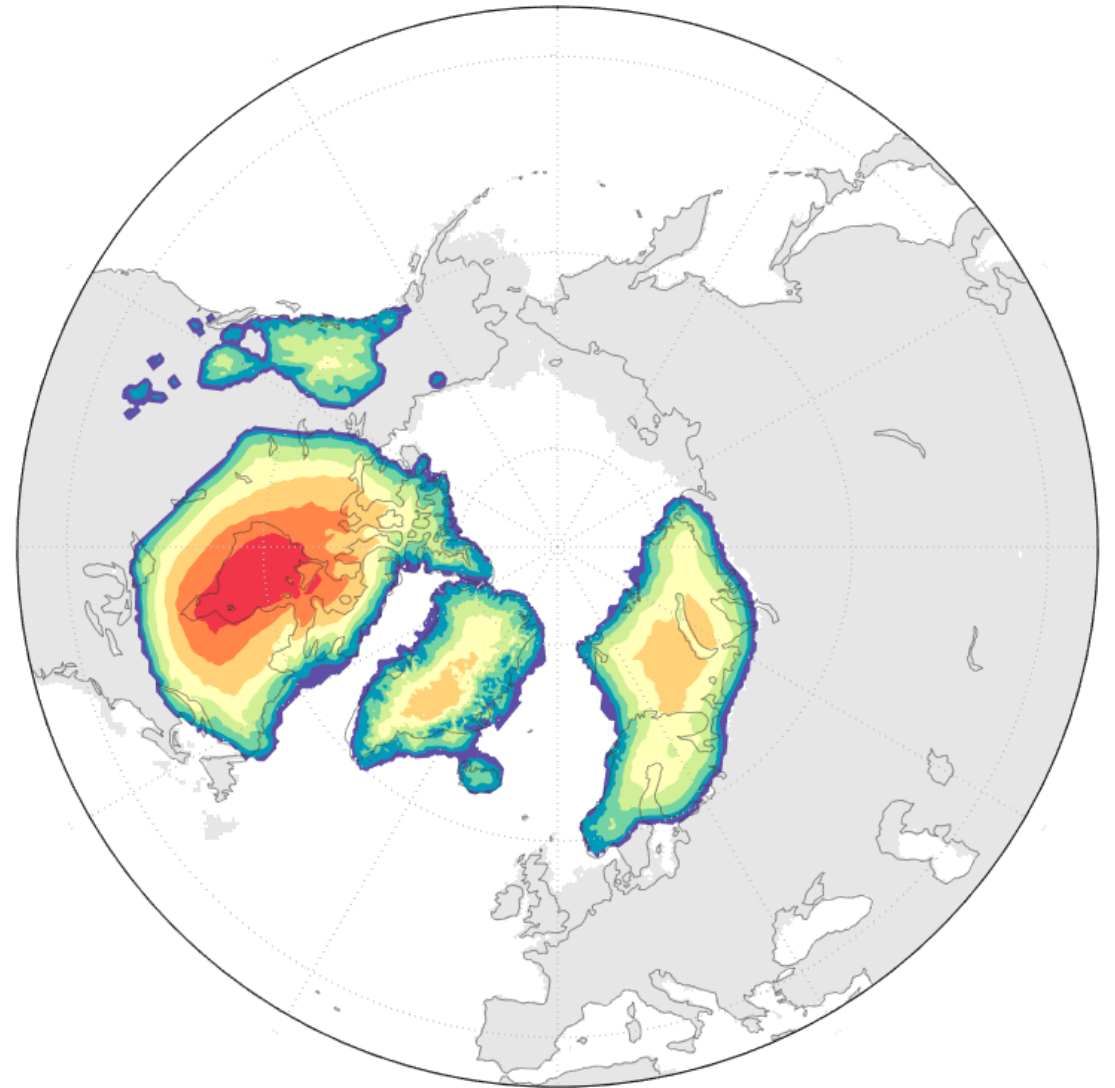
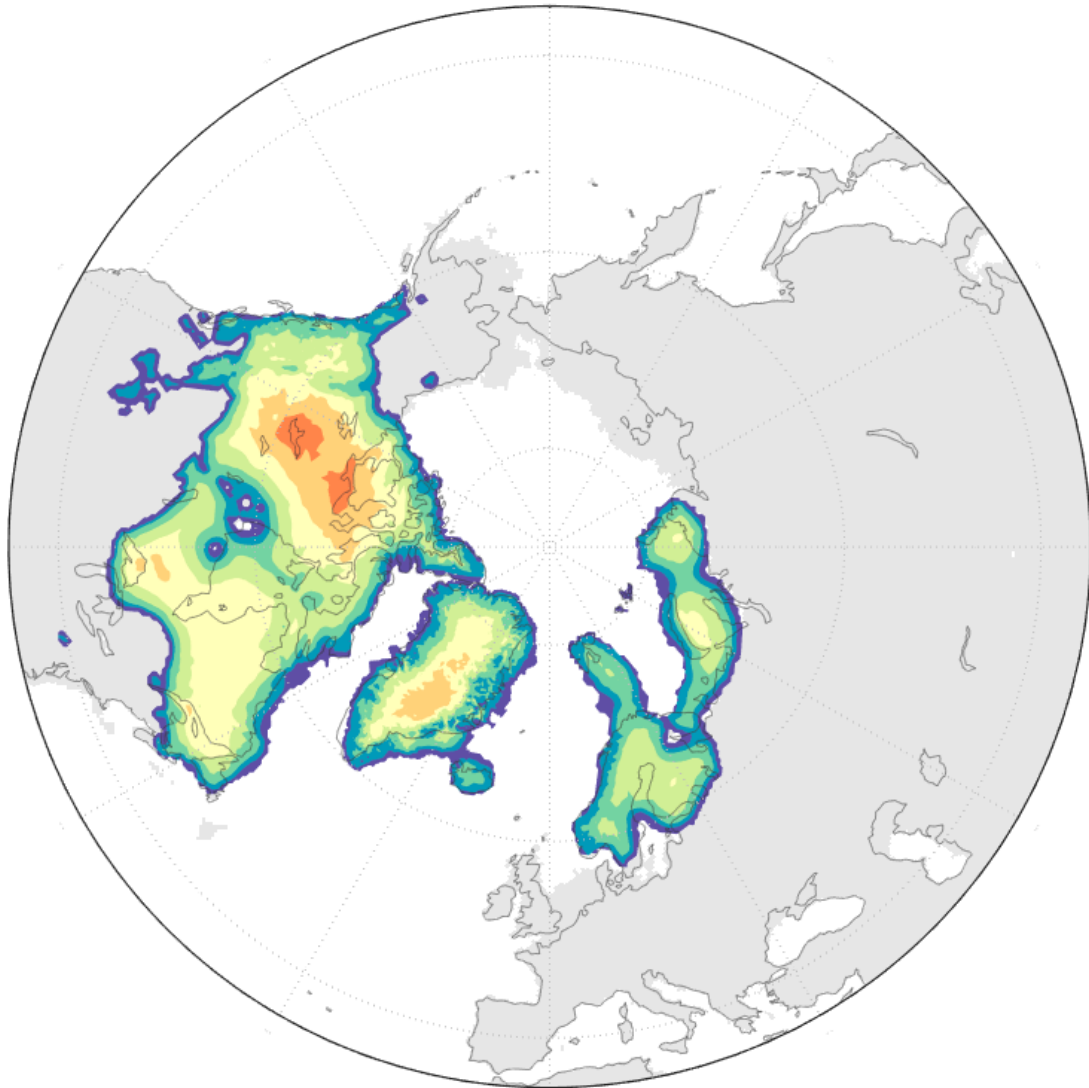
Climate Matrix



Glacial Index

60 ka

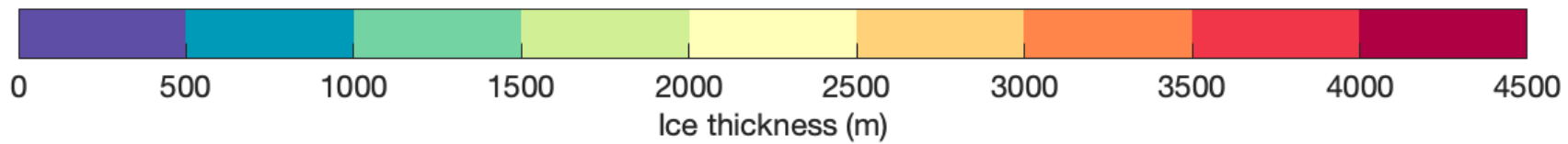
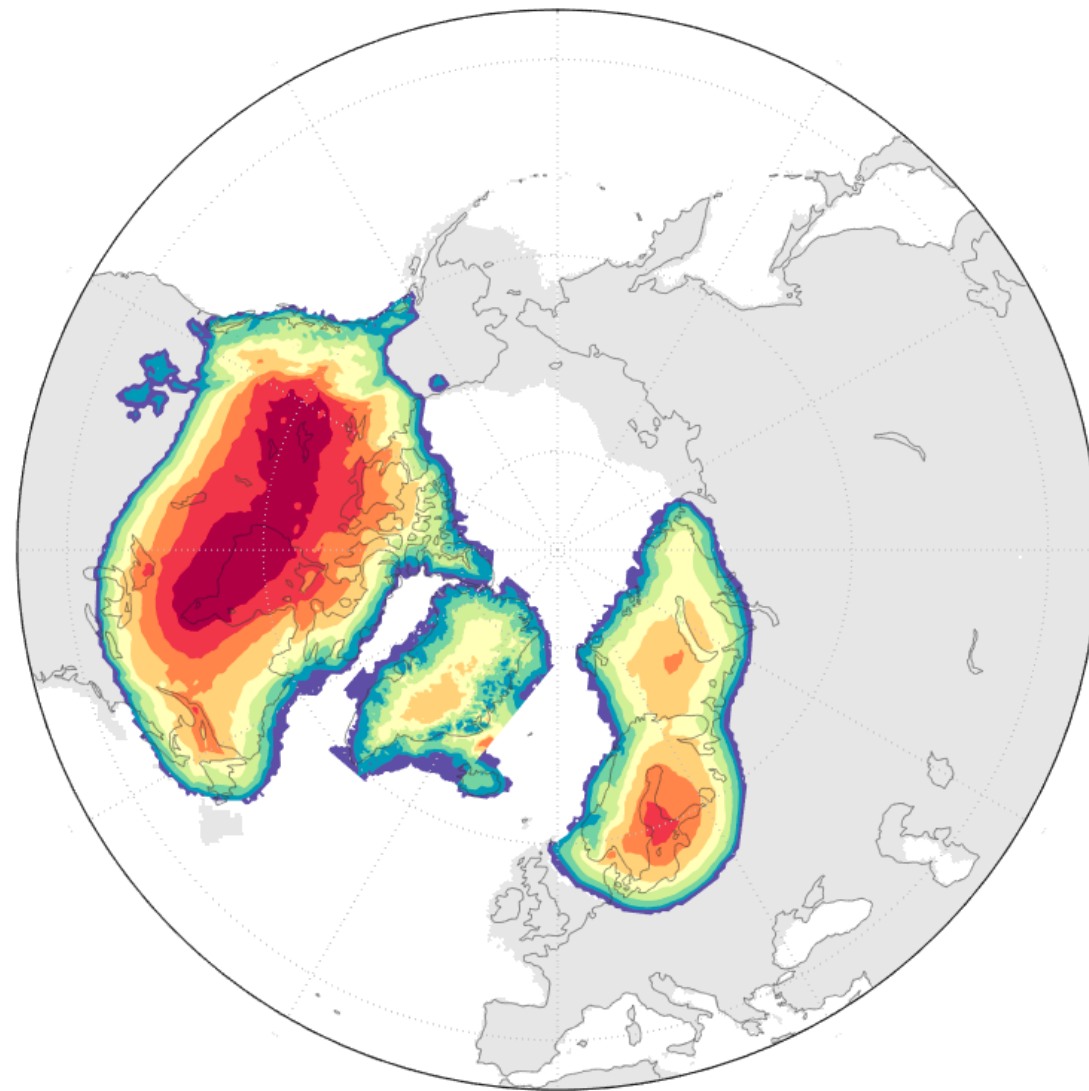
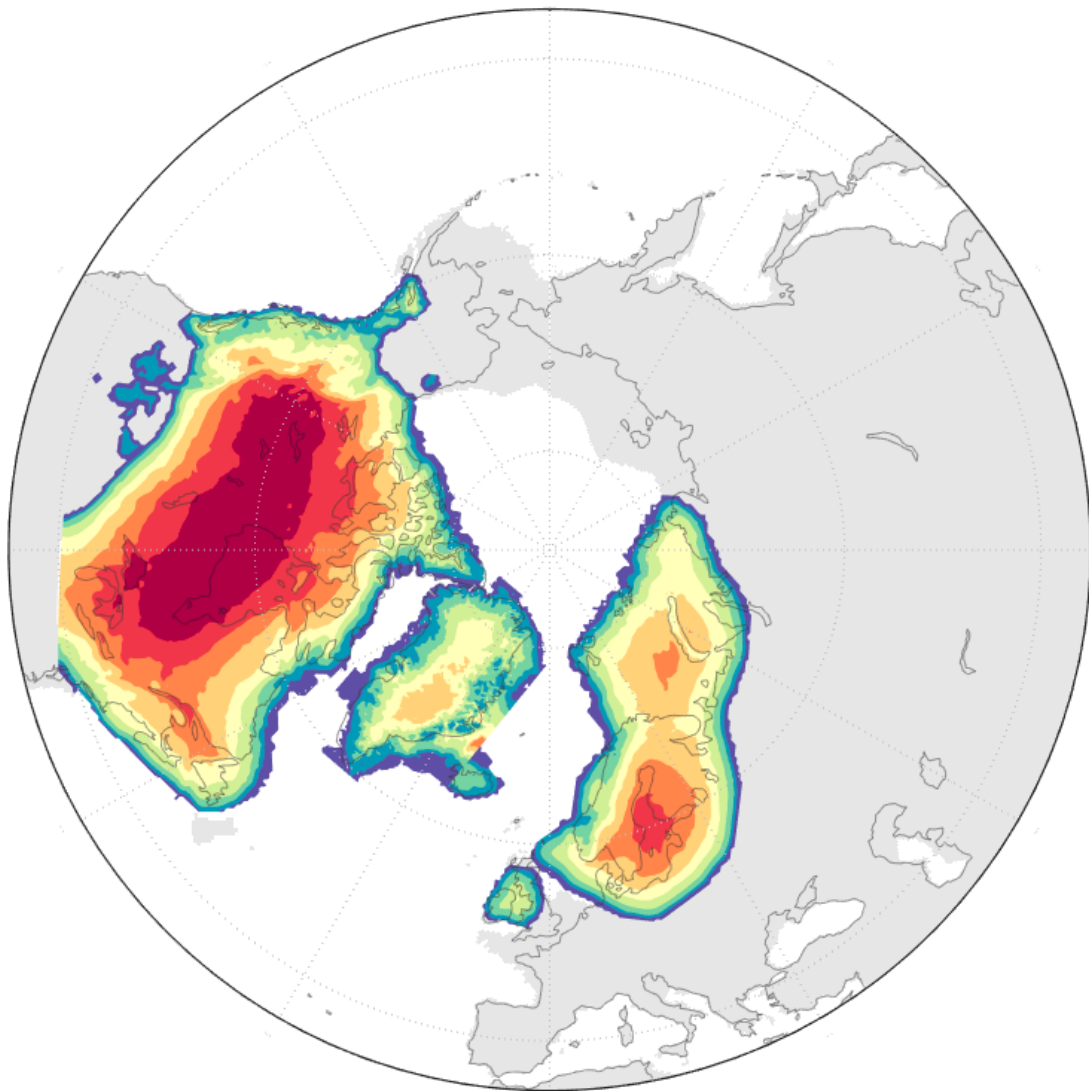
Climate Matrix



Glacial Index

21 ka

Climate Matrix



Glacial Index

10 ka

Climate Matrix

