Towards transient simulations of the last deglaciation with interactive carbon cycle using CLIMBER-X

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CLIMBER-X

Spatial resolution of the climate component: 5° x 5°
Computational performance: > 10,000 model years per day
CLIMBER-X overview

- atmosphere/ocean/land are of comparable complexity and share the same horizontal grid (5°x5°)
- fully interactive carbon cycle (including $^{13}$C and $^{14}$C)
  - HAMOCC: ocean biogeochemistry + sediments
  - PALADYN: dynamic vegetation + land carbon cycle + weathering
- several ice sheet model domains at different resolution
- solid Earth model which also solves the sea-level equation
- land/sea mask responds to changing sea level
Historical, carbon fluxes

CLIMBER-X air–sea CO₂ flux

Landschuetzer et al. 2017

Gross primary production

CLIMBER-X GPP

MTE

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Transient deglaciation, climate model only

- transient simulation from 22 ka to present
- prescribed atmospheric CO$_2$
- prescribed ice sheets from GLAC-1D (Tarasov)
  - freshwater flux from implied ice sheet melting routed to ocean
LGM time slice, preliminary results

- **closed** carbon cycle setup:
  - no weathering
  - no sediment burial
  - no volcanic degassing

- prescribed LGM ice sheets
- prescribed LGM sea level and land/sea mask
- prescribed CO$_2$=180 ppm for radiation

start from preindustrial equilibrium, switch to LGM boundary conditions and interactive CO$_2$ (for carbon cycle only) and run for 4000 years (not fully equilibrated yet)