Retreat and Regrowth of the Greenland Ice Sheet During the Last Interglacial as Simulated by the CESM2-CISM2 Coupled Climate Ice Sheet Model

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~129,000 – 116,000 years ago

Warmer than present climate, primarily due to:

• Changes in solar insolation from orbital configuration (high summer anomaly in northern hemisphere)

• Changes in albedo (vegetation distribution)

→ Arctic summer temperatures 3-5 degrees C warmer than present
Why are we interested in the Last Interglacial?

- To learn about important behavior and feedbacks under warming conditions that may be relevant for the future
- Sea level high-stand during the LIG was likely ~6-9 m higher than present
How much of that sea level rise was due to contributions from Greenland?

- Summary by Dutton et al. (2015): 2.0 m (+/- 1.5 m)
- Yau et al. (2016): 5.1 m (+/- 1 m)
Conduct a transient, fully coupled global climate simulation with a dynamic Greenland ice sheet during the Last Interglacial
Community Earth System Model, CESM 2.1

- Community Ice Sheet Model (CISM)
- Coupler
- Atmosphere
- Land
- Ocean
- Sea Ice
Transient LIG Run Design

• 127-119 ka (8,000 years)
• 5x acceleration of ice sheet (total of 1,600 fully coupled CESM years)
• 5x acceleration of orbital parameters
• Vegetation changed every 500 years based on BIOME4 modeled vegetation
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127-120 ka

(7,000 years)
Sea Level Contribution

1.5 m max SLR at ~124 ka  
4.1 m max SLR at ~122 ka
• This fully coupled global climate/ice sheet simulation presents a new estimate of the timing and magnitude of Greenland ice sheet retreat during the Last Interglacial

→ Global vegetation distribution plays an important role in climate interactions and ice sheet evolution

• Impacts on ocean, atmosphere, sea ice, etc.? Much model output and data available for analysis! Many stories to tell…
Thank you.

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