UNIVERSITY OF BERGEN

SINERGIS

BJERKNES CENTRE for Climate Research

Evaluating the Greenland Ice Sheet interior: Design and applicability of the layer age tracer ELSA

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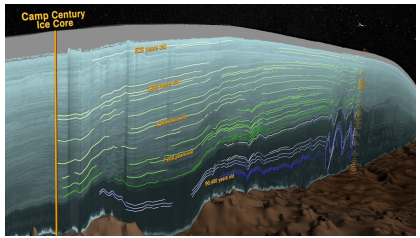
[4]University of Hamburg, Department of Theoretical Physics, Hamburg, Germany

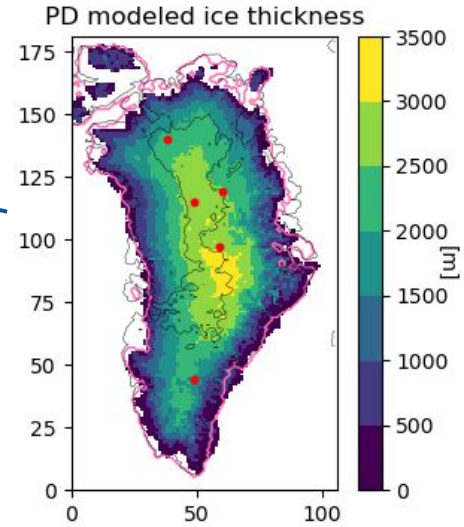
Greenland workshop, Bergen, April 19-21, 2023

Motivation



Radiostratigraphy observations

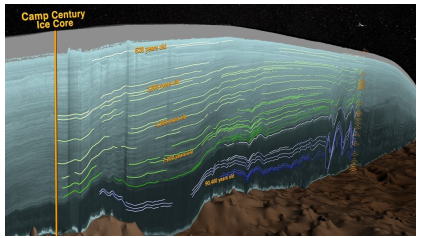
?

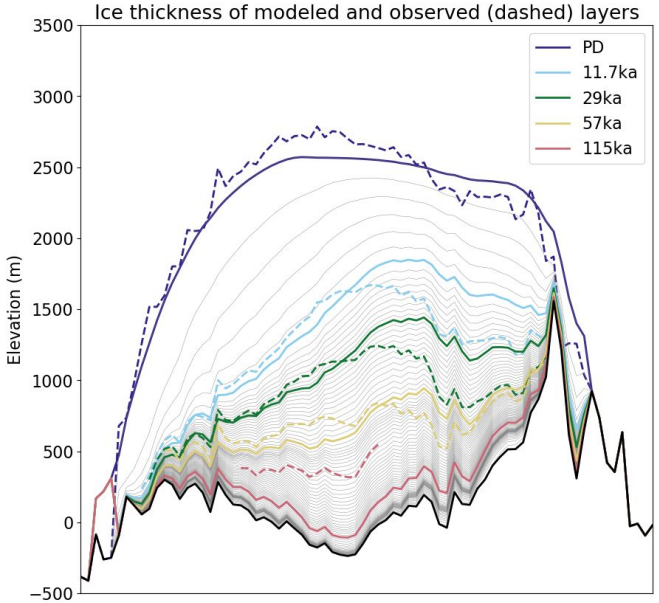


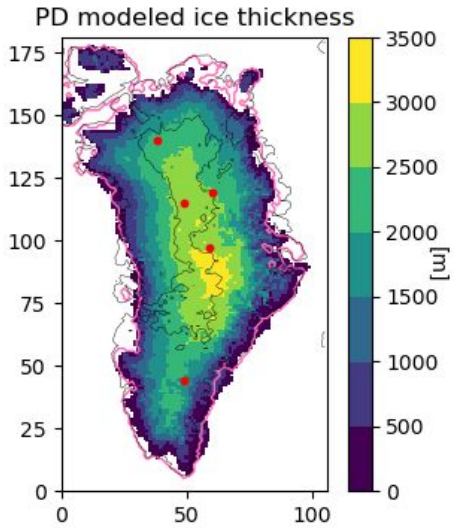
Model data

Motivation

→individual layers of accumulation driven by SMB





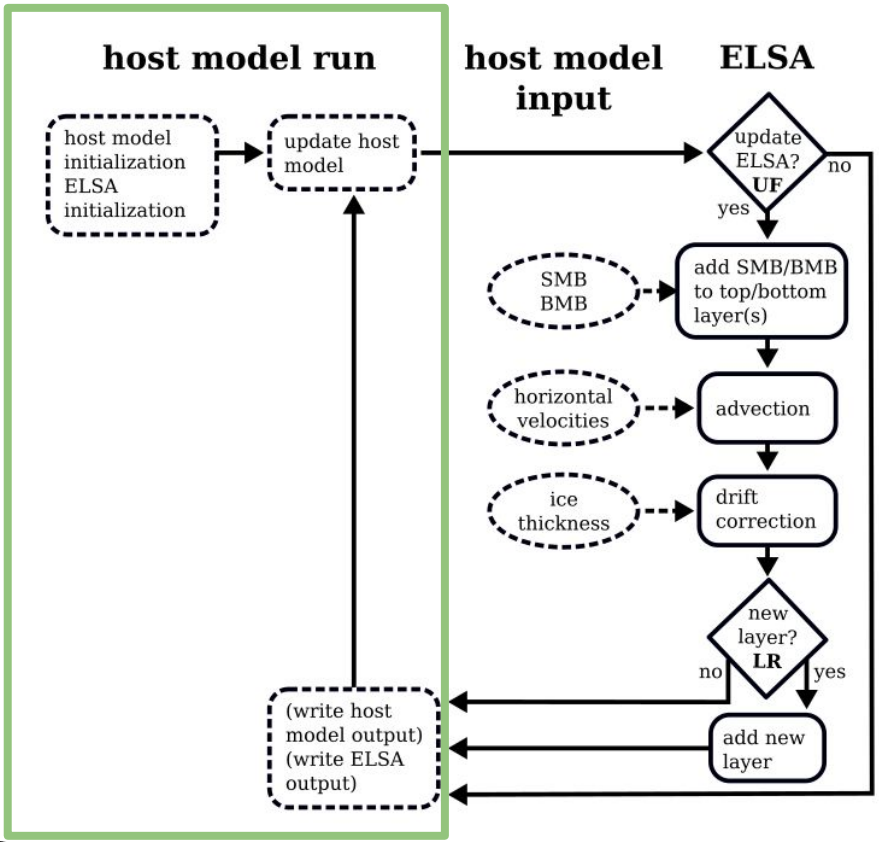


Born (2017): Tracer transport in an isochronal ice-sheet model

Born and Robinson (2021): Modeling the Greenland englacial stratigraphy

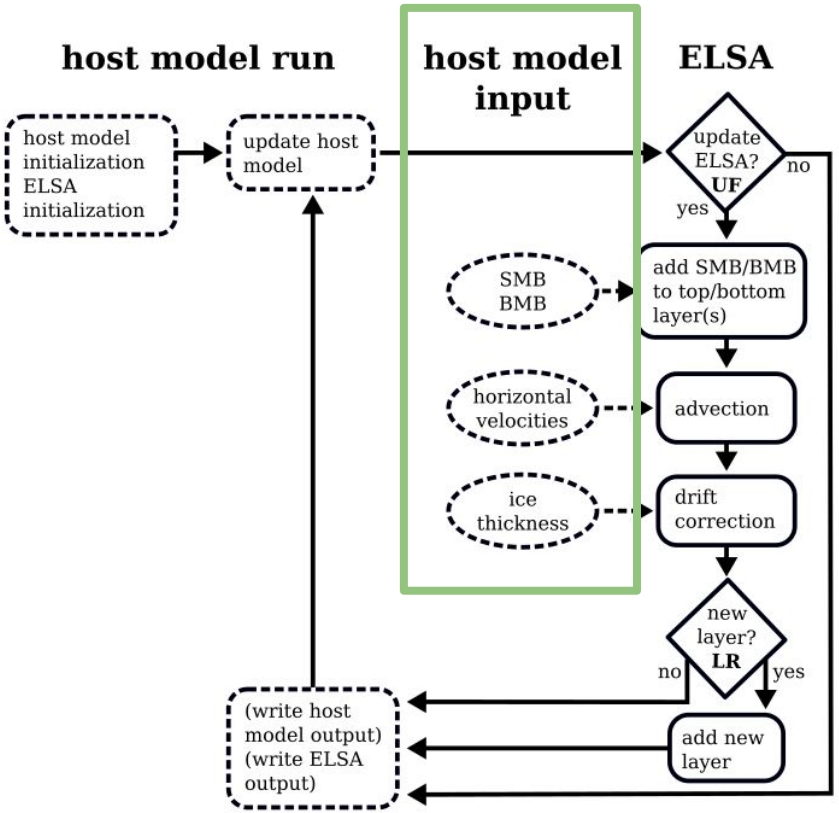
ELSA — Englacial Layer Simulation Architecture

Setup: coupling to the host model



ELSA is **not** a stand-alone ice sheet model

Setup: coupling to the host model



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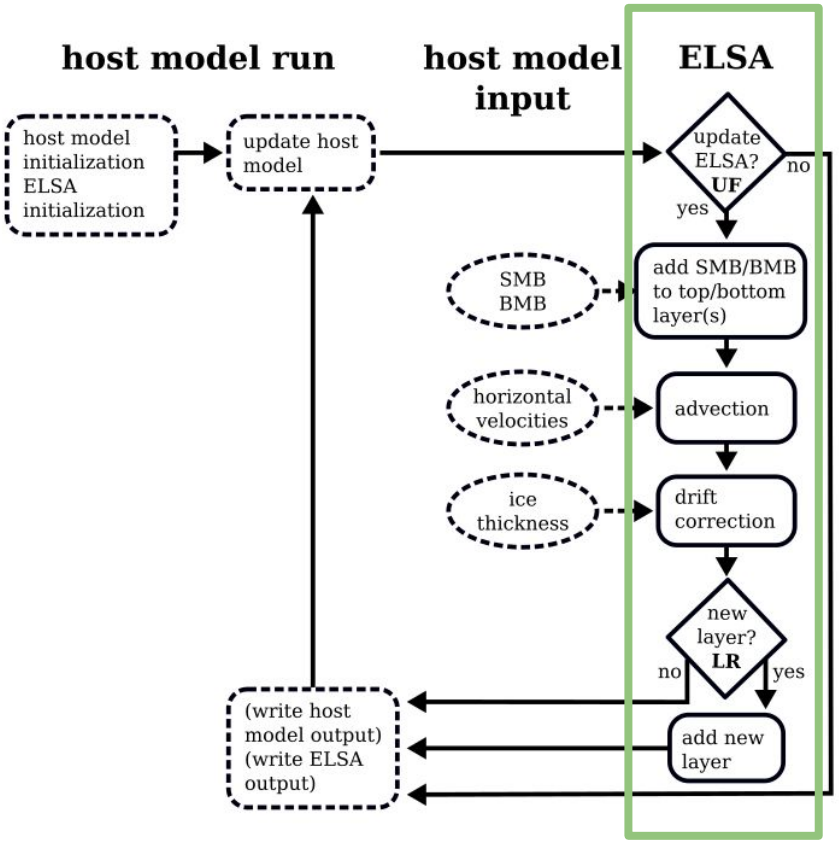

ELSA is **not** a stand-alone ice sheet model

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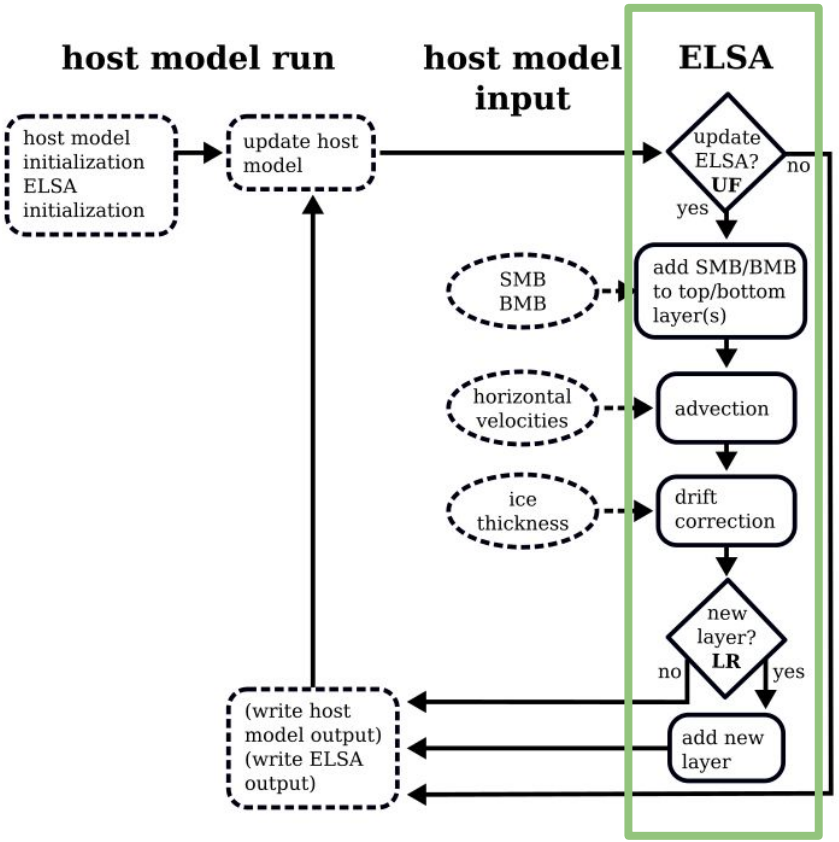


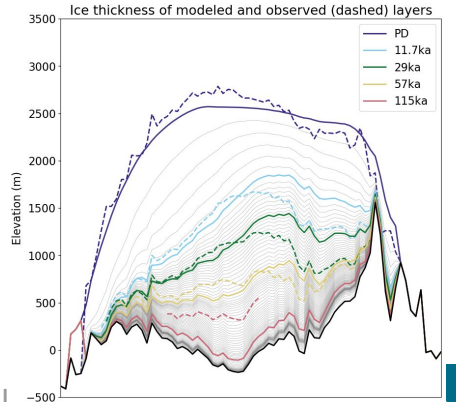
ELSA is **not** a stand-alone ice sheet model

→ **No mass exchange among layers**

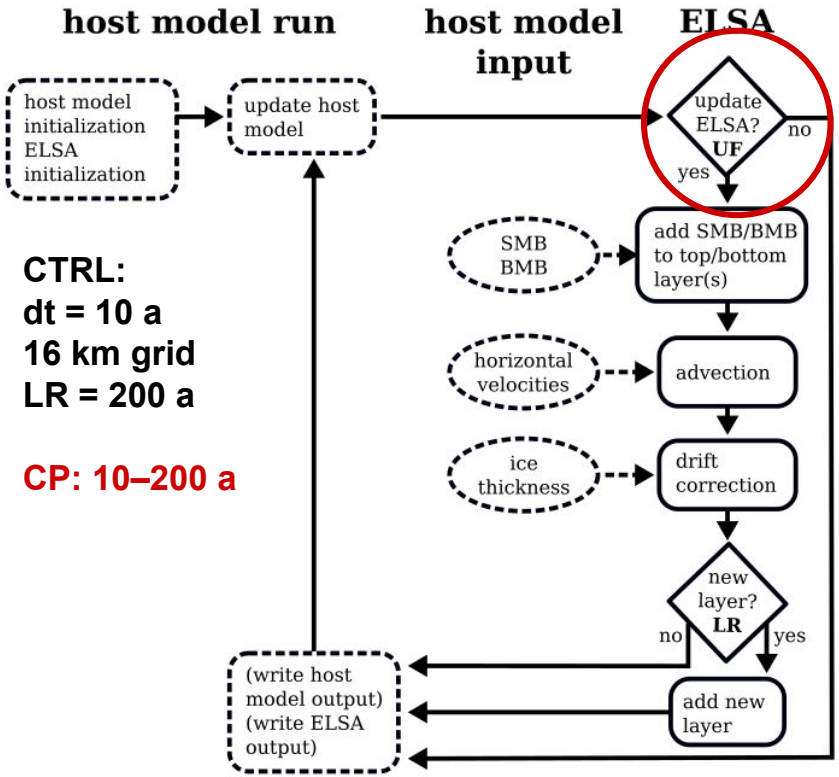
→ Host model is interchangeable (currently yelmo)

https://git.app.uib.no/melt-team-bergen/ELSA_yelmo

→ Can be directly compared to radio-stratigraphy data



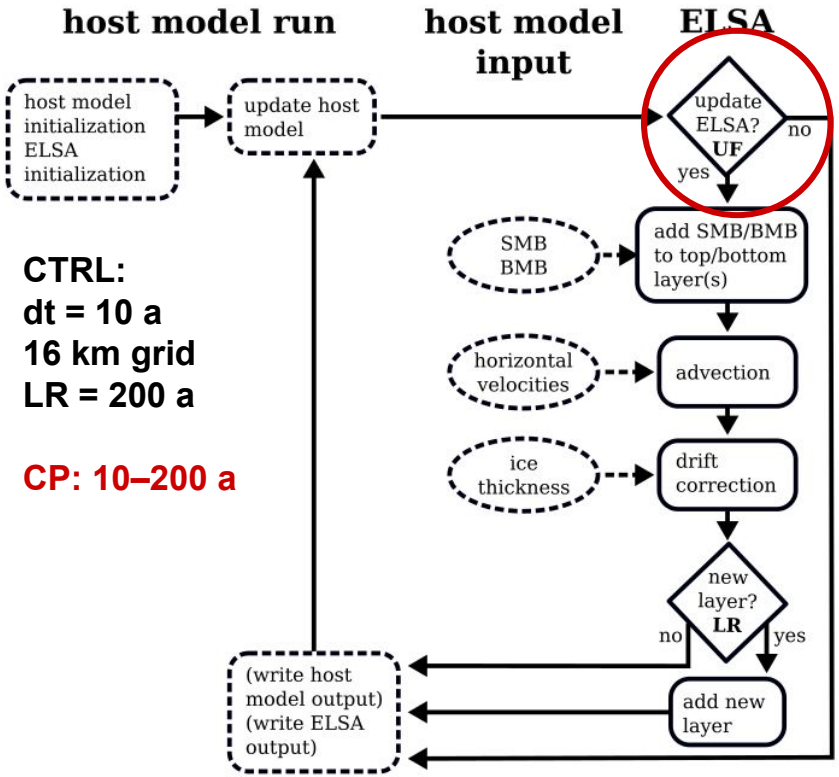
1 Decreasing ELSA's temporal resolution



CTRL:
dt = 10 a
16 km grid
LR = 200 a

CP: 10–200 a

1 Decreasing ELSA's temporal resolution



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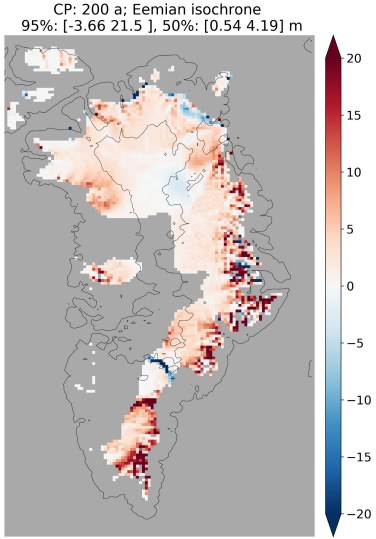

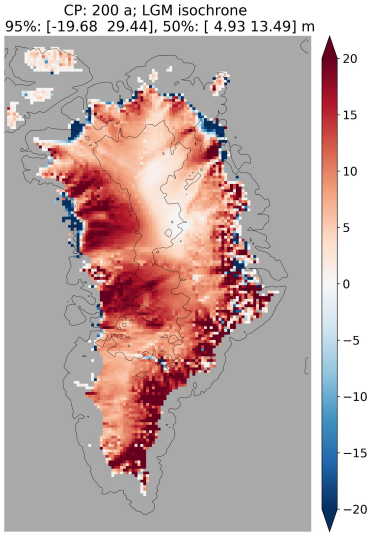

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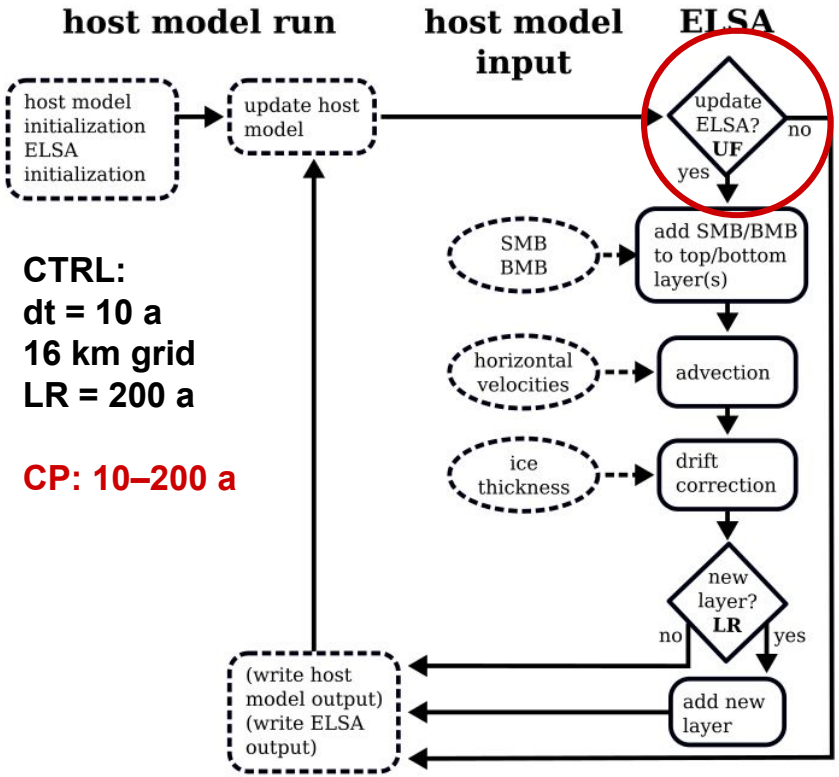
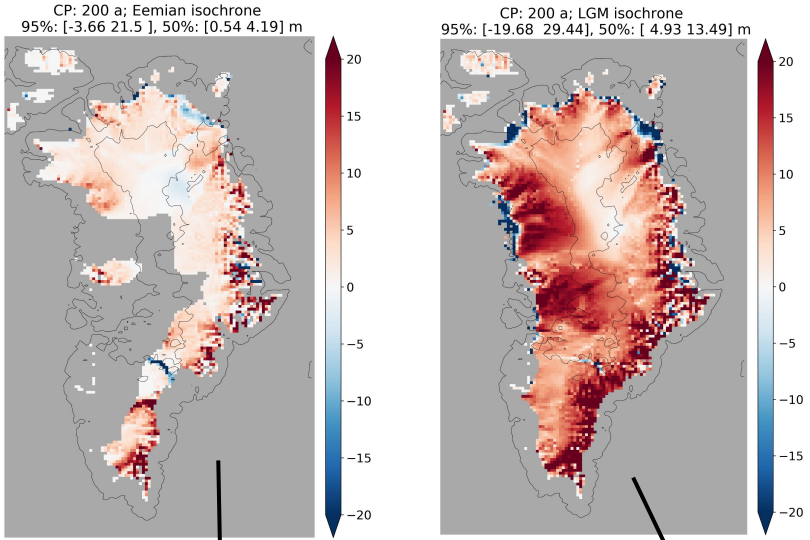
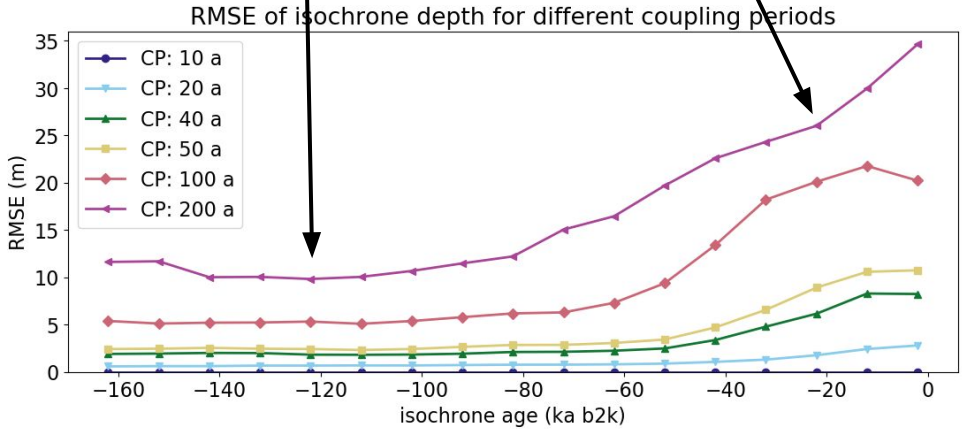


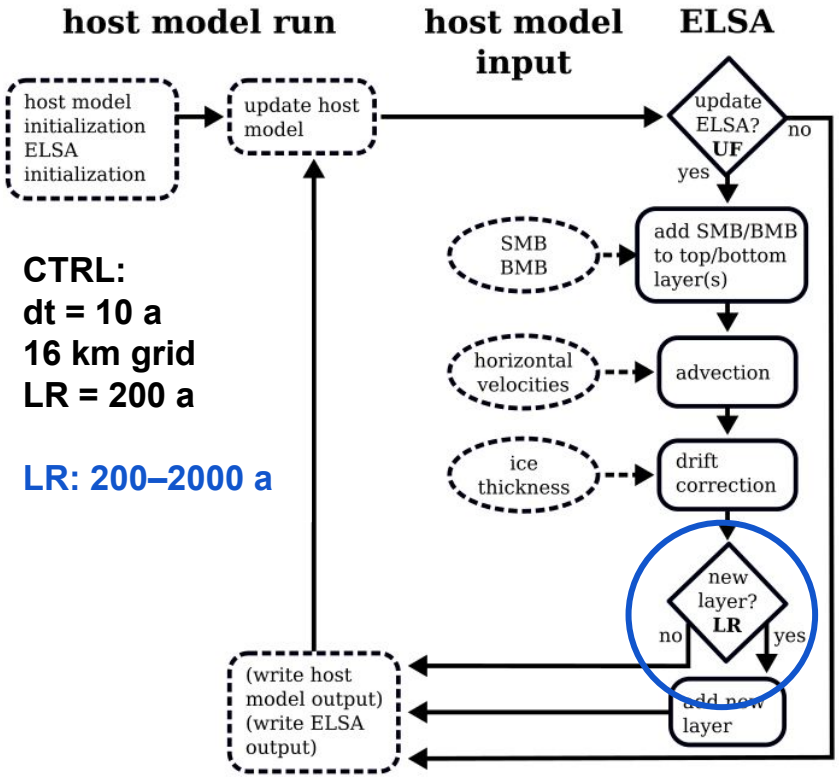
CTRL:
dt = 10 a
16 km grid
LR = 200 a

CP: 10–200 a



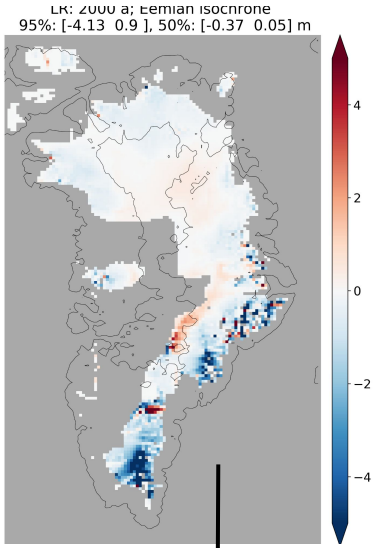


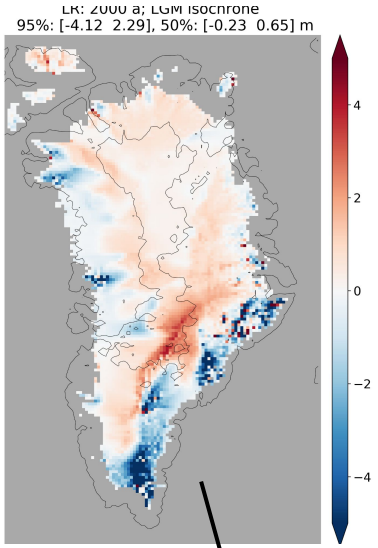
2 Decreasing ELSA's vertical resolution

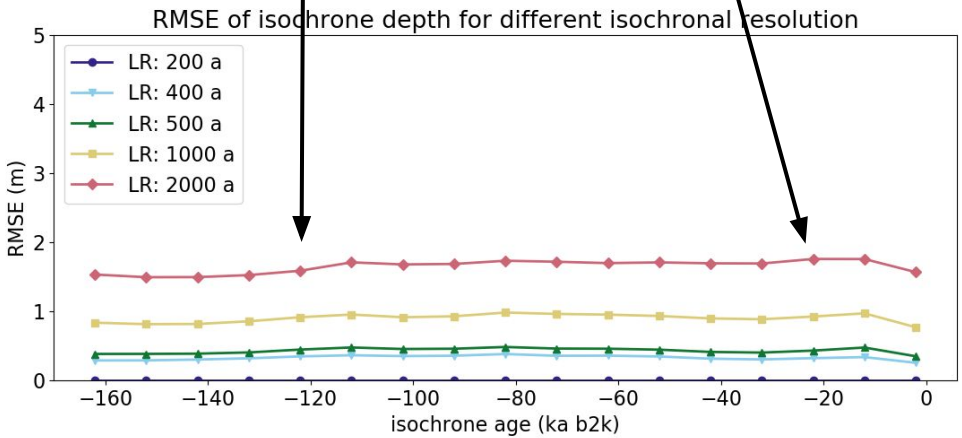


CTRL:
dt = 10 a
16 km grid
LR = 200 a

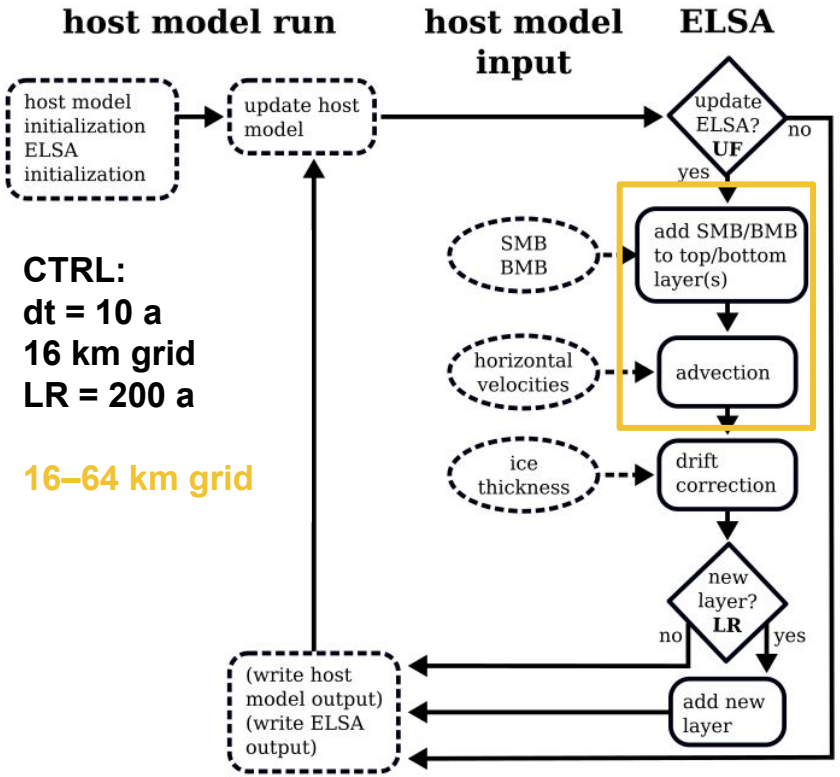
LR: 200–2000 a





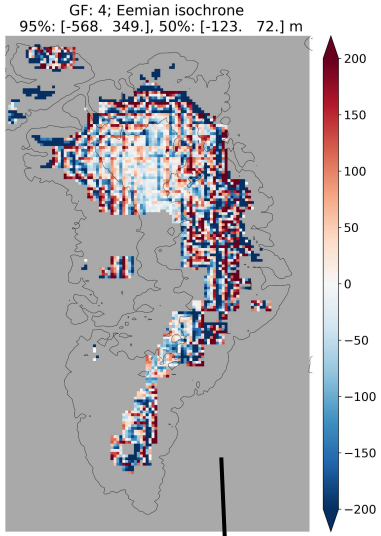


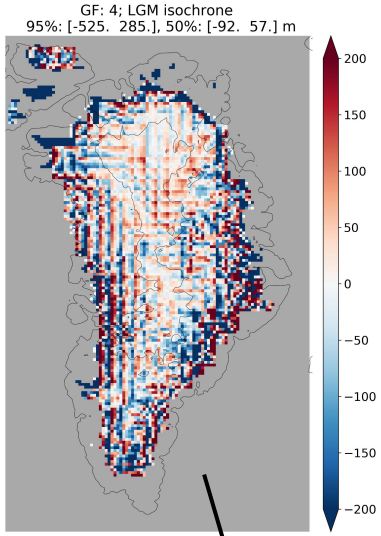
3 Decreasing ELSA's horizontal resolution

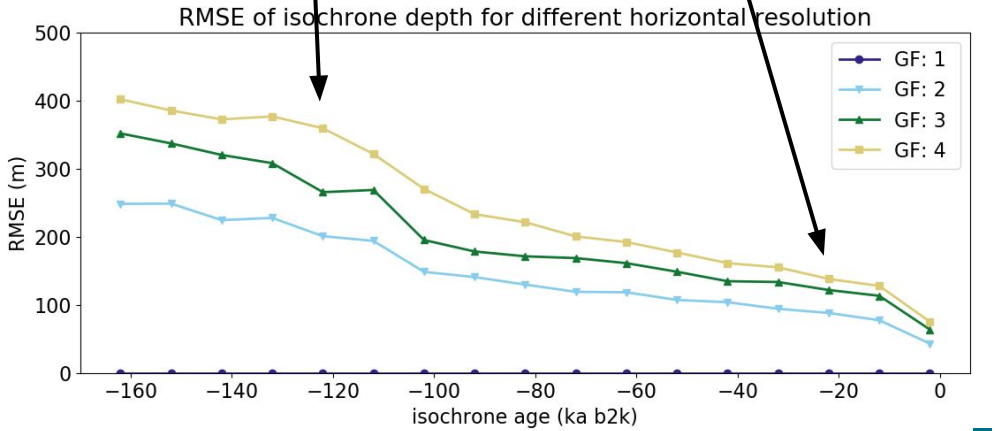


CTRL:
dt = 10 a
16 km grid
LR = 200 a

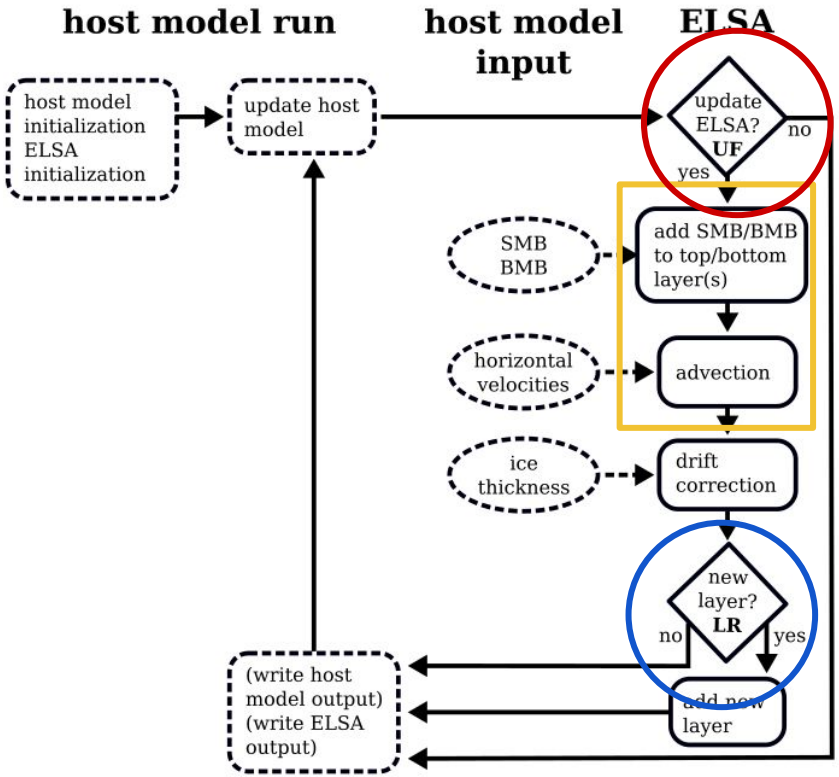
16–64 km grid







Decreasing ELSA's resolution



To double the run speed:

temporal: RMSE ~ 20 m

horizontal: RMSE ~ 200 m

vertical: RMSE ~ 2 m

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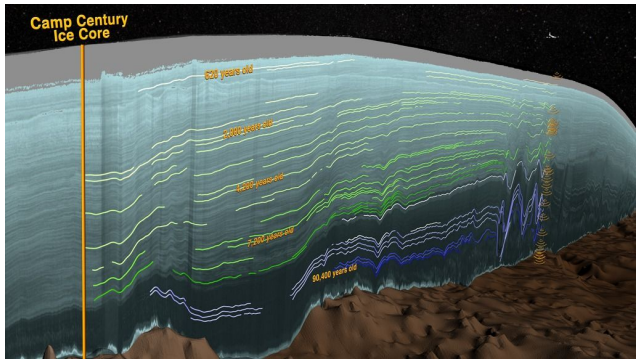

Other applications of radiostratigraphy data?

How would you like to use ELSA?

→ SINERGIS project discussion today at 16:00