Tutorial: Ice sheet modeling in CESM

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CISM in CESM

CAM
(Community Atmosphere Model)

CLM
(Community Land Model)
10 glacier elevation classes

CISM
(Community Ice Sheet Model)

Surface Mass Balance
Surface Temperature
Surface Elevation
Compsets with active ice sheet

- BG (fully coupled)
- FG (CAM, CLM & CISM)
- IG (CLM & CISM)
- TG (CISM only)

Limited number of supported resolutions:

- 1-degree finite volume (f09)
- 2-degree finite volume (f19)
- 3.75-degree spectral (T31)
TG Compset

Key: active / data / stub model

First: Run IG (or FG or BG)

cpl history (tsrf, topo, qice)

datm
clm
cpl

sice
socn

cism
TG Compset

Key: active / data / stub model

First: Run IG (or FG or BG)

Next: Run TG

cpl history (tsrf, topo, qice)
CESM 1.3: Dynamic Landunits in CLM
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CISM (Community Ice Sheet Model)

Gridcell

Landunit

Vegetated

Lake

Urban

Glacier

Crop

Column

Soil

Roof

Sun Wall

Shade Wall

Pervious

Elevation classes

Unirrig

Irrig

Unirrig

Irrig

PFT

PFT1

PFT2

PFT3

PFT4...

Crop1

Crop1

Crop2

Crop2...

TBD

MD

HD

Elevation classes
CESM 1.3: Dynamic Landunits in CLM

CISM (Community Ice Sheet Model)

CLM’s Transient Datasets

Integrated Assessment Model

Elevation classes

Unirrig, Irrig, Unirrig, Irrig

Crop1, Crop1, Crop2, Crop2...
CESM 1.3: Other Feedbacks from CISM

- **CAM** (Community Atmosphere Model)
  - Surface Mass Balance
  - Surface Temperature
  - Icesheet Area

- **CLM** (Community Land Model)
  - Surface Elevation
  - 10 glacier elevation classes

- **CISM**
  - Ice Calving

- **CICE / POP**
  - (Sea Ice)
  - (Ocean)

(CISM to CAM: not out-of-the-box)
Hands-on overview: CESM IG run

• IG compset

• Simple CLM source code modification to simulate global warming / cooling over ice sheets

• Look at how this affects the Greenland surface mass balance over a few years
For more information

http://www.cesm.ucar.edu/models/cesm1.2/cism/