Updates on CISM2-CESM Coupling

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With contributions from
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CESM 1.1 Release Highlights

- TG compset: standalone CISM forced by previous model output
- Improved out-of-the-box CISM parameter settings
- Ensemble capabilities
- Improved glacier cover in CLM, from Randolph Glacier Inventory
  - Option to ensure consistency with CISM over Greenland
- Bug fix in handling of glacier virtual columns
- Standardized namelist generation
CESM 1.2 Release Highlights

CISM

- CISM 1.9
  - Almost CISM 2.0
  - Release code only supports SIA out of the box

- Changes to some configuration defaults

- Spun-up ice sheet initial conditions, in rough equilibrium with CESM climate (Jeremy Fyke)
CESM 1.2 Release Highlights

**CLM**

- **CLM 4.5**
  - Big focus on biogeochemistry, but also updates some snow parameterizations
  - Can still run with CLM 4.0

- Bug fix in surface temperature sent from CLM to CISM
  - Note that this bug affects the current out-of-the-box TG forcing data

- Option to run with 36 elevation classes, rather than 10
CISM2 Integration in CESM

- CISM2 builds within CESM; currently working on runtime failures when running with higher-order code
- CESM build now supports features needed for CISM:
  - C++ code
  - Trilinos
  - cmake
- Port to major CESM-supported machines and compilers
- Added parallel capabilities to CESM’s GLC component and to glint
- Improved testing support
- Remaining needs:
  - Address runtime failures, further testing
  - Create input datasets for Greenland at multiple resolutions
CISM2 Integration in CESM

Out-of-the-box support

```bash
create_newcase -case $CASE -mach yellowstone -compset TGIS2 -res f09_g16_g110
```

### CISM1 Compsets
- One CISM task
- Trilinos not included in build
- Configuration file set up for SIA dycore

### CISM2 Compsets
- Multiple CISM tasks
- Trilinos included in build
- Configuration file set up for SEACISM dycore
Dynamic Landunits in CLM

One column for each elevation class

Gridcell

Landunits
- Glacier
- Wetland
- Vegetated
- Lake
- Urban

Columns

PFTs

One column for each elevation class
Dynamic Landunits in CLM

Currently: fixed fractions

One column for each elevation class
Other Feedbacks from CISM

**CAM**
(Community Atmosphere Model)
- Area of cropland, urban, etc.
- Surface Mass Balance
- Surface Temperature

**CLM**
(Community Land Model)
- Ice Calving
- Icesheet Area
- Surface Mass Balance
- Surface Temperature
- 10 glacier elevation classes

**CISM**

**CICE**
(Sea Ice)
- Ice Calving

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Other feedbacks from CISM include:

- **CLM** (Community Land Model):
  - Icesheet Area
  - Surface Mass Balance
  - Surface Temperature
  - 10 glacier elevation classes

- **CAM** (Community Atmosphere Model):
  - Area of cropland, urban, etc.
  - Surface Mass Balance
  - Surface Temperature

- **CICE** (Sea Ice):
  - Ice Calving
Other Feedbacks from CISM

CAM (Community Atmosphere Model)
- Icesheet Area
- Surface Mass Balance
- Surface Temperature
- Δ ann. surf. temp.
- Δ ann. surf. winds
- Δ ann. surf. precip
- Δ ann. surf. clouds
- Δ ann. surf. temp.
- Full AMWG diagnostics

CLM (Community Land Model)
- 10 glacier elevation classes
- Surface Elevation
- Icesheet Area
- Surface Temperature
- Area of cropland, urban, etc.

CISM
- 80% initial ice volume
- 60% initial ice volume
- Topography

CICE (Sea Ice)
- Ice Calving

See J Fyke poster for details
Improved Mapping Functionality
(Jon Wolfe)

Goals:

• Allow mapping to/from irregular land grids – e.g., Spectral Element grid

• Allow mapping to/from multiple ice sheets, plus a global grid of smaller glaciers & ice caps

• Use new conservative mapping functions from Bill Lipscomb (also, Bob Fischer)

• Parallelize mapping routines