Land Ice Working Group
Software Engineering Updates and Future Plans

Bill Sacks
LIWG Software Engineering Liaison
Climate & Global Dynamics Division
NCAR

With contributions from many others in the CESM Software Engineering Group

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CESM Release Process

- After this May, aiming for annual May releases

**Functional vs. Scientific Support**

- Functional support: passes software tests
- Scientific support: multi-decadal run with scientific review of model output
CESM1.1.0 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
Porting Process

- **Verify functionality**
  - Run hundreds of tests (e.g., restart) across supported model configurations and resolutions

- **Validate climate**
  - Target several popular model configurations

- **Load balance and performance tune**
Three Releases on Feb 1

All of these include Yellowstone support

- **CESM1.1.1**: support for new model features
  - Base for development of CAM5 and CAM-SE
  - Scientific support for CAM5
    - FV 1°, FV 2°
    - 1850, 20th century and RCP CMIP5 scenarios

- **CESM1.0.5**: support for CMIP5 science
  - Scientific support for all CAM4 FV CMIP5 simulations

- **CCSM3 port**
CESM1.2 Release

Target release date: May 30

- CLM4.5
  - Big focus on biogeochemistry, but also updates some snow parameterizations
- Further tweaks and validation of CAM5-SE
- Updates to ocean biogeochemistry
- Bug fix in surface temperature sent from CLM to CISM
  - Note that this bug affects the current out-of-the-box TG forcing data
- CISM2???
CISM2 Integration in CESM

What’s done?

- CISM2 builds and **sort of** runs within CESM
- Latest version of glimmer-cism pulled in as an svn external
  - no more need for copying code
- CESM build now supports:
  - C++ code
  - Trilinos
  - cmake
- Port to major CESM-supported machines and compilers
- Added parallel capabilities to CESM’s GLC component and to glint
- Out-of-the-box support for configuration settings and processor layouts for running SEACISM dycore, standalone or coupled
- Improved testing support
CISM2 Integration in CESM

What still needs to be done?

• Bring glint interface up-to-date with changes that have been made for CISM2
• Create input datasets for Greenland at multiple resolutions
• A few other bug fixes
• Additional testing
CISM2 Integration in CESM

Out-of-the-box support

```
create_newcase  -case $CASE   -mach yellowstone
    -compset TGIS2   -res f09_g16_gl10
```
Dynamic Landunits in CLM
Work in progress

One column for each elevation class
Dynamic Landunits in CLM

Work in progress

Gridcell

Landunits
- Glacier
- Wetland
- Vegetated
- Lake
- Urban

Columns

PFTs

Currently: fixed fractions

One column for each elevation class
Dynamic Landunits in CLM

Work in progress

CAM
(Community Atmosphere Model)

CLM
(Community Land Model)
10 glacier elevation classes

CISM

Surface Elevation
Icesheet Area
Surface Mass Balance
Surface Temperature

Area of cropland, urban, etc.
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