Tutorial:
Ice sheet modeling in CESM

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CISM in CESM

CAM
(Community Atmosphere Model)

Surface Mass Balance

CLM
(Community Land Model)
10 glacier elevation classes

Surface Temperature

Surface Elevation

CISM
(Community Ice Sheet Model)

Compsets with active ice sheet

- BG (fully coupled)
- FG (CAM, CLM & CISM)
- IG (CLM & CISM)
- TG (CISM only – in CESM1.1)

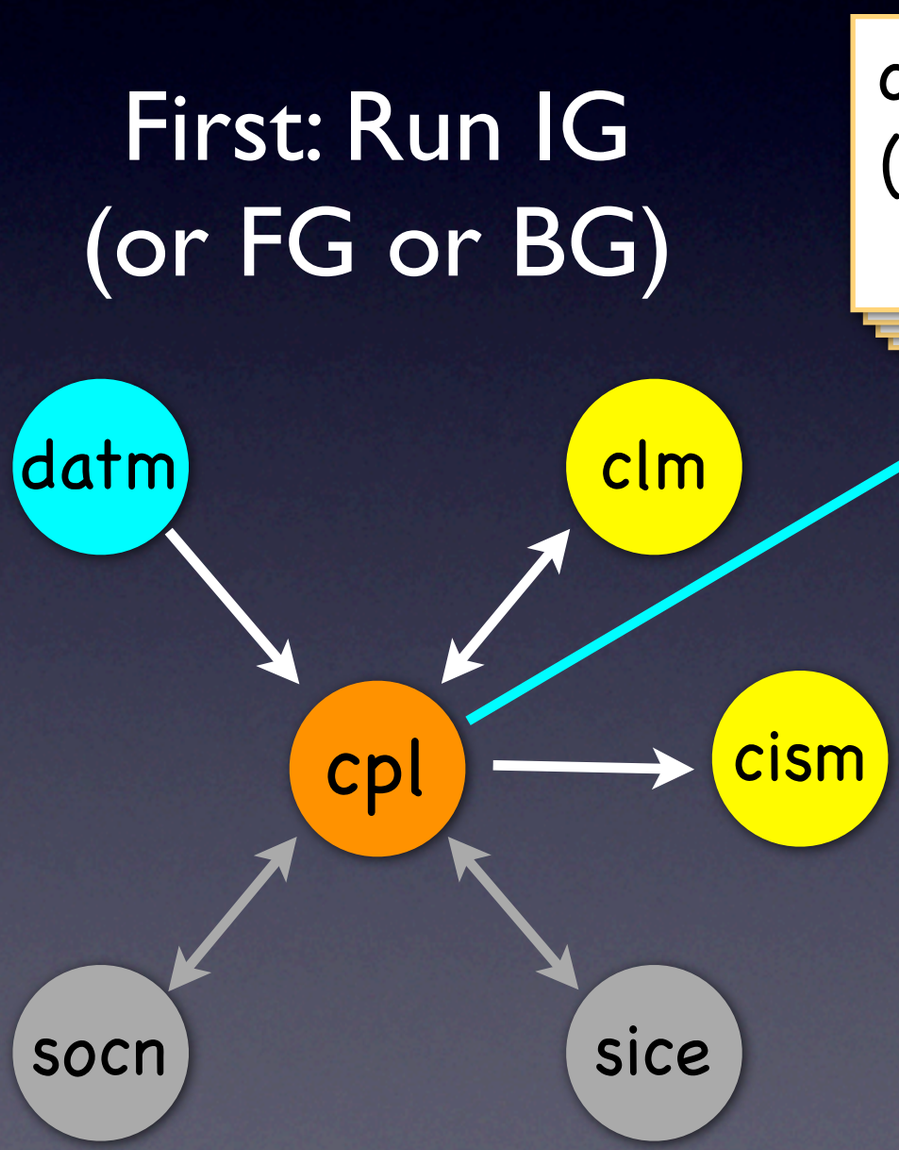
Limited number of supported resolutions:

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

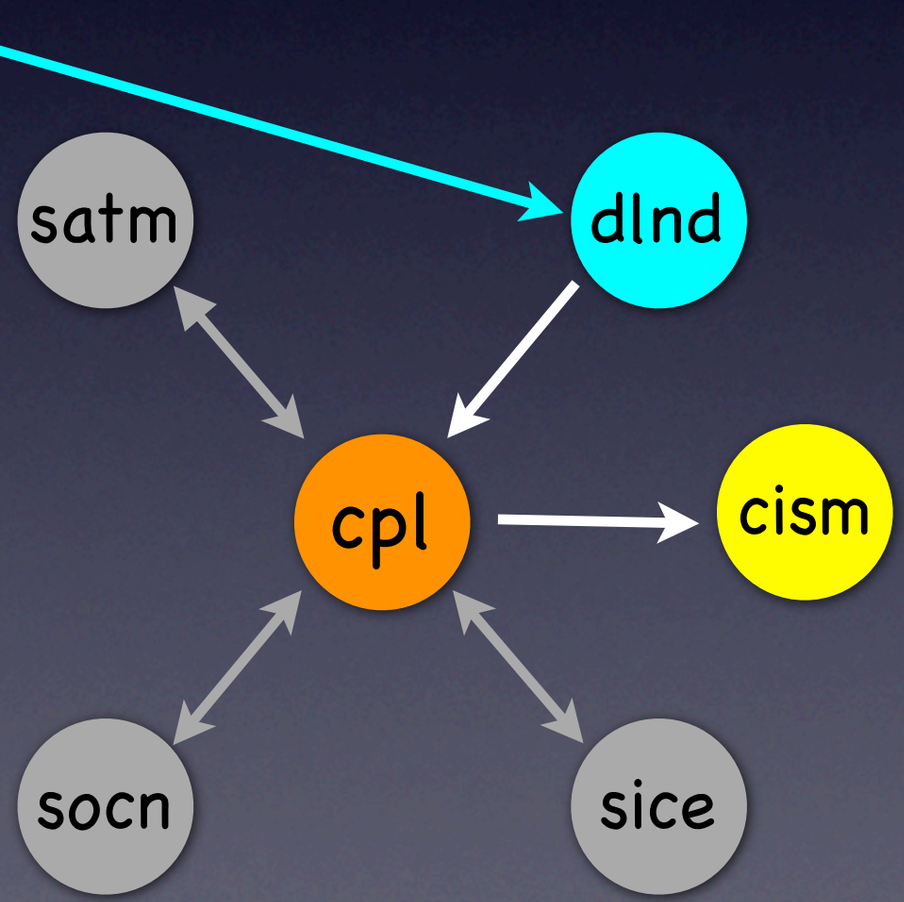
New TG Compset (CESM1.1)

Key: active / data / stub model

First: Run IG
(or FG or BG)



Next: Run TG



CESM1.1: New CISM Features

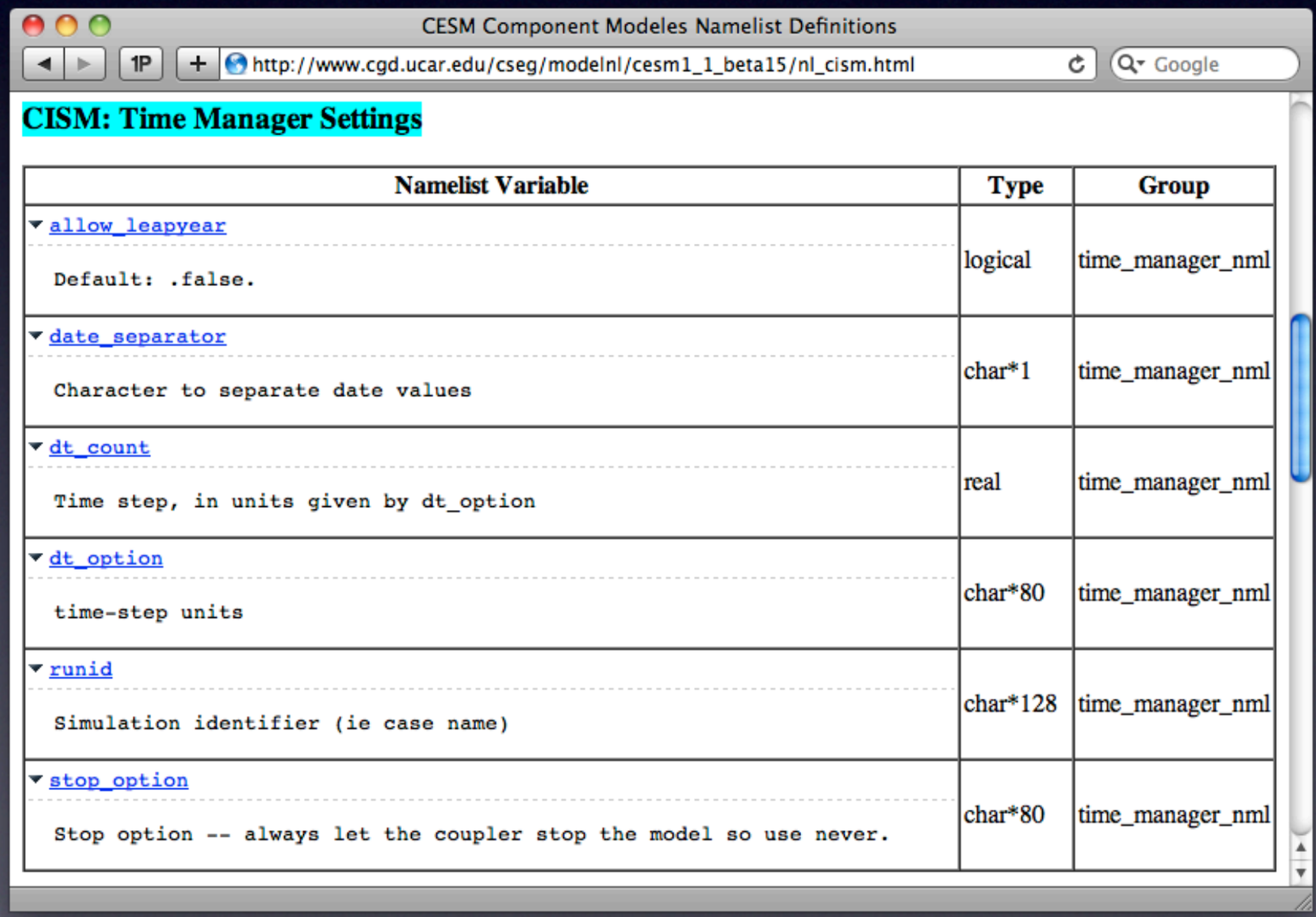
- CISM2!
  - SEACISM dynamical core, parallel solvers, etc.
  - BISICLES coming soon
- Ensemble capabilities
- Support for longer time steps in CISM and CESM scripts
  - e.g., 1-year time step

CESM1.1: New namelist features

Namelist modifications go in $CASEROOT/user_nl_cism

For example:

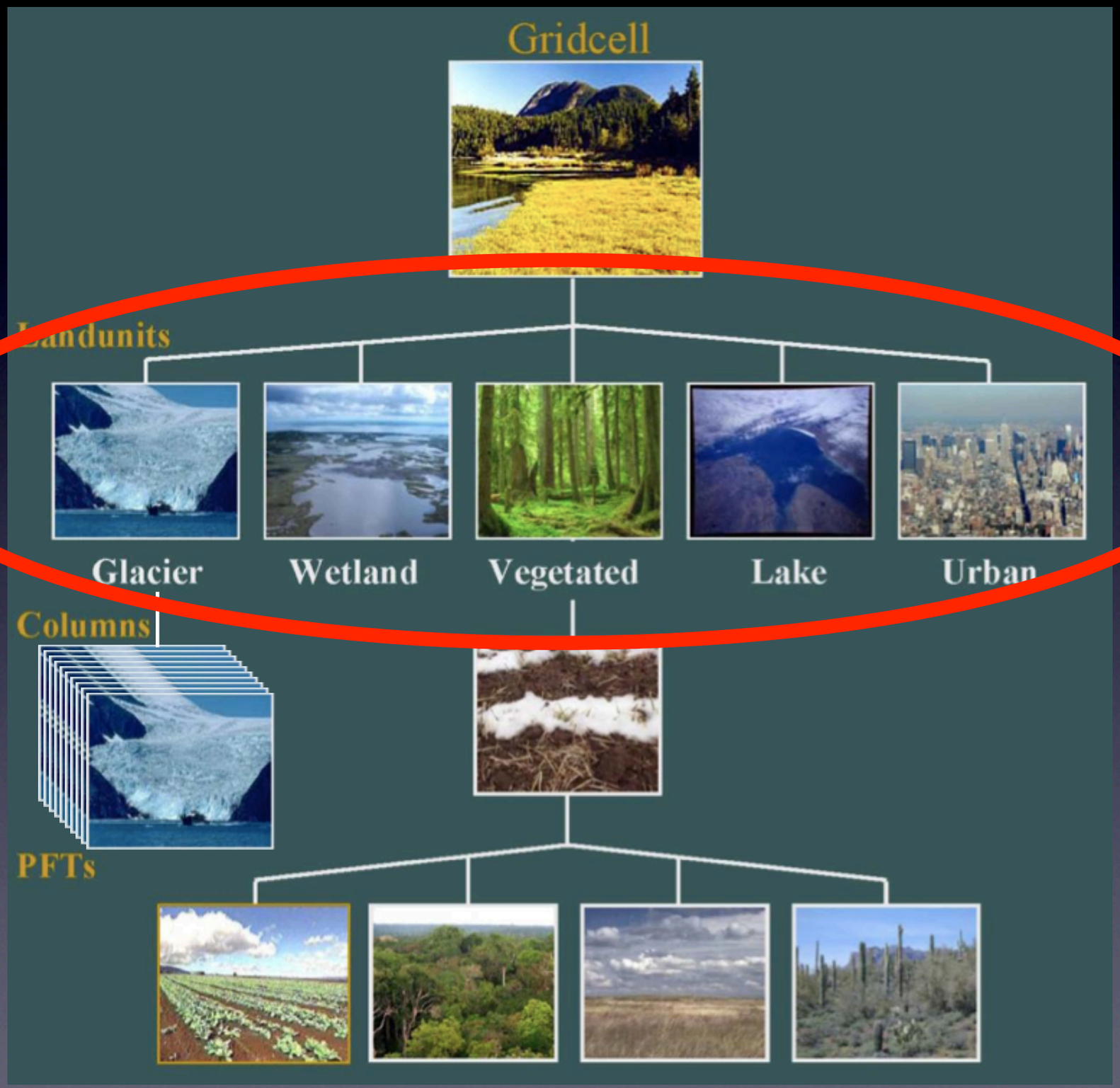
```
evolution = 0
```



CESM1.1: New CLM Features

- Improved glacier cover, consistent with CISM over Greenland
  - Global glacier cover from Alex Gardner
- Ability to output fields averaged only over glacier portion of each grid cell
- Glacier-related bug fixes

Post-CESM1.1: Dynamic Landunits in CLM



Currently: fixed fractions

One column for each elevation class

Post-CESM1.1:
Dynamic Landunits in CLM

CAM
(Community Atmosphere Model)

CLM
(Community Land Model)

10 glacier elevation classes

Surface Mass Balance

Surface Temperature

Icesheet Area

Surface Elevation

CISM
(Community Ice Sheet Model)

Area of cropland, urban, etc.

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

Hands-on overview: Standalone CISM run

- Why standalone CISM
  - access to higher-order, parallel solver
  - standalone useful even when CISM2 comes into CESM, for testing & development, or coupling to other forcing data
- Dome test case
  - Useful for testing the model in a simple configuration
  - Can watch ice evolving
- Greenland 5 km, one-year run, 750 processors