



NCAR
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FEBRUARY 11, 2026

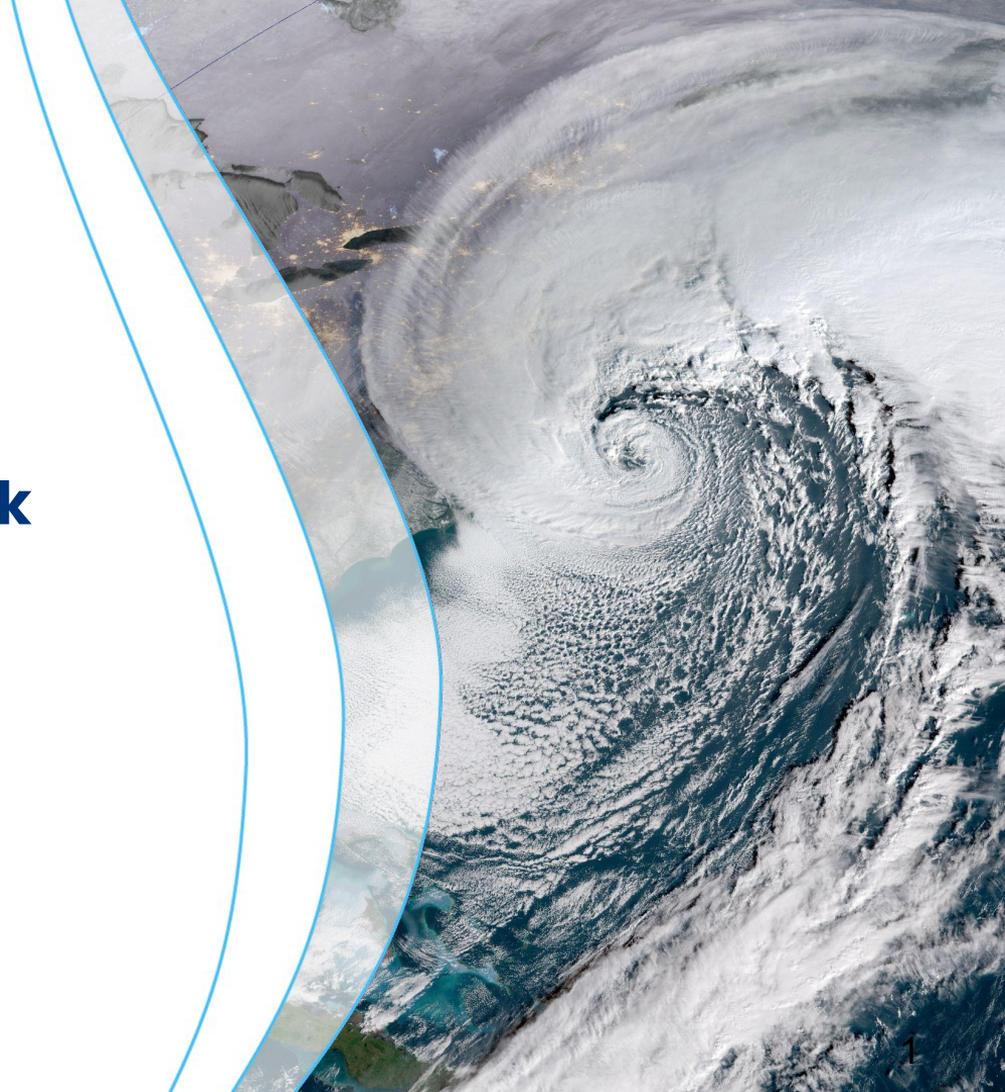
A quick overview of software engineering work since the summer meeting.

KATE THAYER-CALDER

**Gunter Leguy, Bill Lipscomb, Samar Minallah,
and many others!**

LIWG within CGD at NSF NCAR

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- Docker build
- TopoUpdater script to python
- Two big CISM Updates
- Namelist updates in CESM to support new CISM options
- Exact restarts with changing processor counts
- Support for DGLC in CISM_wrapper
- CitcomSVE3 in CESM
- Isotopes Survey



Docker is a piece of software that lets you run containers on your laptop.

A container is a stand-alone and self-contained computing environment that has its own operating system, files and libraries saved. If you launch our container in Docker, you have (basically) a small version of an NCAR supercomputer on your laptop.

- Installing CISM on a laptop is easier because the libraries are installed and saved in the container.
- The environment in the container looks and behaves a lot like Derecho (but no queue).
- Libraries installed in the container are not installed on your laptop, so you don't have to worry about software conflicts or compatibility.
- Fastest way to get CISM to run on a new machine!



<https://www.docker.com/products/docker-desktop/>

Tamara Segal, Summer Intern with CI-Compass from Univ of Connecticut

Used ClaudeAI to develop a python-based version of the Topography Updating script.

- This script previously used a mixture of bash, ncl, and Fortran to update the lower level of the atmosphere model (CAM) topography file to match changes in the GRIS.
- Used for most transient simulations with CESM2, but we had some issues with error handling and reliability (scripting support changed on Derecho without notice).
- Not the final version, more updates needed:
 - New topography generating code for CAM7
 - New unstructured grids for CAM7



cism_main_2.02.001

- First in the CISM 2.2 series
- Merged early 2025
- **Added support for Mountain Glaciers:**
- Reads in glacier information for an RGI region or sub-region
- Reads in climate fields: typically, monthly means of surface air temperature and precipitation at a reference elevation.
- New restart option: "hybrid restart".
- Spin-up options to help glaciers reach observationally-based target thickness and extent.

cism_main_2.02.002

- Merged in May 2025
- **Updates to calving and improvements for CalvingMip**
- A more accurate way to compute the calving front length for problems with radial symmetry
- More accurate diagnostics for computing the runtime calving front location along the designated profiles
- Support for new CalvingMIP grids with the origin lying at a cell corner

cism_main_2.02.003

- Merged in November 2025
- **Large refactor for SMB and some other additional options**
- Created a new module, glissade_mass_balance, consolidating some code that was spread among several modules
- Added a slope correction for the DIVA solver
- Modified the extrapolation of ocean thermal forcing to sub-shelf cavities
- Added an option to invert for coulomb_c at the basin scale in spin-ups

Added code to do global sums in a way that does not change if the parallel processor layout changes between runs.

Current PR in review, will be the next CISM main tag.

- Reproducible sums are the standard for components in CESM currently, so this is appreciated in other models as well.
- The algorithm is a bit slower (more expensive) than the non-repro sums, so the capability is optional. But will be default in CESM3.
- Testing branch set up in CISM-wrapper currently.



CISM-wrapper (CESM) support updates



8 new tags last year, here are the most important points:

Updates to namelists to support new `cism_main` tags.

Some rearranging of options, but almost all of the new options added in the previous CISM updates are also available in CESM runs.

Updates to namelist defaults for all CESM configurations.

Utilizing the new namelist options, we developed a new set of default namelist options for both GRIS and AIS in CESM.

Tests showed some answer changes due to these new options.

May not be the default for the CESM3 release as the spin-up is currently under way.

Support for DGLC in CISM-Wrapper

Previously, the code for DGLC was present in CISM-wrapper but inaccessible to any configuration supported by a checkout.

DGLC is now available for compsets involving CTSM in CISM-Wrapper. Created a new "JK" compset that is CTSM-DGLC.

Now testing for updates to land ice can include tests to data glacier.

New Grids for CESM3

Gunter has developed new GRIS grids (see his presentation) and these are now supported in CESM3 and CISM-Wrapper.

Also added new aliases for fully coupled compsets that include the current atmosphere and ocean grids.

CESM3 code freeze soon?



The co-chairs and CESM chief scientist Dave Lawrence feel the model is converging on a final configuration.

In the past, once we have the science and general climate that we want, then we create “frozen” release branches.

- Each component creates a branch for testing and documenting that is no longer updated (aside from critical bug fixes) and this becomes our release branch.
- Development branches can continue, but those code changes will go into the next release.
- It takes about 2 months to test and document a full CESM release, so branches may be made soon!

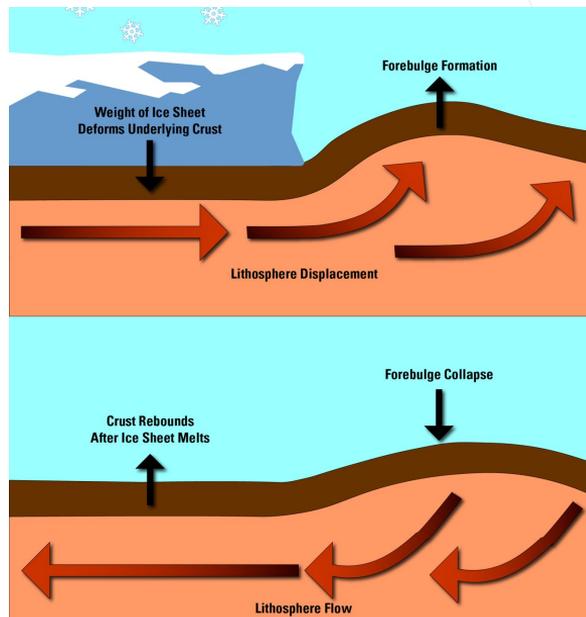


Glacial Isostatic Adjustment (GIA) is the process of the Earth's crust deforming under the load of ice sheet growth, and then rebounding after the retreat.

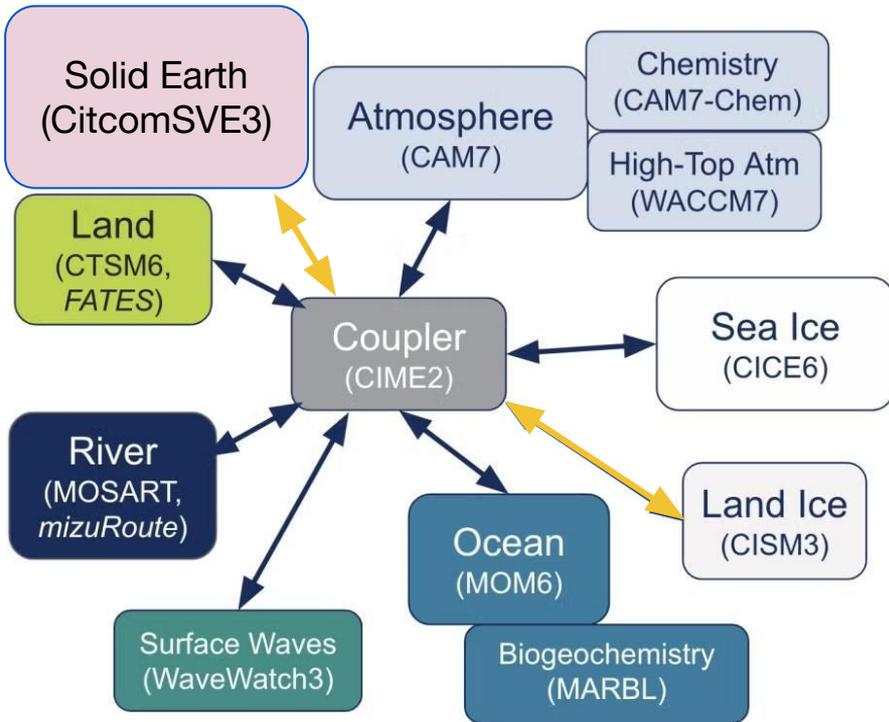
The surface of the Earth (including global average sea level) is not static but rises and falls as loads change. However, in CESM, currently, it is always assumed to be static.

We have started working with collaborators at CU to build a CESM component for CitcomSVE3, a parallel solid earth convection model.

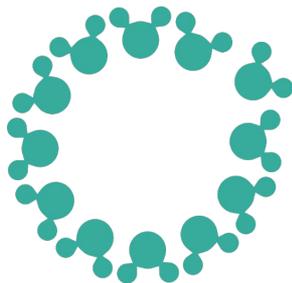
Submitted a full proposal to NSF CSSI in November, hoping for resources to continue the work!



Plans to couple GIA into CESM



- Our goal is to bring the CitcomSVE3 solid earth model into CESM as a component.
- <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2022GC010359>
- The coupling infrastructure in CIME will allow us to couple CISM to CitcomSVE3 for our first studies.
- Eventually, nearly every model could be updated to include support for Solid Earth changes.



SCI-SWIM

Sustainable Community Infrastructure
for Stable Water Isotope Modeling
Enabling Earth System Research

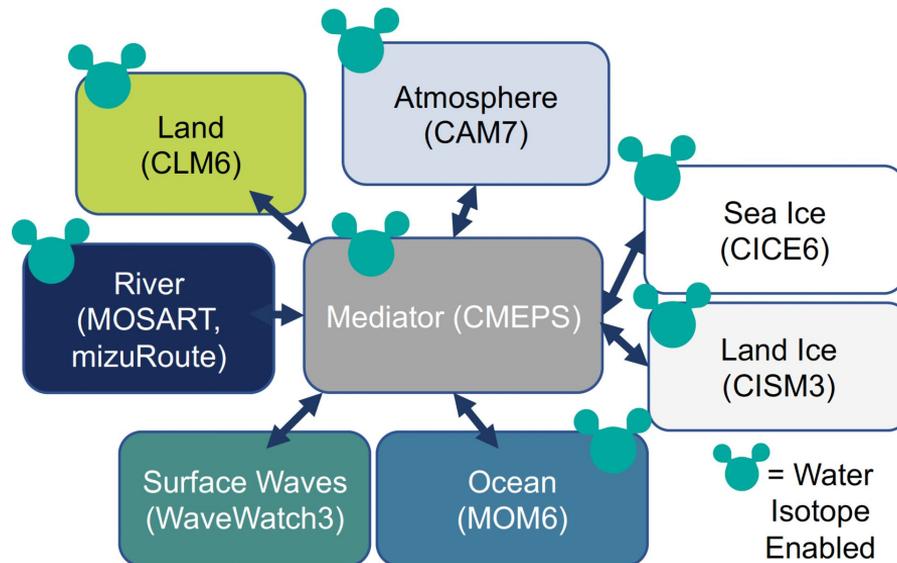
NSF-CSSI Funded Project

PI: Sylvia Dee (Rice U.) &
Jiang Zhu (NSF NCAR)

Co-PI: Peter Lauritzen &
Will Wieder (NSF NCAR)

Other Personnel: Bill Sacks &
Jesse Nusbaumer (NSF NCAR)

- Develop the next-generation water-isotope-enabled CESM using modern software design.
- Sustain long-term community use and co-development through open-source tools, clear documentation, and training.
- Replace the legacy iCESM1, which relies on physics more than a decade old.

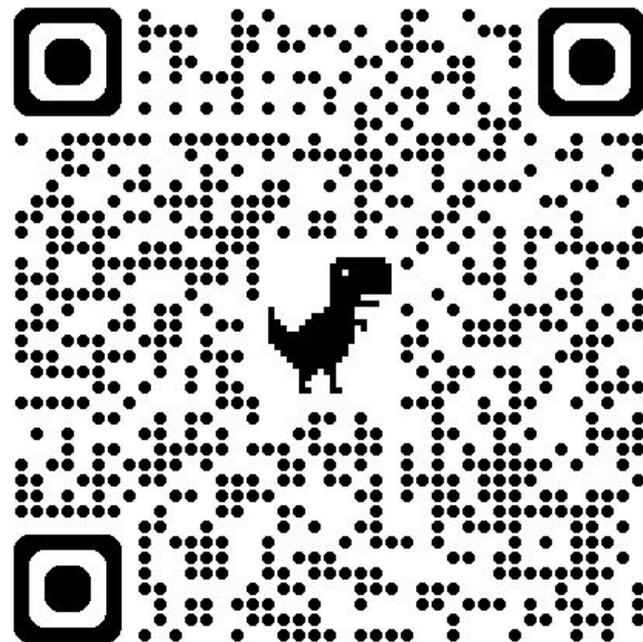
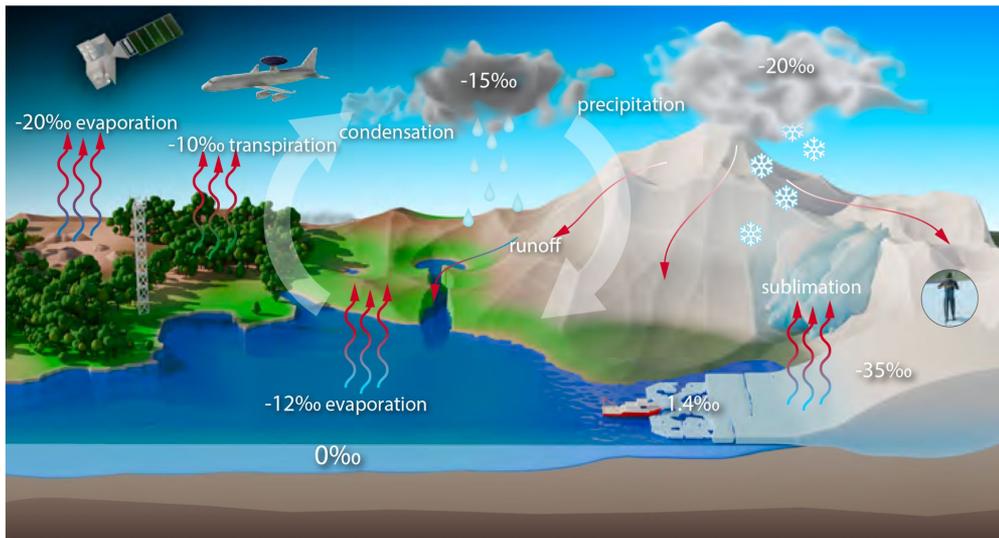


Please participate in this survey to help guide *iCESM development, validation, and user support.*

iCESM User Survey

<https://forms.gle/gBftvVGEQeMWG2NGA>

(Link also available in upcoming CESM Newsletter)



In Summary – Please Snow

