

## What's new in the CESM1.0 release of CLM4?

The CESM1.0 release includes changes to CLM4 since the April 1, 2010 release of CLM4 such as software engineering improvements, bug fixes, and addition of new capabilities.

- The Community Ice Sheet Model (CISM) has been implemented within CESM1.0. In order to accommodate CISM requirements for high resolution surface mass balance, CLM4 splits glacier landunits into multiple elevation classes, with a distinct surface mass balance computed for each class. The surface mass balance in each elevation class is passed to CISM via the coupler and then downscaled to the ice sheet grid. Note that the multiple elevation classes are only active when CISM is active. For further information on CISM, see the CISM Users Guide at <http://www.cesm.ucar.edu/models/cesm1.0/cism/>.
- Aerosol and nitrogen deposition fluxes are now read in from stream files at a single resolution (1.9x2.5) and regridded to the resolution of the current simulation on the fly. The aerosol deposition file is now specified in the data atmosphere (datm) namelist when running CLM4 offline (e.g., an "I" case) and in the CAM namelist when running coupled (e.g., an "F" or "B" case) in prescribed aerosol mode. This results in changes that are larger than roundoff but the same climate as the April 1, 2010 release of CLM4.
- A bug fix to the snow hydrology subroutines. Snow layer liquid water plus ice content could on occasion exceed the snow layer thickness in some snow columns. The solution to this problem was to adjust layer thickness for any water plus ice content changes in excess of previous layer thickness at appropriate steps in the snow hydrology subroutines. This results in changes that are larger than roundoff but the same climate as the April 1, 2010 release of CLM4.
- Several new namelist items were introduced to activate new model features:
  - "Carbon\_only" – If true, and the carbon nitrogen model (CN) is on, supplemental nitrogen will be provided such that plants are not nitrogen limited. However, a complete implementation of "carbon-only" also requires that nitrogen limitation values be used and this is not currently implemented. Thus, it is not recommended to use this namelist item. Default is false.
  - "scaled\_harvest" – If true, use scaled coefficients for forest harvest (see page 226 of the CLM4 technical note at <http://www.cesm.ucar.edu/models/cesm1.0/clm/>). Default is false.
  - "ice\_runoff" – If true, river runoff will be split up into liquid and ice streams in RTM, otherwise ice runoff will be zero and all runoff directed to the liquid stream. Default is true.
  - "create\_glacier\_mec\_landunit" – If true, glacier multiple elevation classes will be created. Default is false.
  - "glc\_dyntopo" – If true, CLM glacier topography changes dynamically. Default is false. Not yet fully implemented.
  - "glc\_smb" – If true, surface mass balance will be passed to CISM, otherwise positive-degree-day (PDD) information will be passed to CISM. Default is true.
- Several new history fields were introduced. These are mainly associated with the introduction of the glacier model. See the CLM Users Guide at <http://www.cesm.ucar.edu/models/cesm1.0/clm/> for a list of new fields.