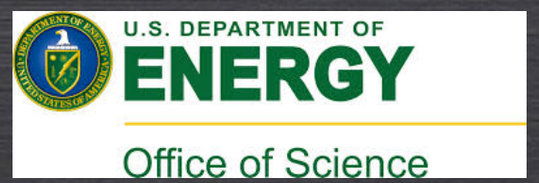
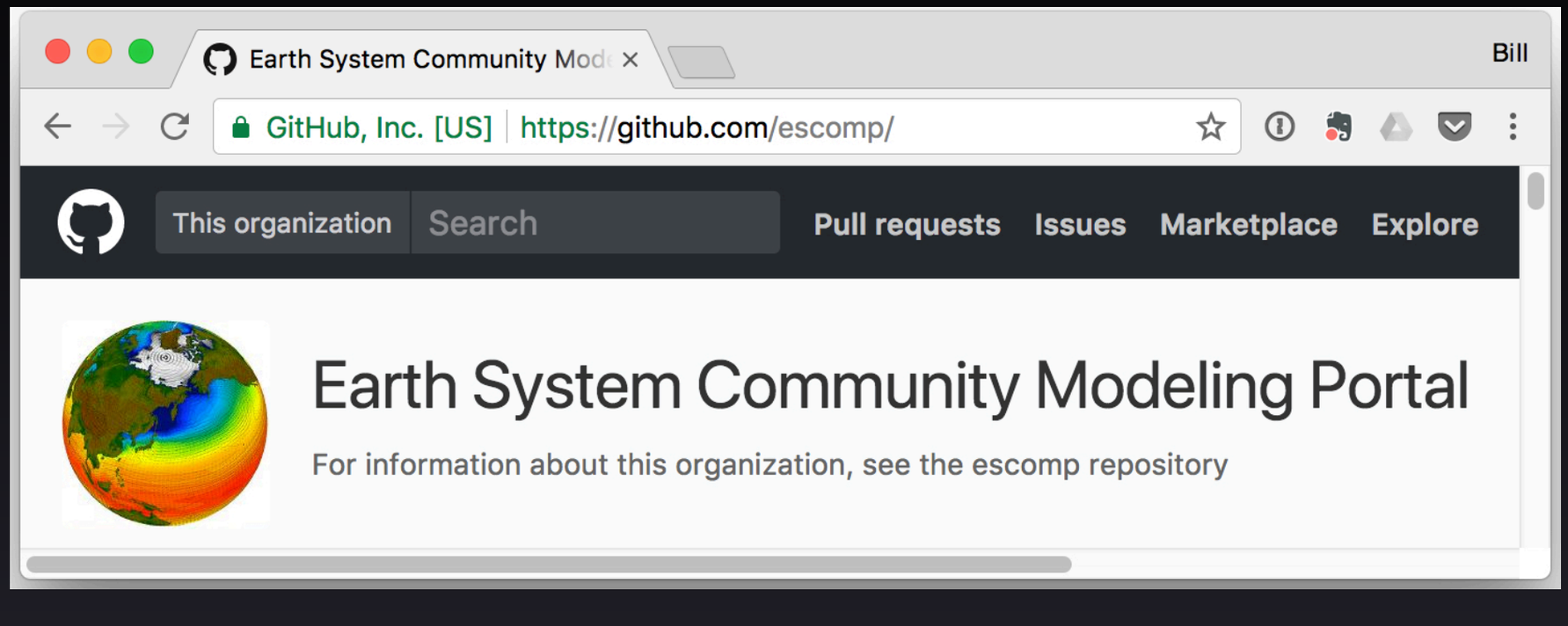
Year in Review: Land Ice-Relevant Changes in CESM Since Last Winter

Bill Sacks
Land Ice Working Group
Software Engineering Liaison

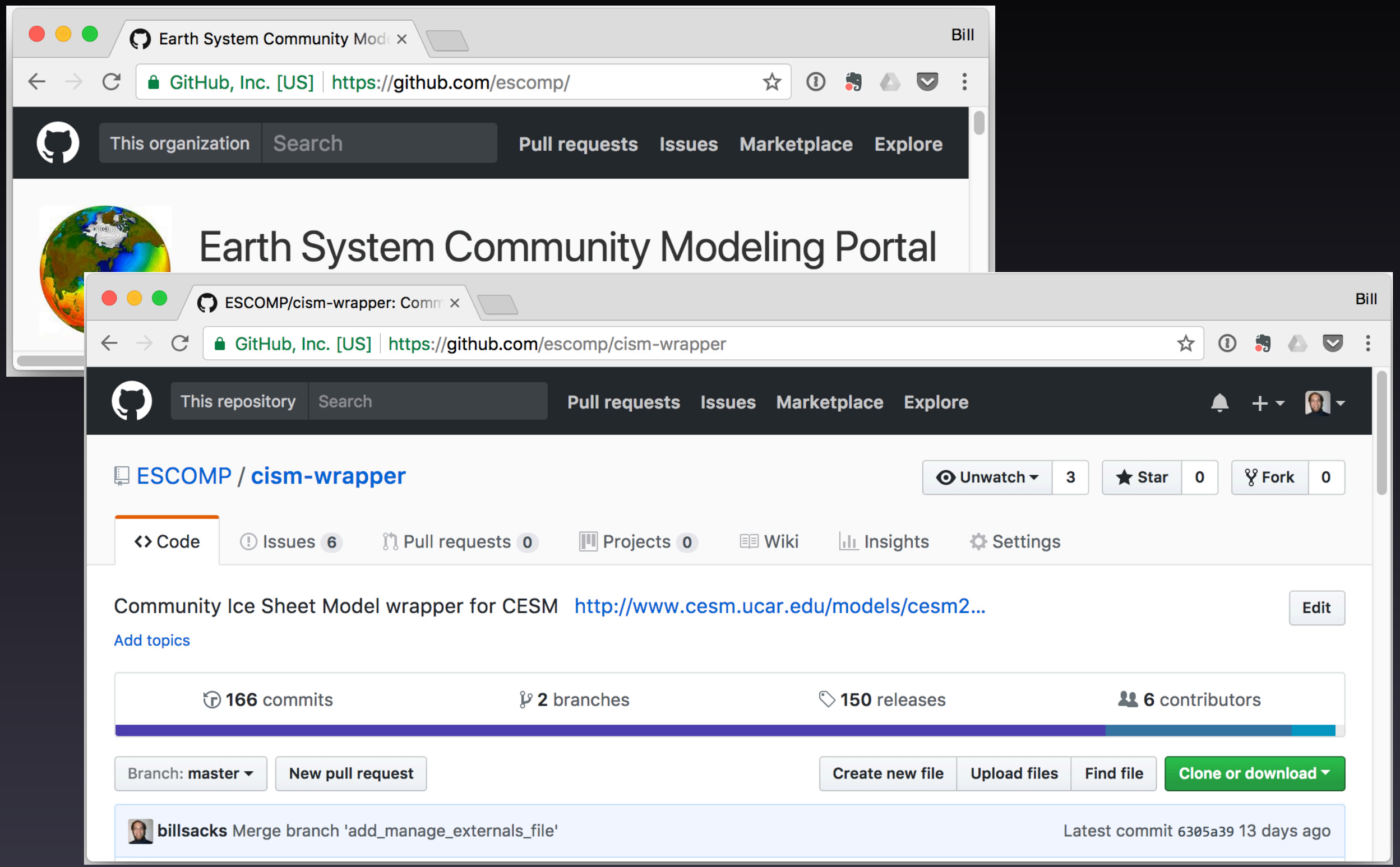
With contributions from many others in the LIWG and the CESM Software Engineering Group (CSEG)



CESM Migration to GitHub



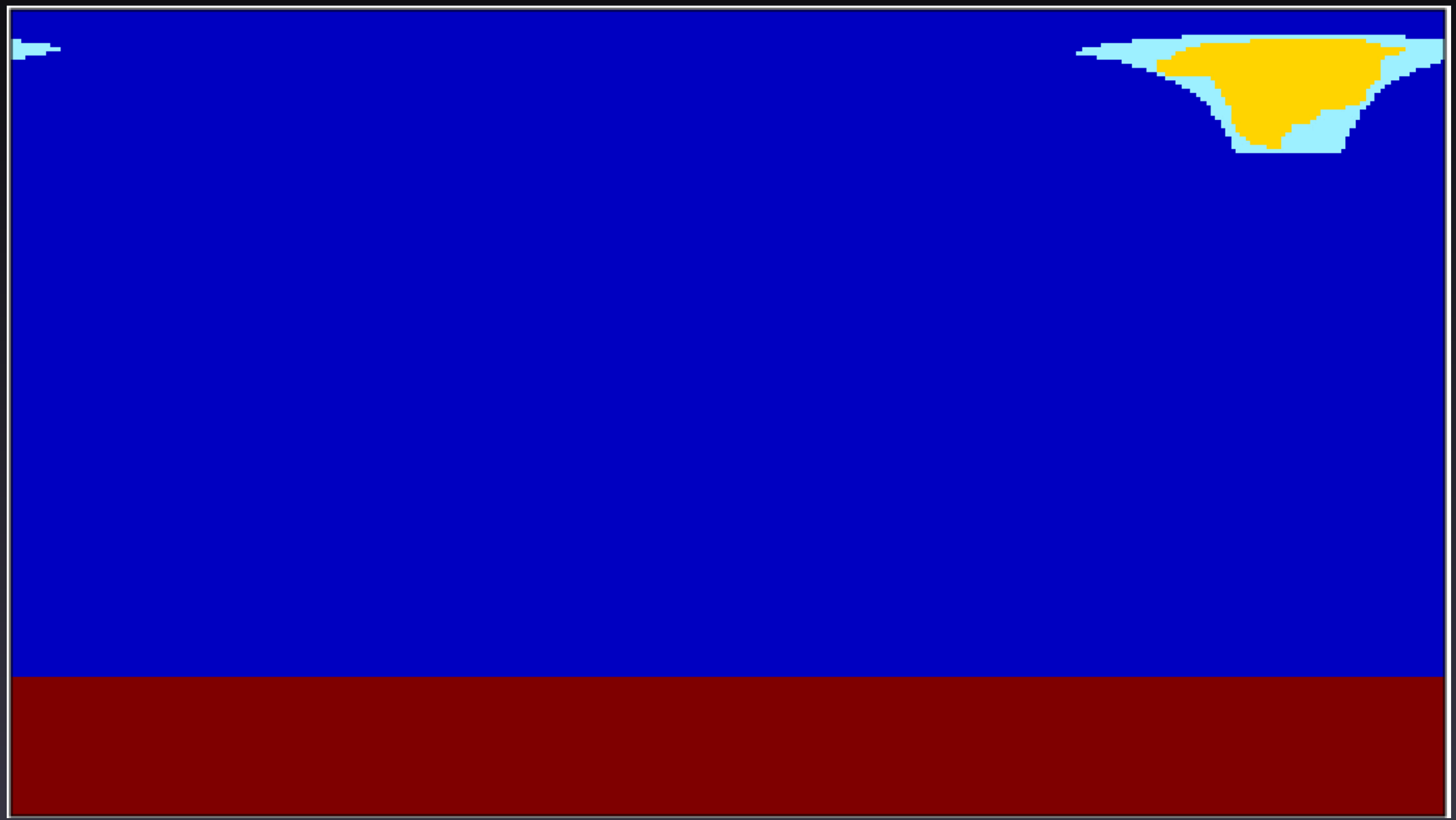
CESM Migration to GitHub



CLM: Use MEC Even With SGLC

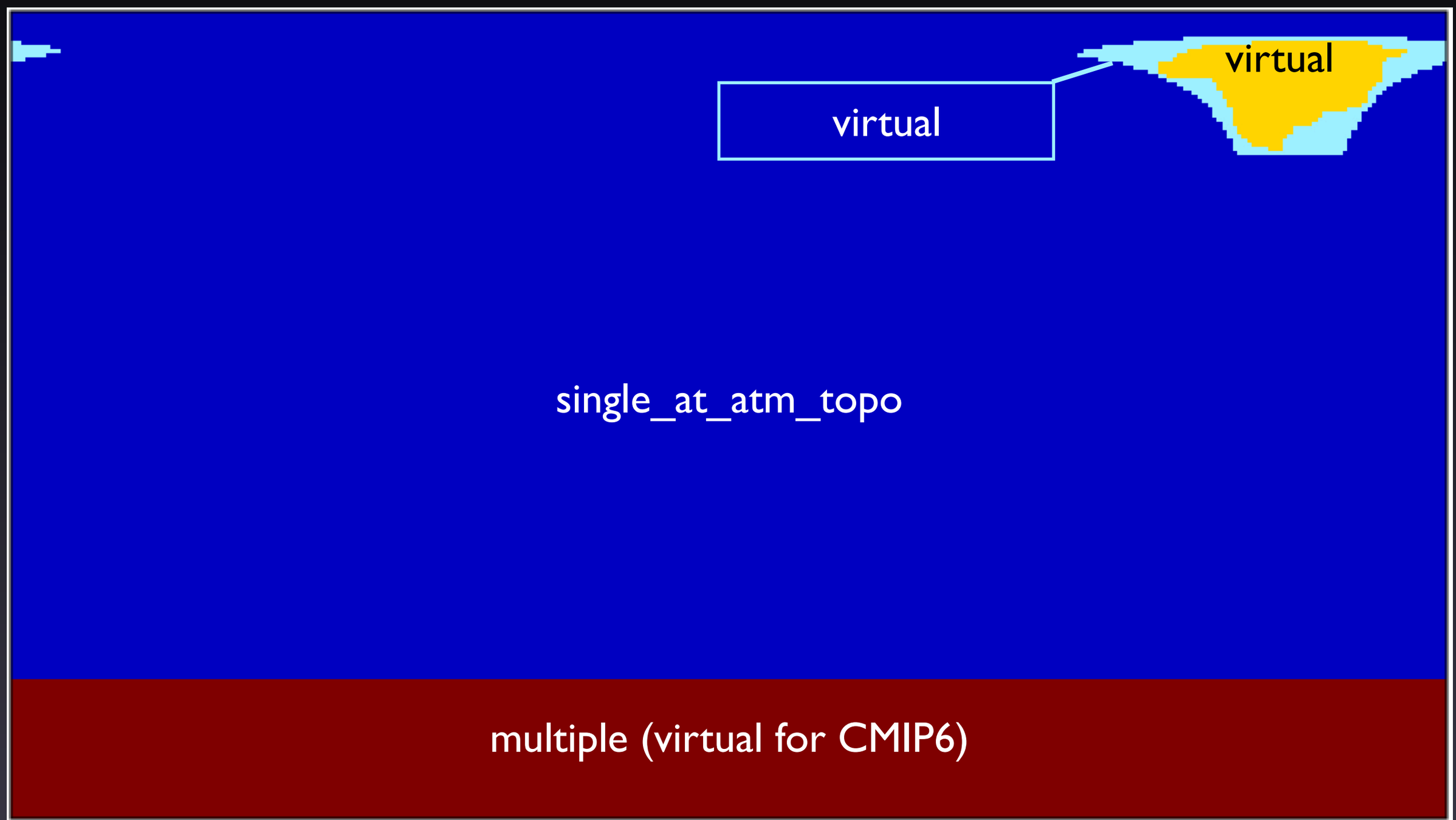
- Previously, CLM's logic for whether to use multiple elevation classes (MEC) was tied to whether CISM was running
- Now even runs with a stub glacier model (SGLC) use the MEC scheme
  - Computes SMB in each elevation class, but no downscaling
  - Applications:
    - Single-point / regional runs over glacier regions
    - Achieving consistent physics in runs that cannot or don't want to use CISM (e.g., runs with Gregorian calendar)

CLM's Glacier Regions



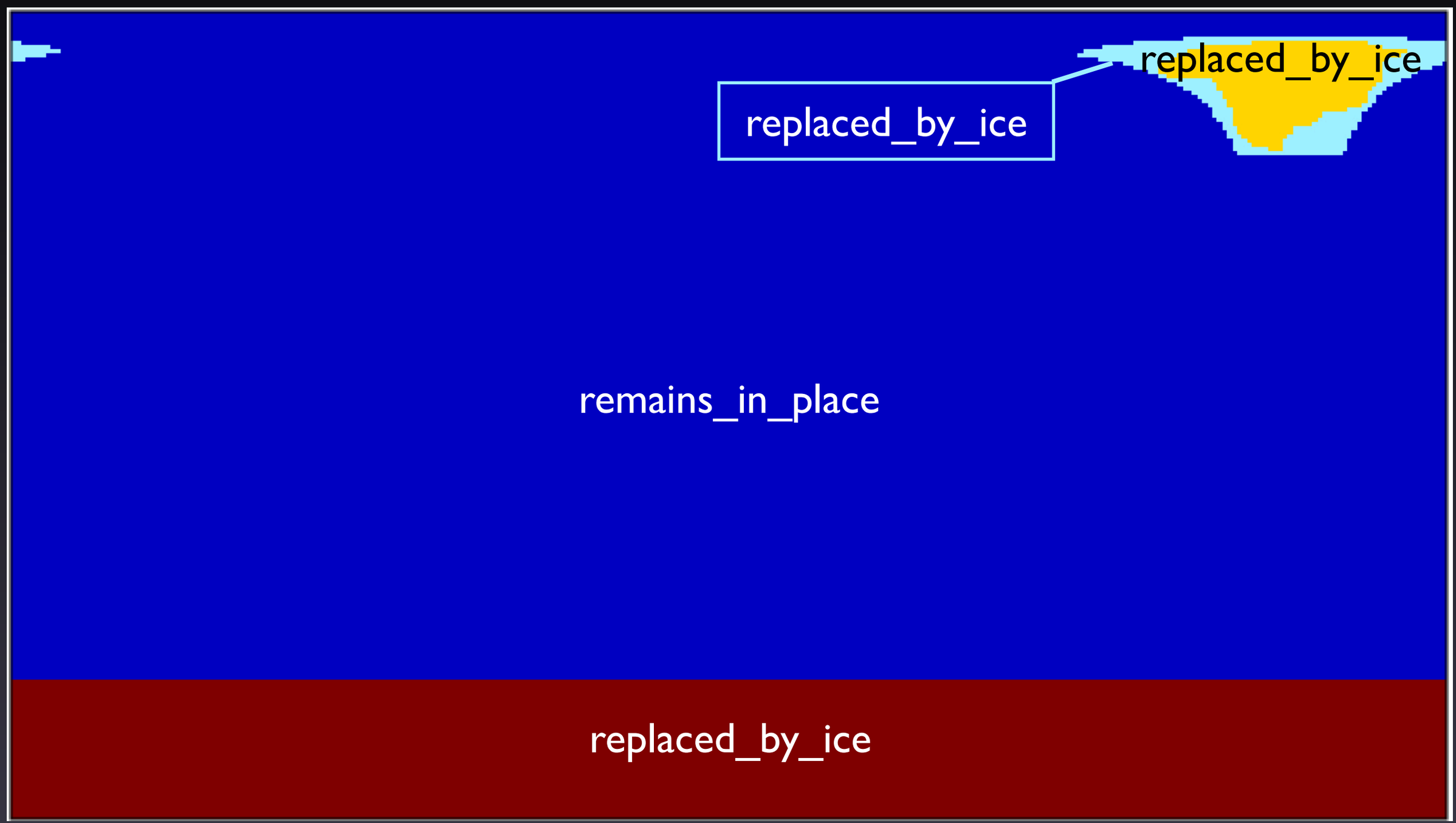
CLM's Glacier Regions

glacier_region_behavior



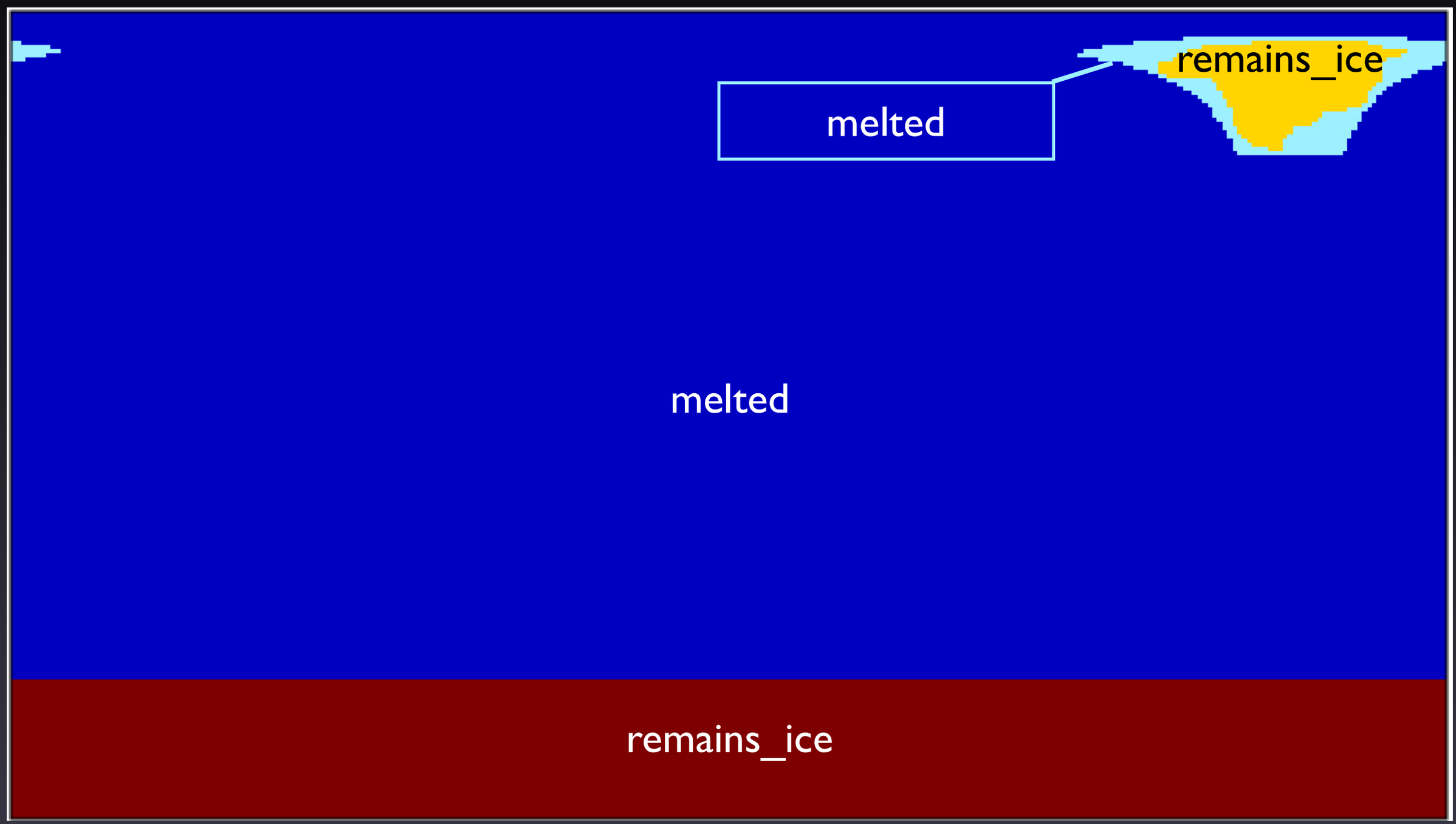
CLM's Glacier Regions

glacier_region_melt_behavior



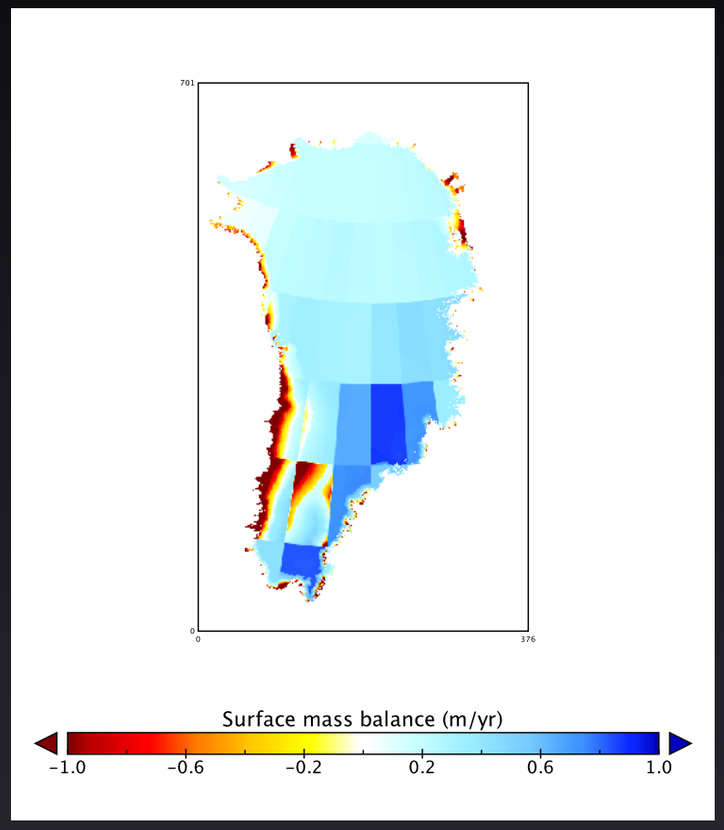
CLM's Glacier Regions

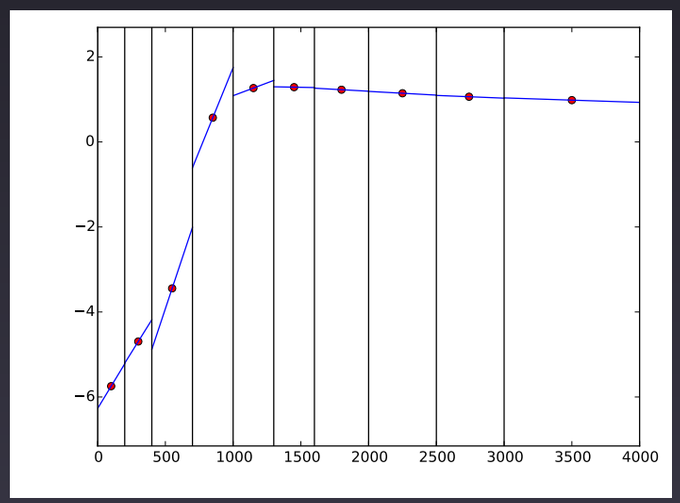
glacier_region_ice_runoff_behavior



Remapping Changes

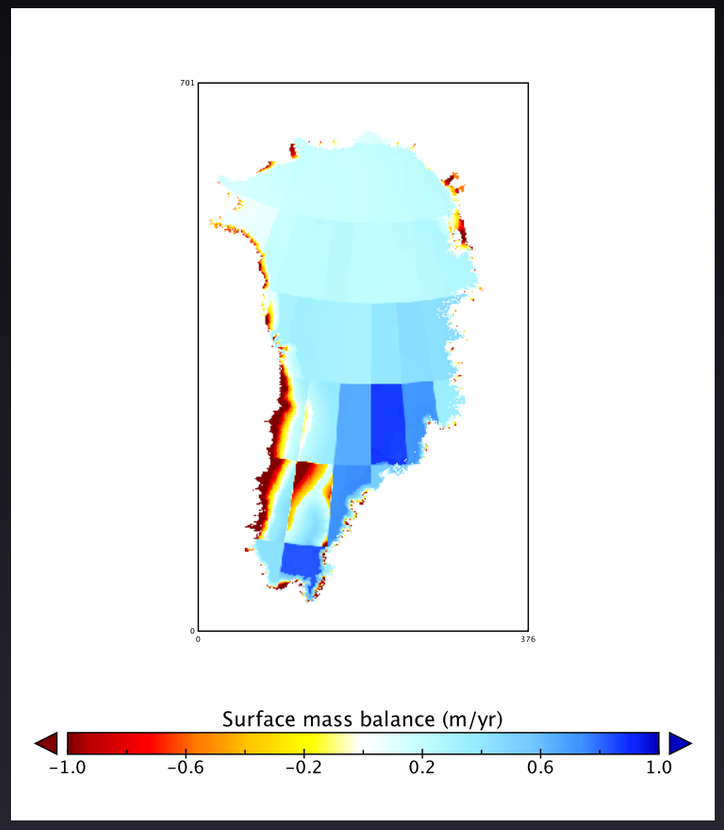
Bill Lipscomb, Mariana Vertenstein, Jeremy Fyke

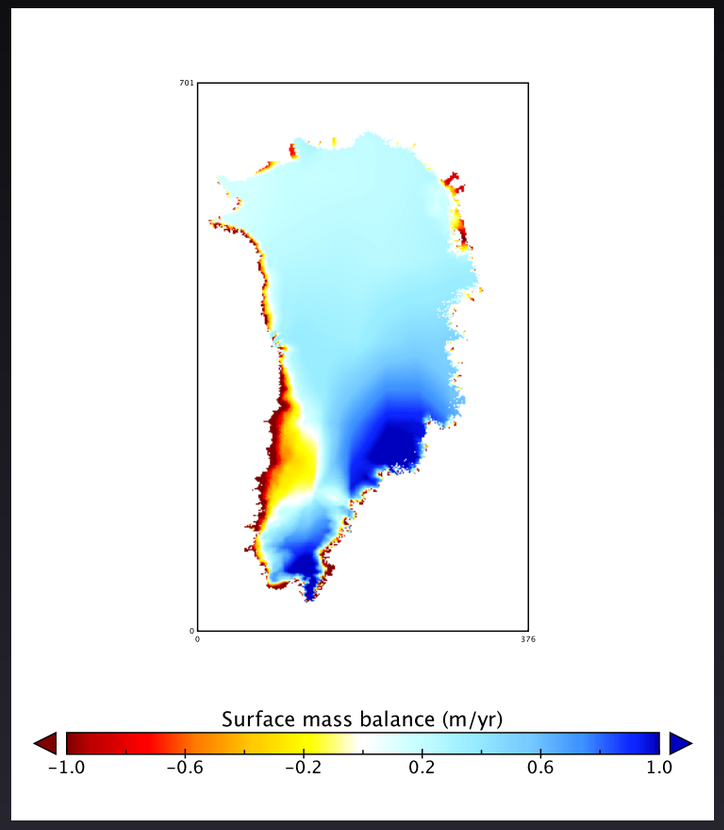


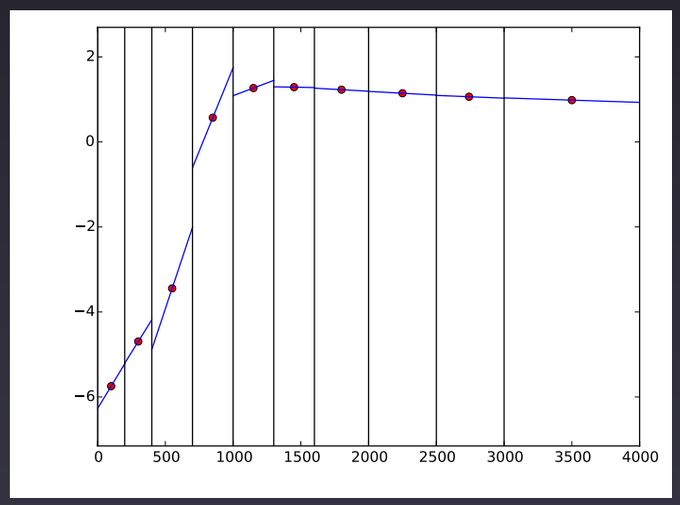


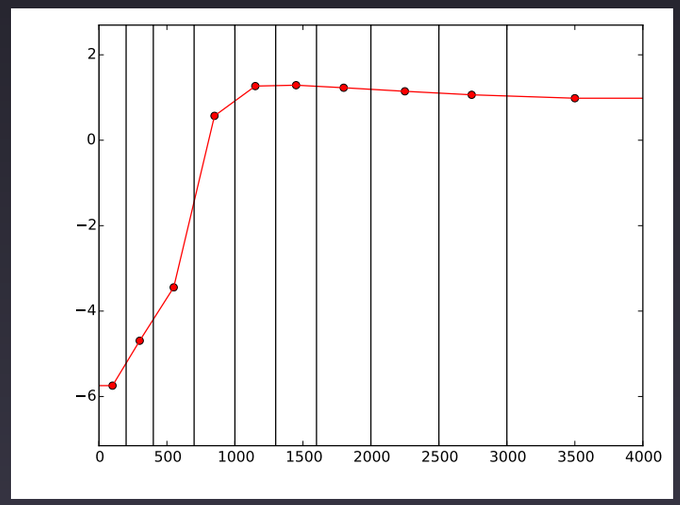
Remapping Changes

Bill Lipscomb, Mariana Vertenstein, Jeremy Fyke









Other Changes

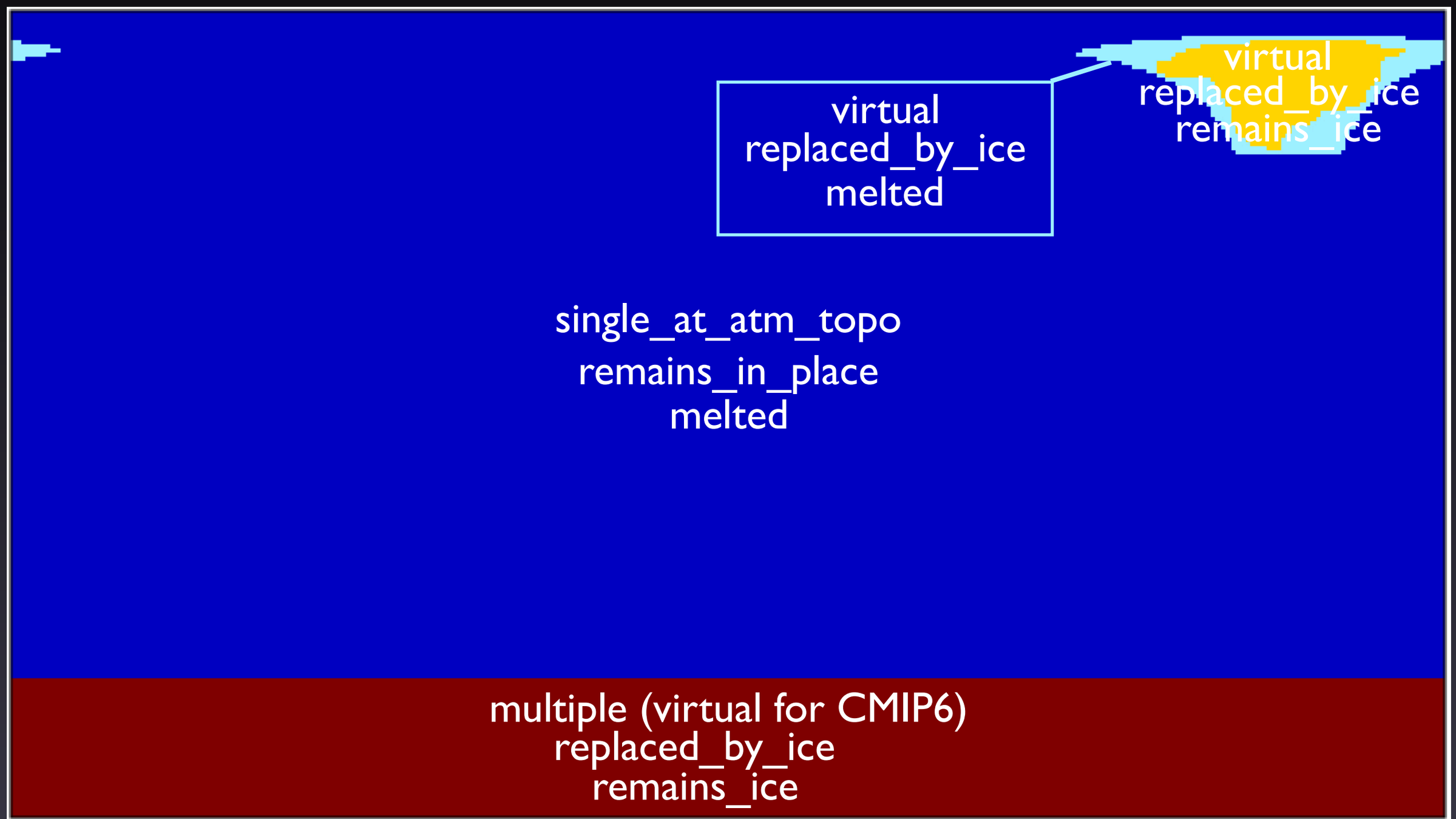
- Fixes to remapping of CISM's runoff – relevant for two-way-coupled runs
  - Fixed major bug in remapping of CISM's ice runoff to ocean: remapped runoff was too low by roughly a factor of 2-3
  - Tweaks to runoff mapping to work with POP's Estuary Box Model (EBM)
- New options to reset CLM's initial snow pack over glacier and/or non-glacier columns (Leo van Kampenhout)
  - Can be used when transitioning from offline spinup to coupled run
  - For glacier columns, can specify an elevation threshold
- Consistent atmospheric topography when running an I or JG compset with cplhist forcings (Mariana Vertenstein)

Some Software Priorities Over the Next Year

- Bring CISM2.1 into CESM
- Fix generation and use of TG forcings
  - Currently, TG compsets should only be used for software testing, not science
- Allow multiple ice sheets (Brian Kauffman)
- Improved handling of water and energy conservation with dynamic landunits
  - Avoiding large, fictitious fluxes
  - Support new SMB definition (inclusion of snow pack)
- Some coupling edge cases
  - e.g., CLM dictates more melt than CISM can accommodate
- Rework CISM's time manager (general cleanup, allow Gregorian calendar) (Gunter Leguy)

CLM's Glacier Regions

glacier_region_behavior

glacier_region_melt_behavior

glacier_region_ice_runoff_behavior