CESM3 Update and Wrap-Up Discussion

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CESM3 Science Freeze

CESM3 Release (code + simulations)

Scenarios available CESM3.1

CESM3.1-ML release (??)

CESM3-ML dev

Tuning, update forcings

SE testing, doc, sims

CESM3 high res dev (0.25º atm, 0.1º ocn)

CESM3.1-ML CMIP7 runs (??)

Jan 2024

Jan 2025

Jan 2026

CMIP7 Fast Track sims
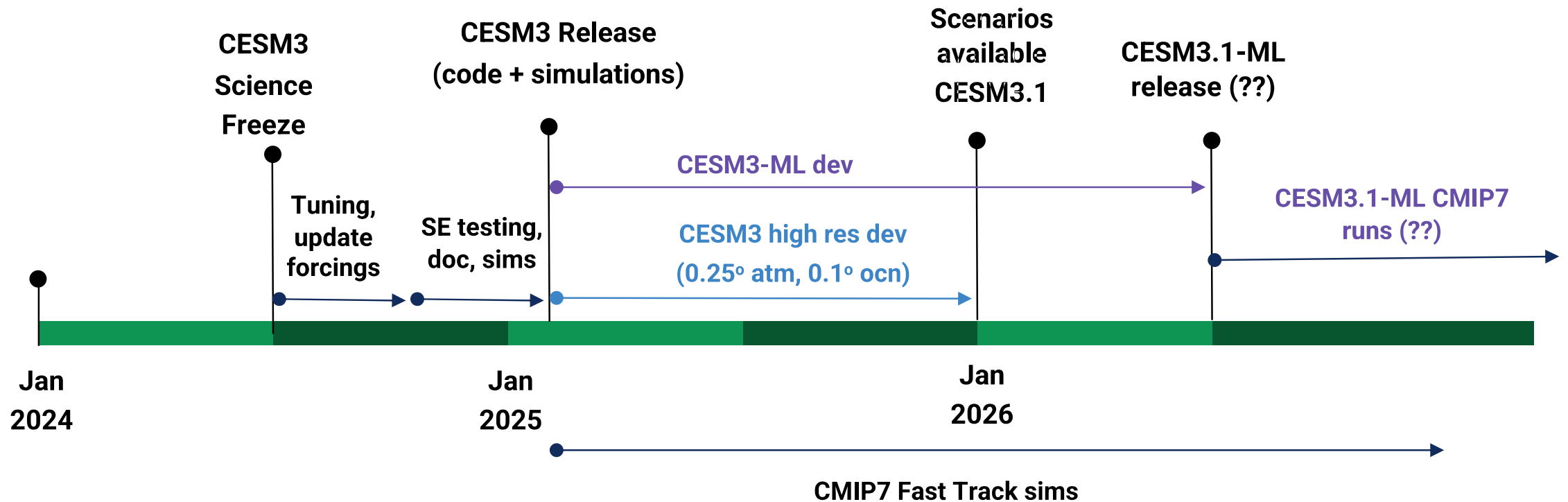
o We will use Last Glacial Maximum simulation as an out-of-sample test to provide early feedback to model development

o Impacts from past efforts: Paleoclimate-calibrated CESM2 *(Zhu et al., 2022, JAMES)*

- Removed an inappropriate limiter on cloud ice number
- Treatments to the long microphysical time step

o Ongoing investigation on the CESM2 Eocene simulation (temperature not converging crashing the model; see my talk at AMWG Meeting)

NOTE: talk available on YouTube @NCAR_CGD

o New spectral element dynamical core (Talk by Peter Lauritzen)
   Better scaling; Variable resolution support; Unstructured grid

o Increased vertical levels (Talk by Isla Simpson)
   93 (from 32); 58 for parameterization development

o New radiation scheme (Talks by Brian Medeiros & Jiang Zhu)
   RTE+RRTMGP is more accurate with wider lookup table

o New dust scheme (Talk by Danny Leung)
   Partition by surface roughness; sub-timestep wind gusts; erodibility map in CTSM

o Updated Microphysics (Gettelman et al. 2023, GMD)

o …

NOTE: talks available on YouTube @NCAR_CGD

(a)

(b)
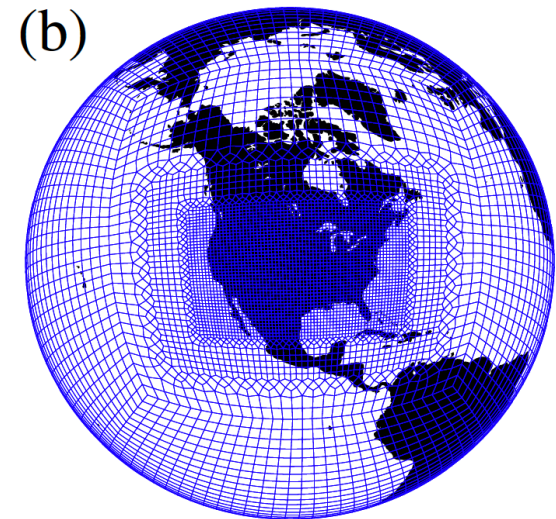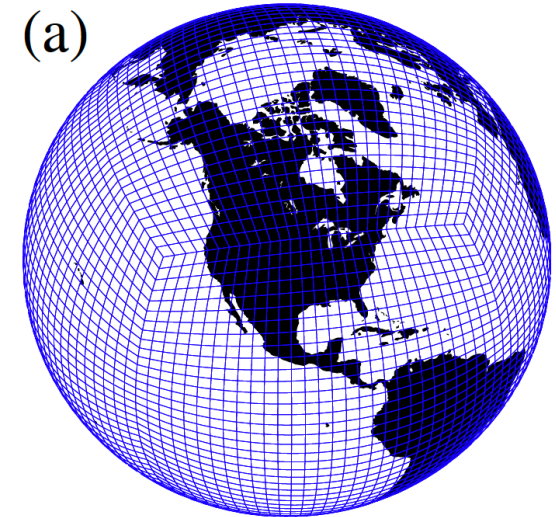
- Talk by Gustavo Marques
  - *Southern limit of grid: 81°S*
  - *Natural surface freshwater flux*
  - *Choices of vertical coordinate*
  - *Mixing and deep-time application?*

- MOM6 webinars (2020) *https://www.cesm.ucar.edu/events/244/agenda*

	POP2	MOM6
H. Grid	1.125° dipole w/ equatorial refinement	0.66° tripole w/ equatorial refinement
V. Grid	z-coord., dz = 10 m @ surface, 60 levels	z*-coord. or hybrid (z*/isopyc) or vert. mode optimized, dz = 2.5 m @ surface, 65-75 levels
Freshwater B.C.	Constant volume, virtual salt flux	Variable mass, natural B.C
V. Mixing	CVMix-KPP + Langmuir	CVMix-KPP + wave processes
GM+Redi	Marshall N^2 scaling	MEKE+GEOMETRIC scaling + **Vertical structure in Redi** + backscatter
Mixed Layer Eddies	Fox-Kemper et al. (2010), L_f = 5 km	Fox-Kemper et al. (2010), L_f = 1 km + Bodner et al. (2023)
H. Viscosity	Anisotropic Laplacian	Isotropic Laplacian + Biharmonic, via MEKE
Solar penetration	Ohlmann (2003)	Manizza (2005)
Advection	3rd order upwind	Horiz. PPM, Vert. ALE w/ 3rd order remapping
Other params	Overflow, estuary box model	**subgrid scale EOS correction**, **geothermal**, estuary box model

- Land Ice & Polar Working Groups (Talks by Gunter Leguy, Bill Lipscomb, & David Bailey)

  Antarctic Ice Sheet & coupling with MOM6; Paleo ice sheets; Mountain glaciers; Notebooks on sea ice diagnostics from David Bailey.

- Upcoming Working Group Meetings
  - Land Model & Biogeochemistry: tomorrow
  - Software Engineering: Mar. 4
  - Earth System Prediction: Mar. 5
  - Climate Variability & Change: Mar. 6

- New coupling infrastructure: NUOPC/CMEPS *(no more offline generation of mapping files, …)*

o Derecho is in general faster and/or cheaper than Cheyenne

o Submit a support ticket if you forgot to get data from /glade/p/palwg

o Diagnostics & data visualization

- *CESM Unified Postprocessing & Diagnostics (CUPiD):*
  https://github.com/NCAR/CUPiD (see talks at SEWG Meeting)

- *Earth System Data Science (ESDS) Initiative: https://ncar.github.io/esds/*

o **CESM2.1.5** (& PaleoCalibr) is the supported & recommended version

o **CESM1.3_iHESP** is the supported code for high resolution *(Chang et al., 2020; ne120_t12 & ne30_g17): https://github.com/ihesp/cesm/releases/tag/cesm-ihesp-hires1.0.47*

o **Water isotope-enabled CESM1.3_iHESP** is still being evaluated & may be released this summer