

Updates to Variable Resolution CESM (VR-CESM) Arctic Configurations

Winter LIWG Meeting, 2021

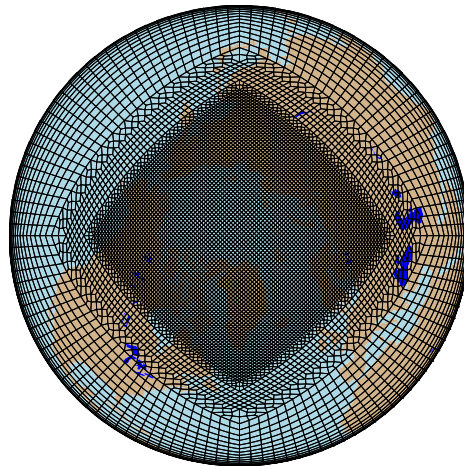
Adam R. Herrington, CGD Project Scientist

Peter Lauritzen, Andrew Gettelman, Matt Rehme, Marcus Lofverstrom (UA)

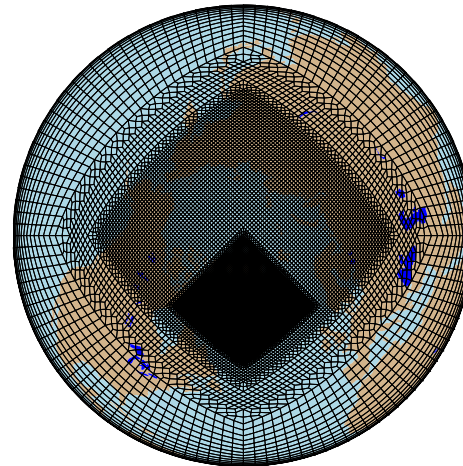
Outline

- Visualization (preliminary)
- More science results from the FHIST compset runs (CESM2.2)
 - `--res ne0ARCTICne30x4_ne0ARCTICne30x4_mt12`
 - `--res ne0ARCTICGRISne30x8_ne0ARCTICGRISne30x8_mt12`
- Tuning a B1850G compset with the ARCTIC grid

ARCTIC (1/4deg)



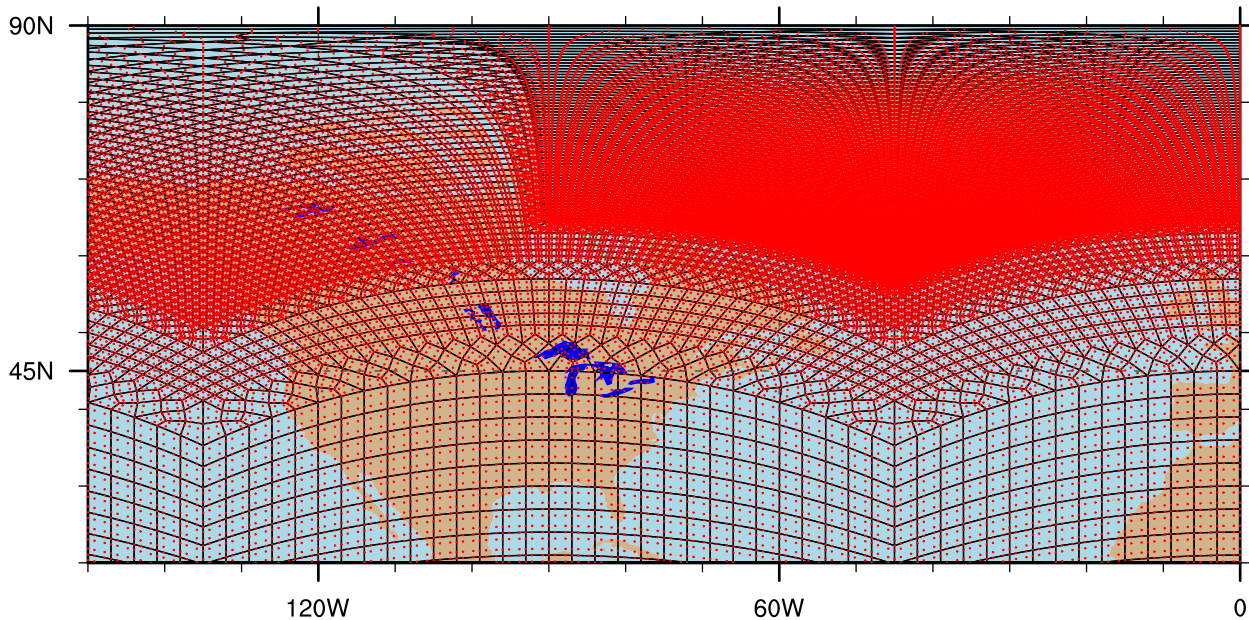
ARCTICGRIS (1/8deg)



Visualization

A collaboration with Matt Rehme (CISL)

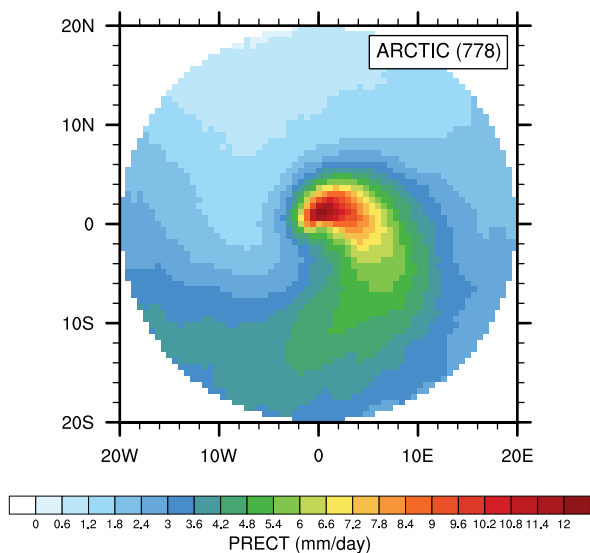
[Link to video \(156 MB\)](#)



Storm Composites from TempestExtremes Tracker

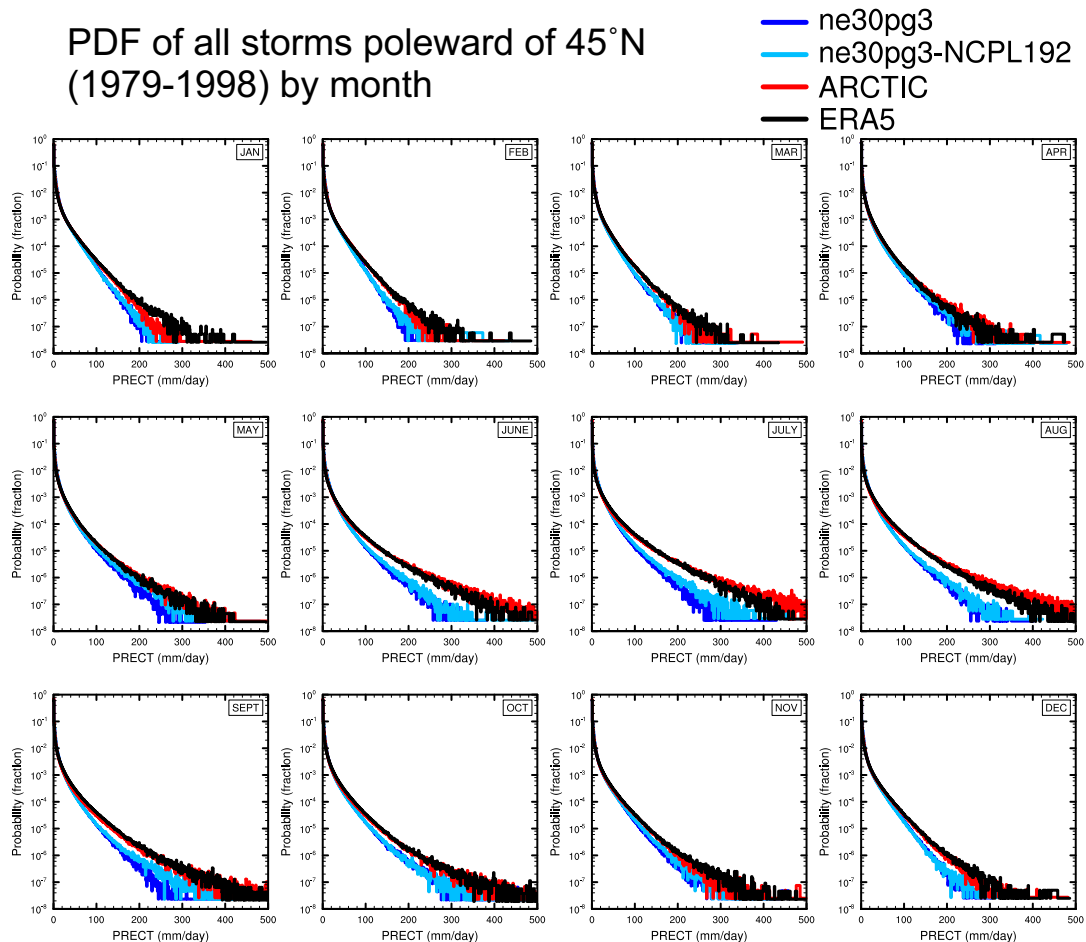
- TempestExtremes (<https://github.com/ClimateGlobalChange/tempestextremes>)
- StormCompositer (<https://github.com/adamrher/storm-compositer>)

Composite mean of all JAN storms

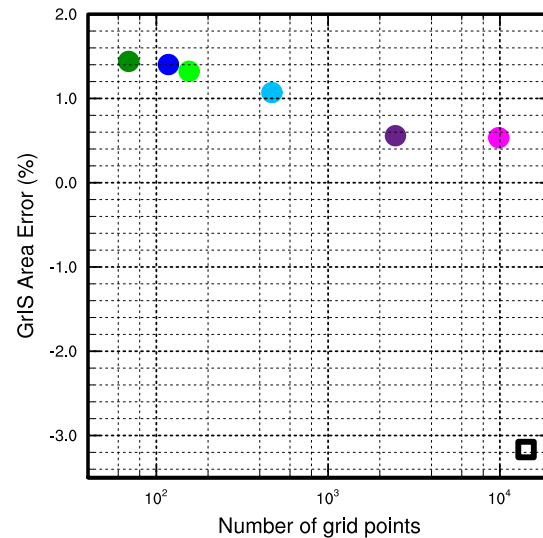
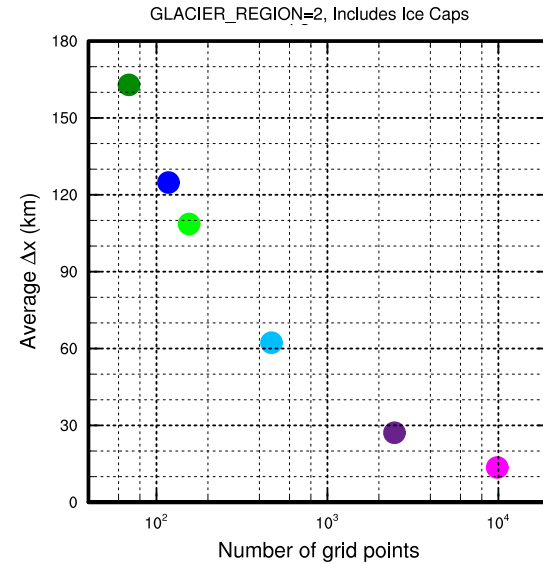
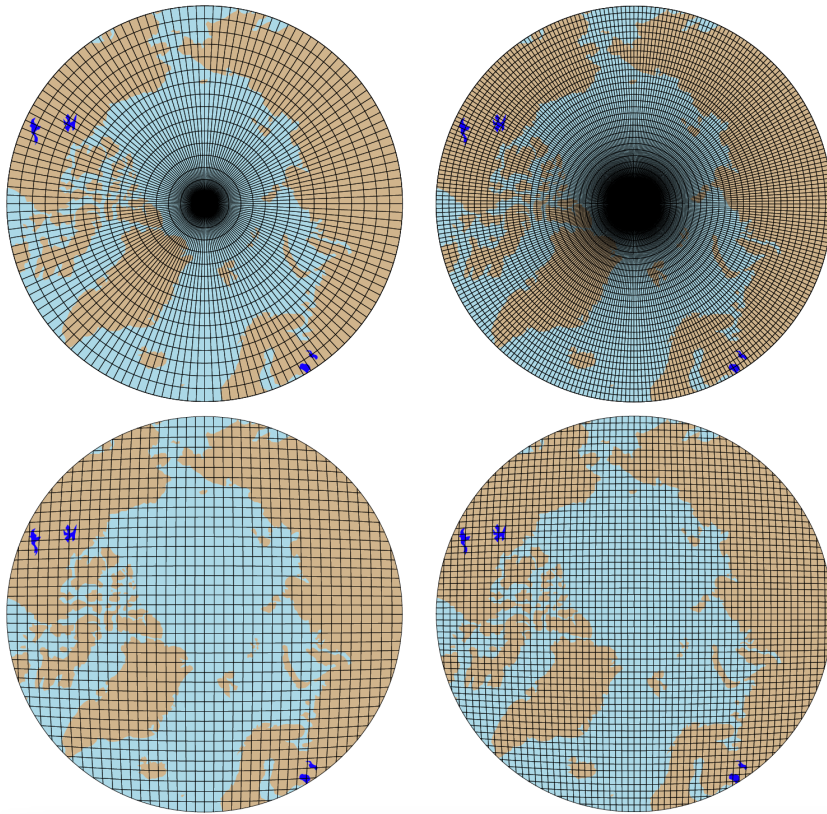


Higher horizontal resolution in ARCTIC grid increases extreme precipitation, and is more similar to ERA5.

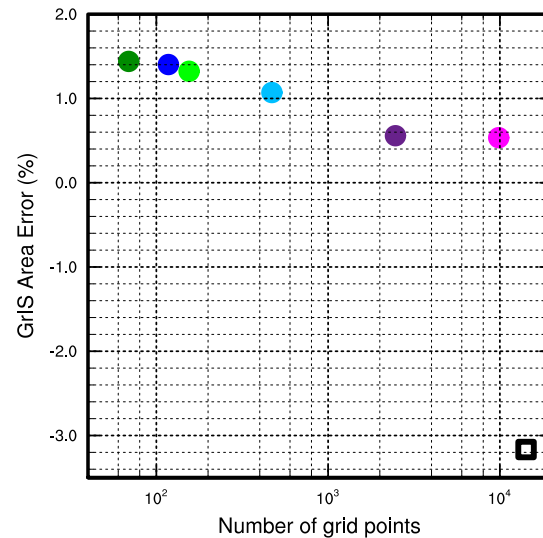
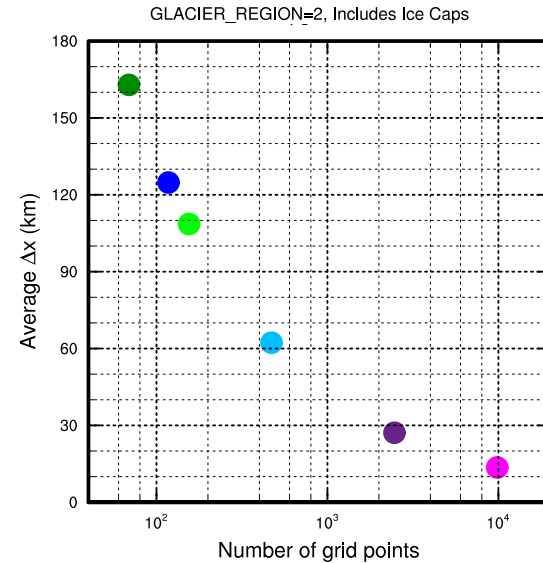
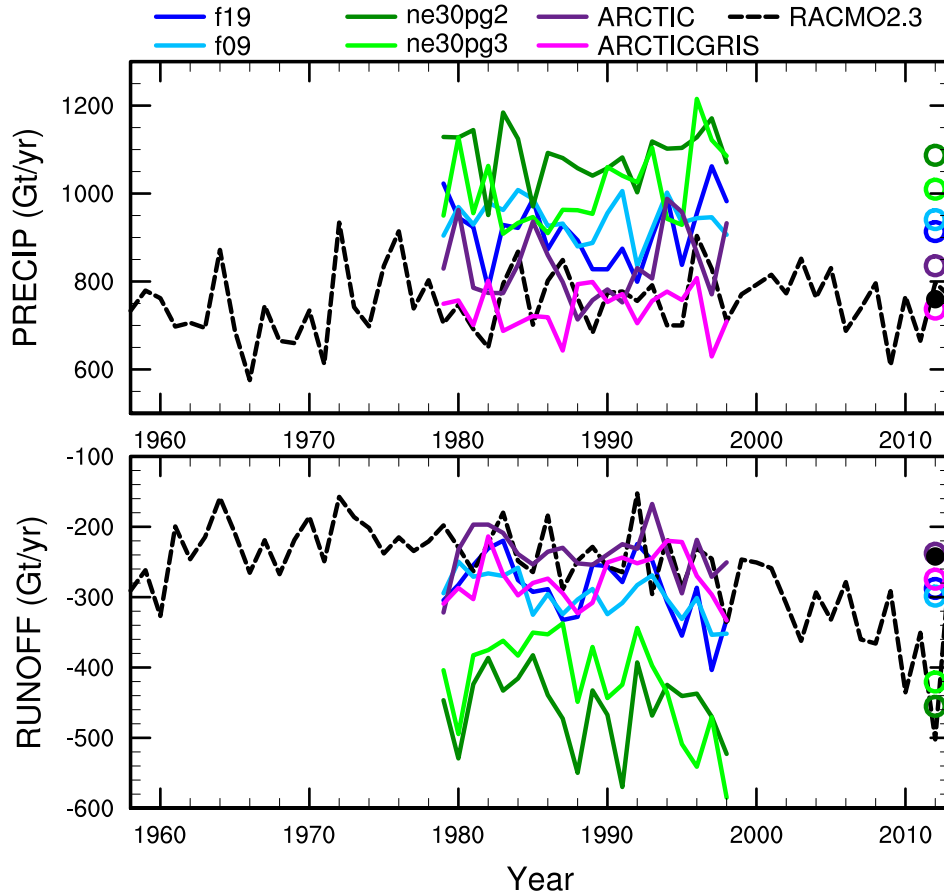
PDF of all storms poleward of 45°N (1979-1998) by month



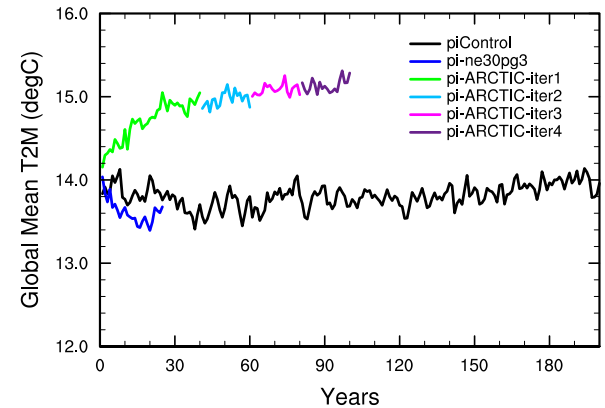
Representation of GrIS on different grids



Representation of GrIS on different grids



Tuning ARCTIC B1850G compset



Problem

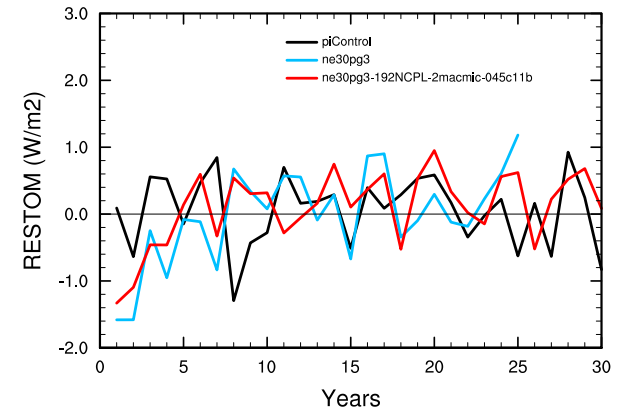
- The use of a smaller physics time-step (450 s) reduces SWCF (+5 W/m²)
- Tune ne30pg3 B1850G with a 450 s physics time-step as a proxy

Tuning targets

- Bring RESTOM to within 0.1 W/m²
- SWCF of about -47 W/m²

Preliminary Configuration

- `cld_macmic_num_steps = 2`
- `clubb_c11b = 0.35 -> 0.45`
- `RESTOM = 0.106 W/m2`



Tuning ne30pg3 w/ 450 s physics time-step

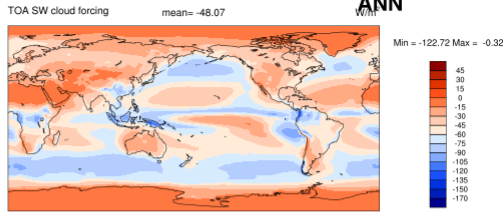
ne30pg3 (out-of-the box)

ARCTIC

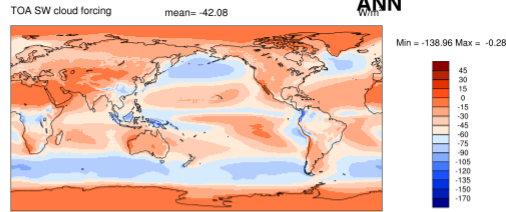
ne30pg3 dtphys=450s (tuned)

ANN

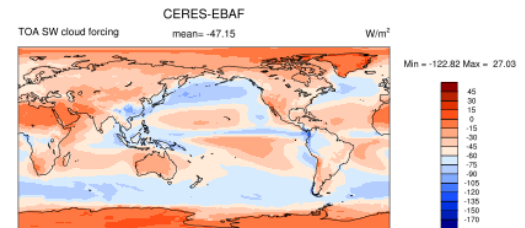
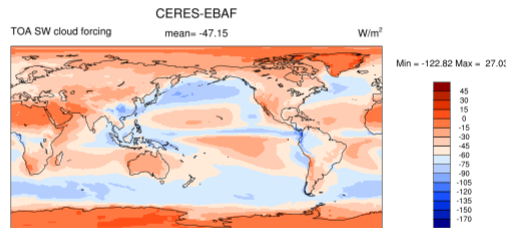
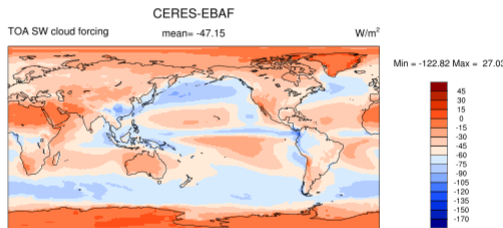
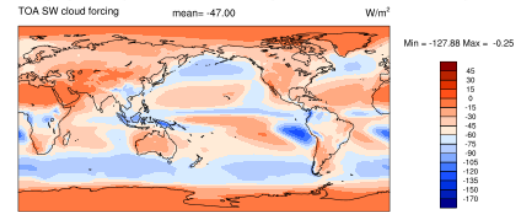
cesm2_2_alpha06d.poparctic_B1850G_ne30pg3_g17_1368pes_201003_125nutop-hybrid-Nx5yrs (yrs 2-25)



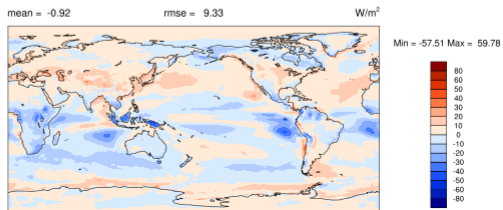
oparctic_B1850G_ne0ARCTICne30x4_g17_3924pes_200915_aoflux-atm-hybrid-Nx1yrs (yrs 2-40)



IG_ne30pg3_g17_1368pes_201215_aoflux-atm-hybrid-192NCPL-2macmic-125nutop-045c11b-Nx2yrs (yrs 2-30)



cesm2_2_alpha06d.poparctic_B1850G_ne30pg3_g17_1368pes_201003_125nutop-hybrid-Nx5yrs - CERES-EBAF



arctic_B1850G_ne0ARCTICne30x4_g17_3924pes_200915_aoflux-atm-hybrid-Nx1yrs - CERES-EBAF ne30pg3_g17_1368pes_201215_aoflux-atm-hybrid-192NCPL-2macmic-125nutop-045c11b-Nx2yrs - CERES-EBAF

