MPAS Ocean/Ice North America Refined Mesh Tests

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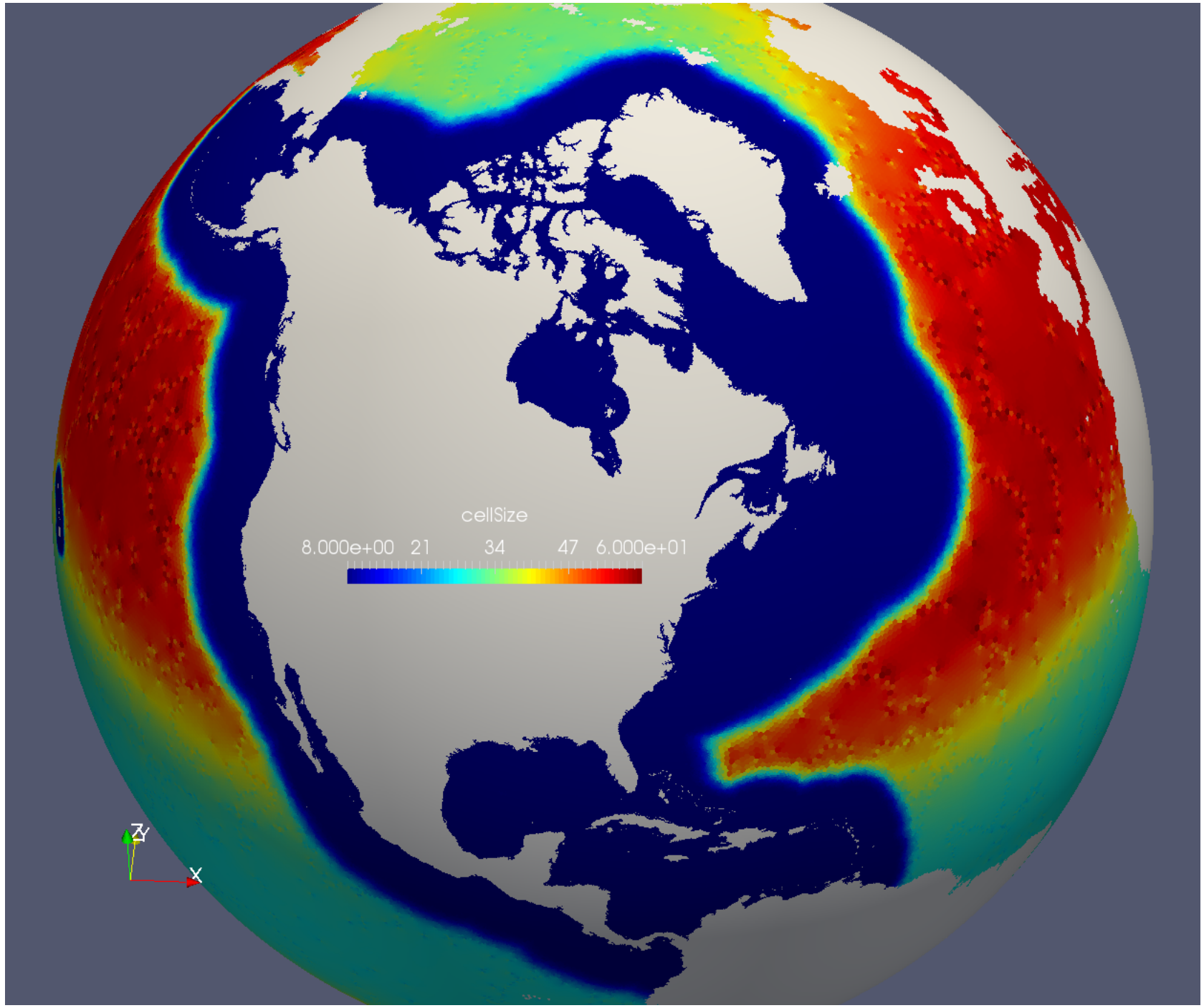
Refined Grids

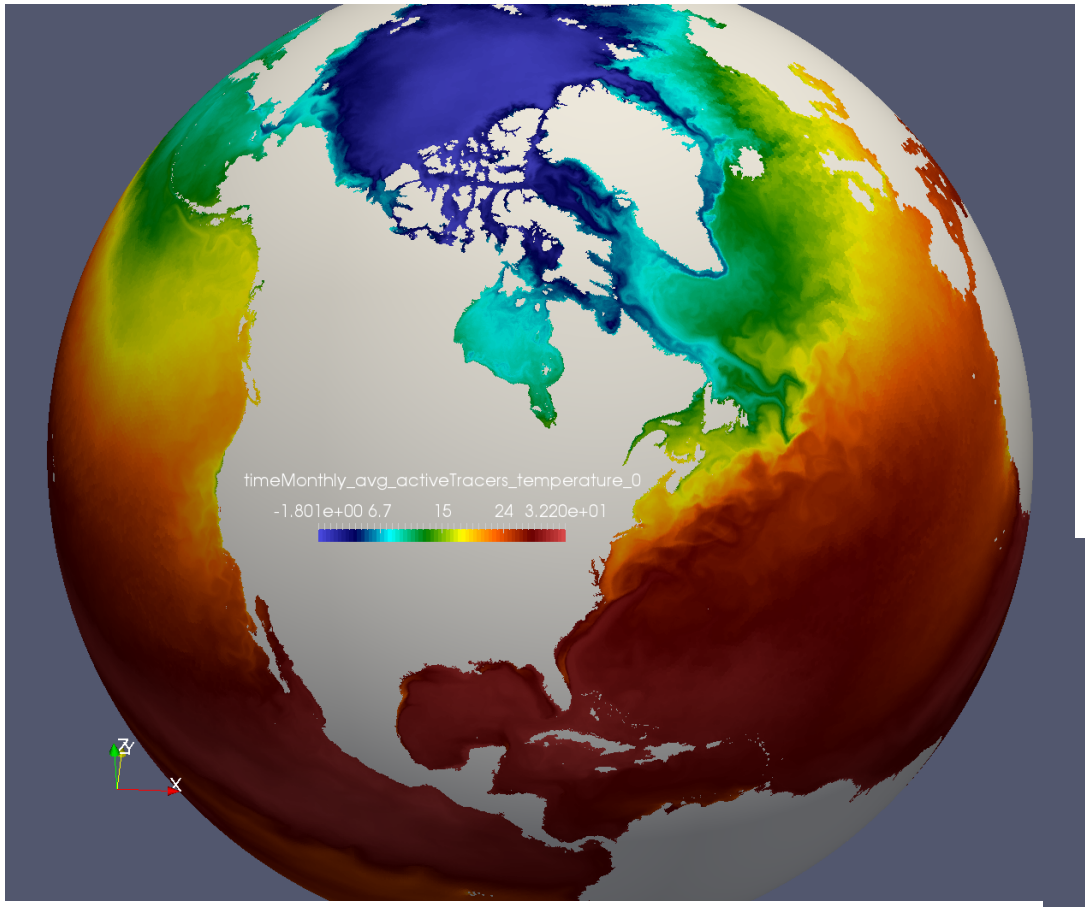
- Unique capability of E3SM
- Improves the extensive Labrador sea ice bias
- Improves representation of Gulf Stream System
- Improves representation of Eastern Pacific upwelling
- Improves representation of intricacies of Canadian Archipelago
- First tests of fully coupled with refined MPAS grid

8 km Refinement

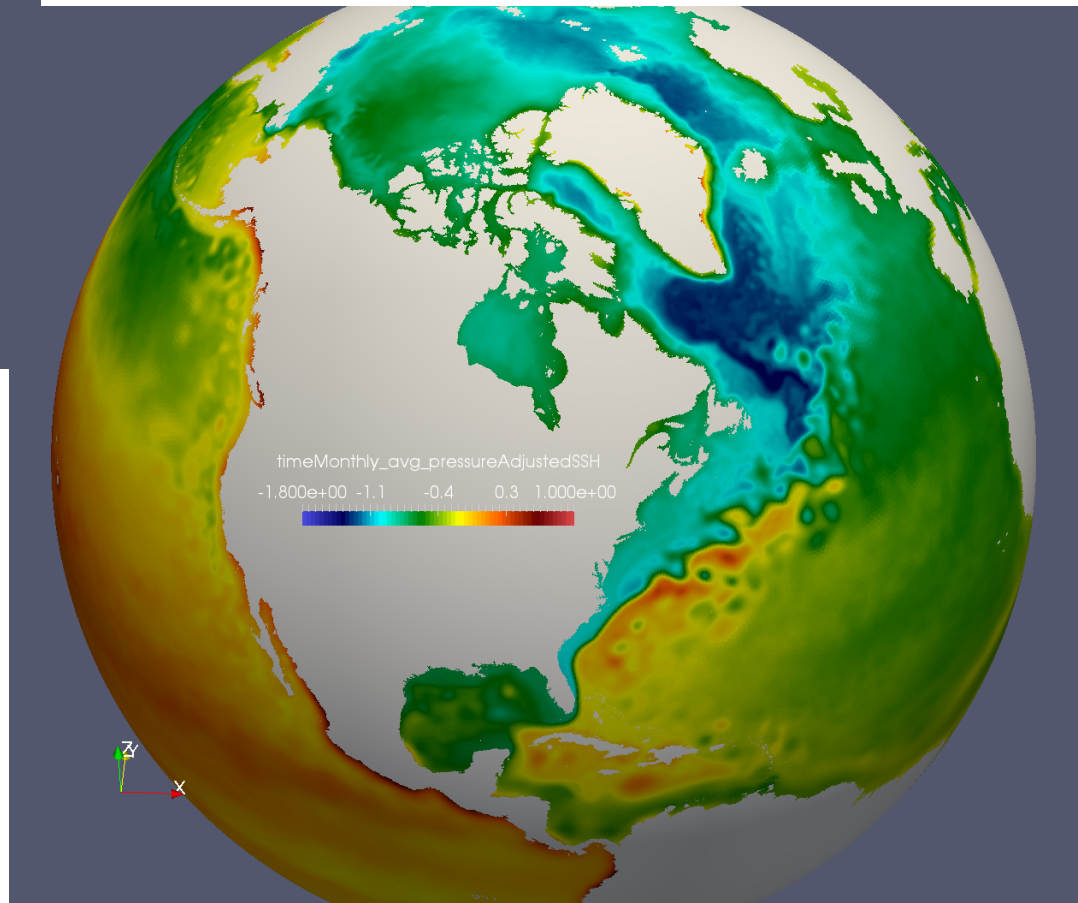
Background mesh essentially the same as v1 low resolution (60km at mid-latitudes, 30km at equator and poles)



Surface Temperature
(monthly average)



Surface Height
(monthly average)



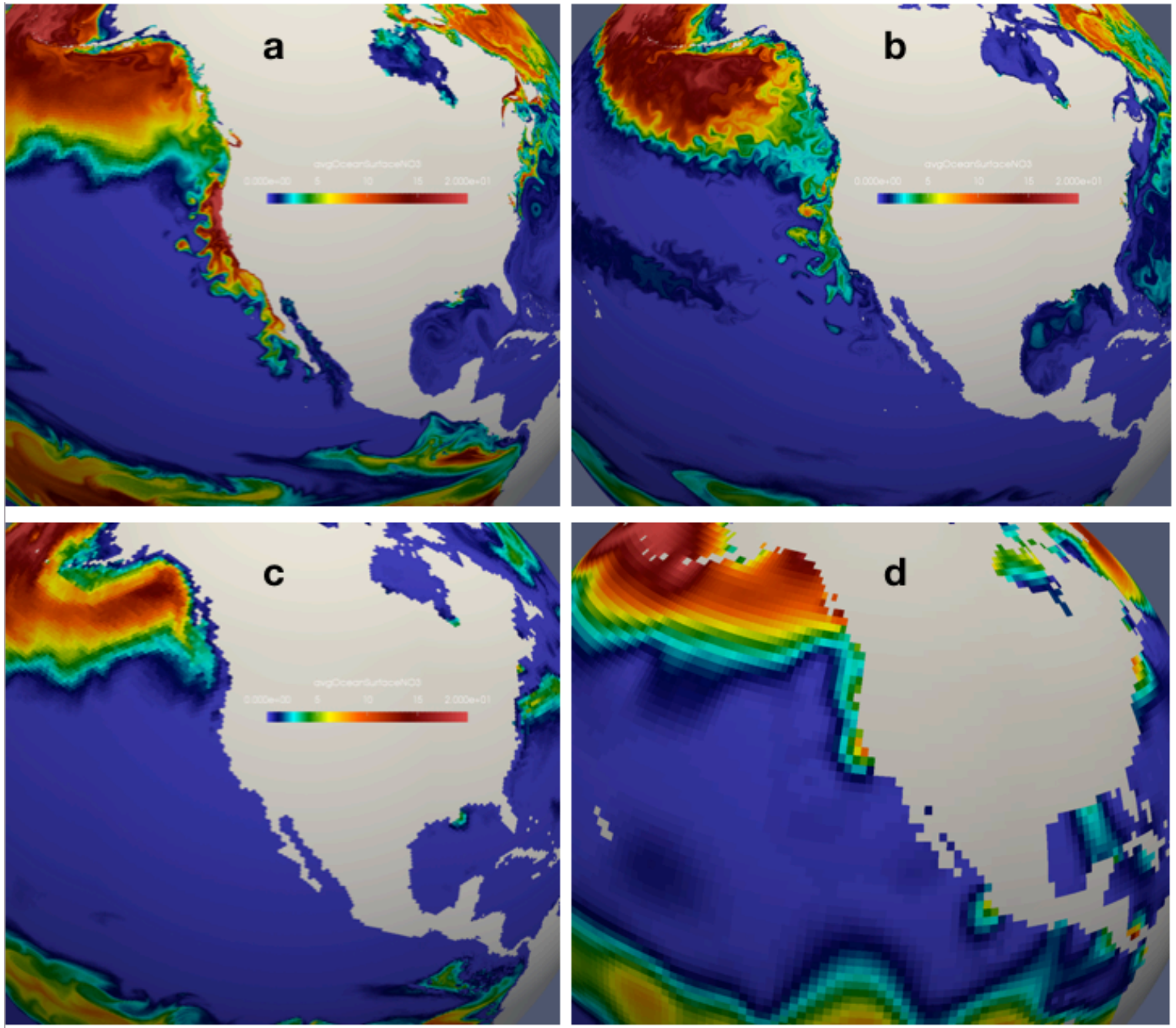
Surface NO_3 (December average)

8km refined

Global eddying
(30km to 10km)

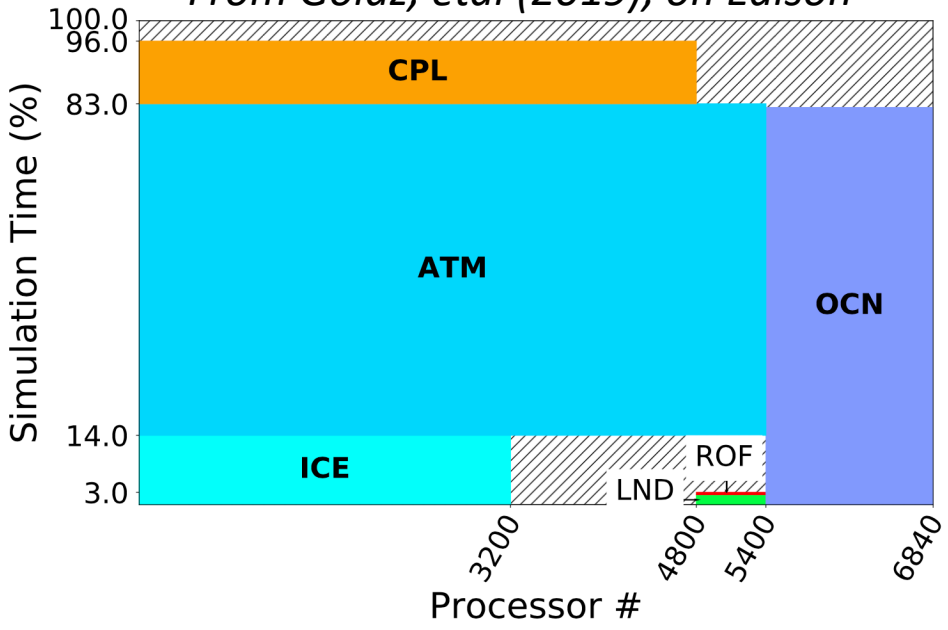
v1 low resolution
(60km to 30km)

World Ocean Atlas (2005)

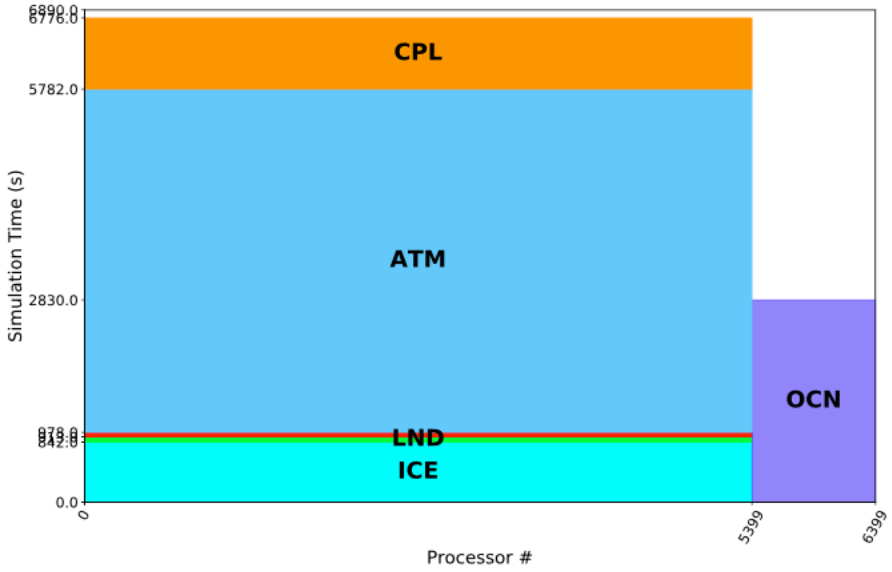


Computational Cost

From Golaz, etal (2019), on Edison



Sample of v1 DECK configuration, on CompyMcNodeFace



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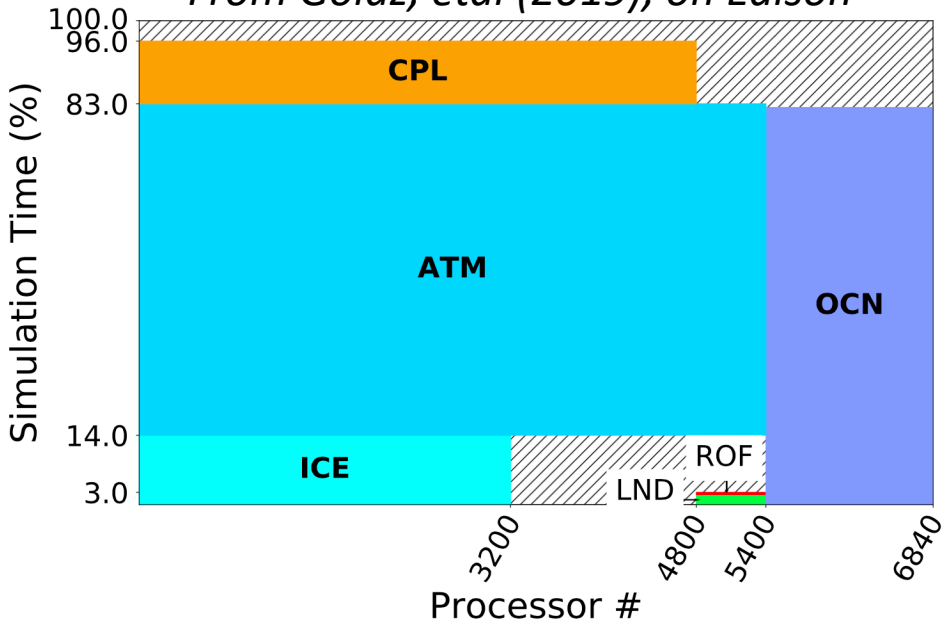

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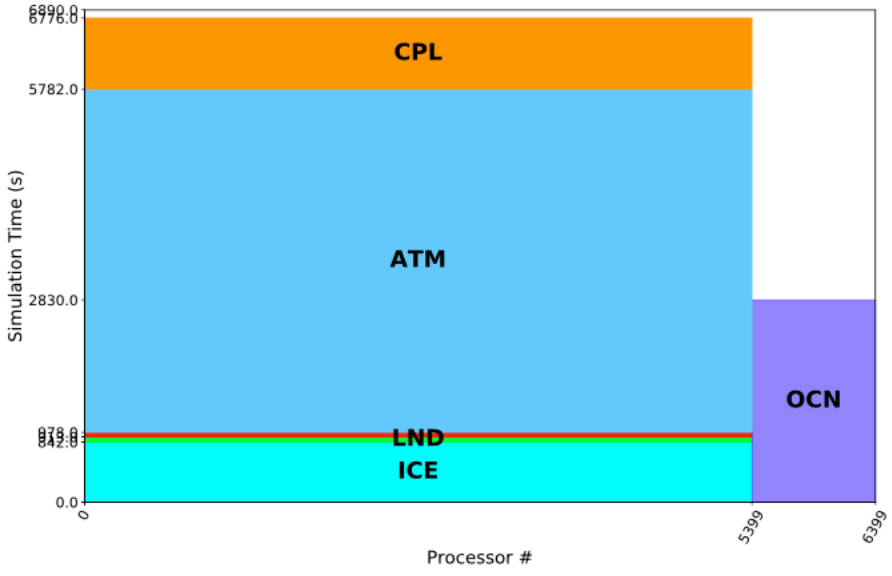
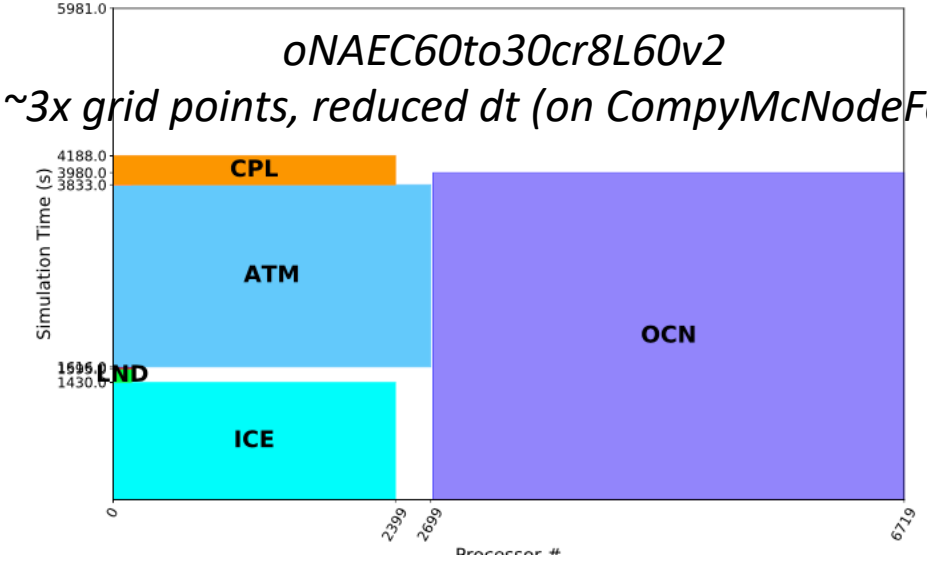


oNAEC60to30cr8L60v2

~3x grid points, reduced dt (on CompyMcNodeFace)



Computational Cost

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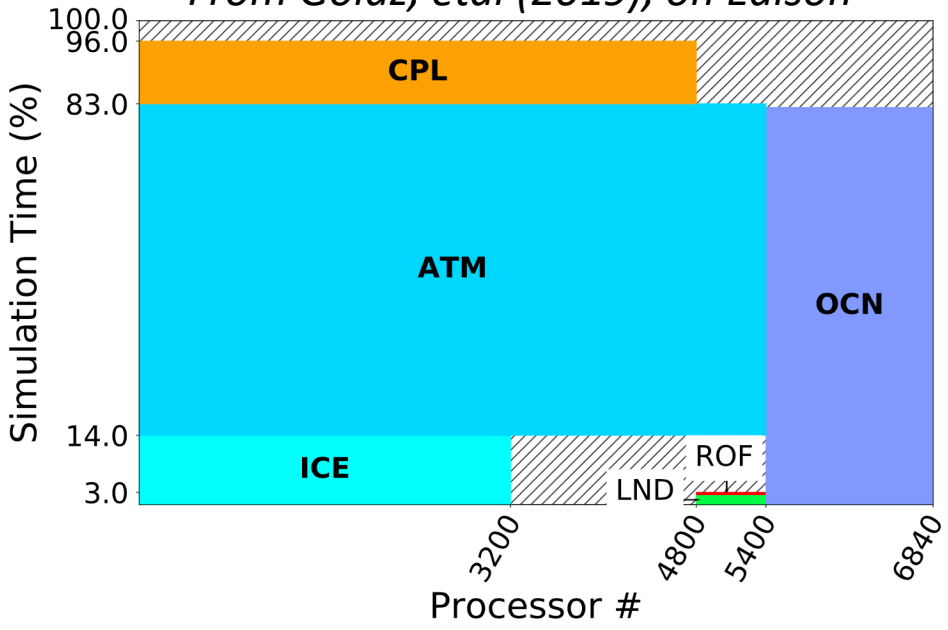
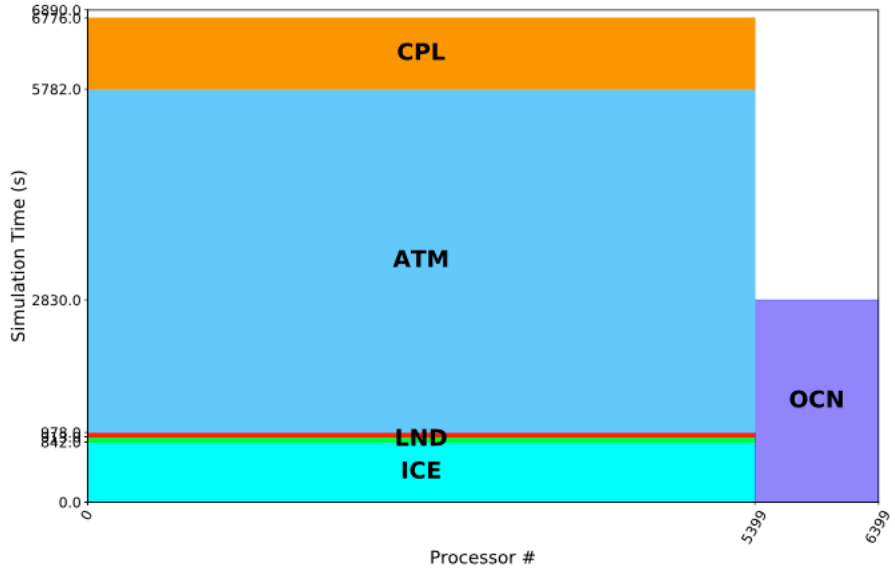
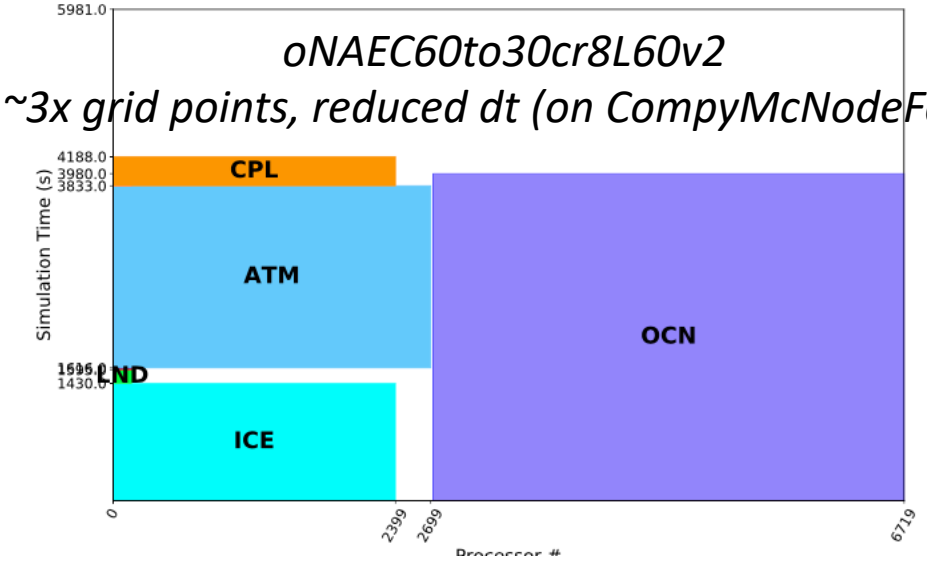


Sample of v1 DECK configuration, on CompyMcNodeFace



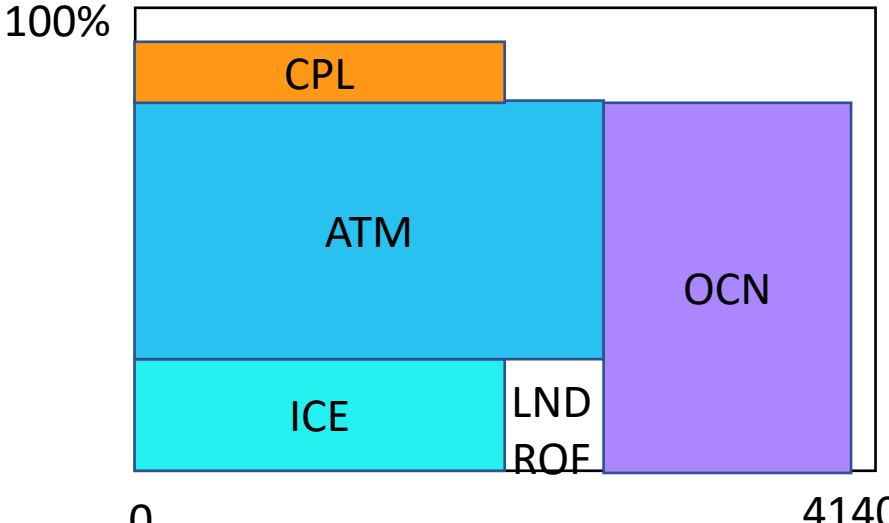
oNAEC60to30cr8L60v2

~3x grid points, reduced dt (on CompyMcNodeFace)



oNAEC60to30cr12L60v1

~2x grid points, reduced dt (on Anvil)



12km refined grid

Next Steps

- Assess 12km refinement compared to 8km and no refinement
- 15km refinement?
- Different vertical grid?
- Smoother transitions between refined and coarse regions?
- Still need to use eddy parameterizations
  - GM scale aware
  - Redi still being formulated/tested