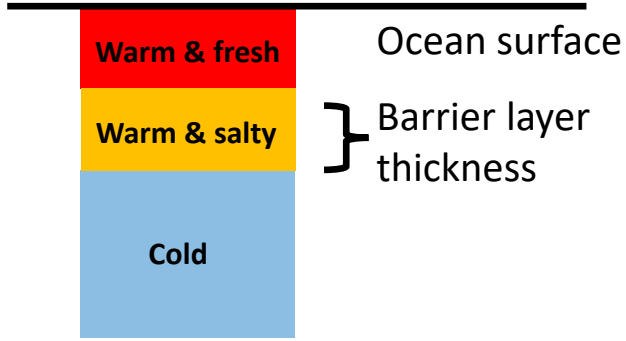
Ocean Barrier Layers in E3SM

Background:

- Barrier layers separate warm, fresh surface waters from cold deep ocean.



- Caused by combination of ocean circulation, rainfall and river runoff.
- Can insulate surface waters from entrainment of cold water from below.

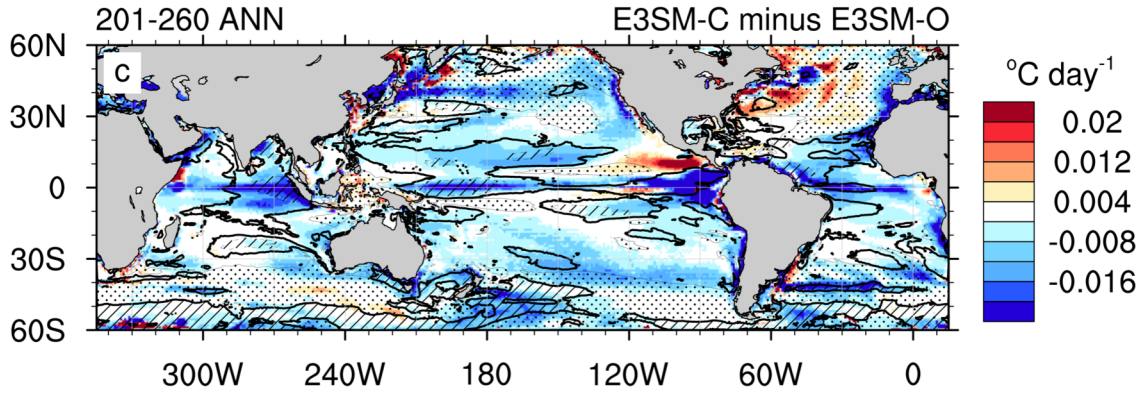
Summary

- First global assessment of barrier layers in Earth system models.
- E3SM simulates barrier layers in locations where they are observed, though with errors in barrier layer thickness (BLT).

Novel modeling insights

- Atmosphere model biases (especially rainfall) can contribute to tropical BLT biases; ocean model dominates in midlatitudes.
- Cold water insulation effect most significant in tropics.

Figure: BLT differences (hatching) explain a large fraction of difference in entrain-ment cooling between two E3SM simulations (colors).



Citation:

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E3SM Energy Exascale Earth System Model

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