

Enhanced atmospheric response to Gulf Stream SST anomalies in CAM6 simulations with $1/8^\circ$ regional grid refinement over the North Atlantic

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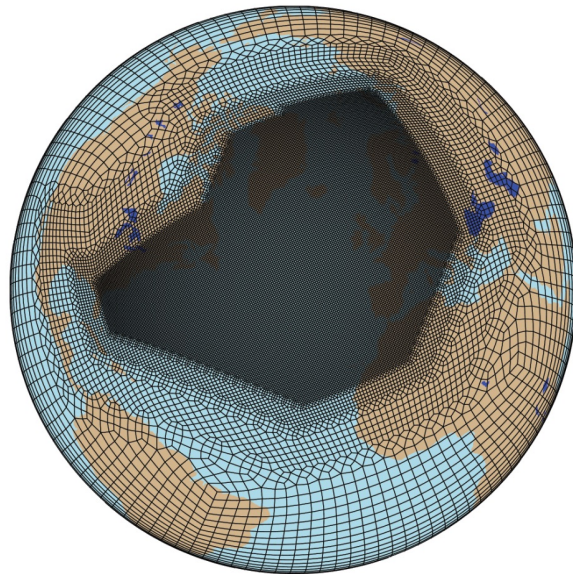
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Motivation:

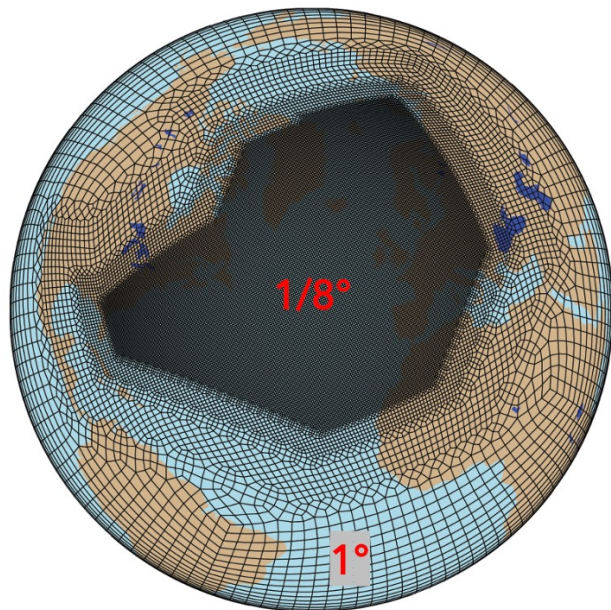
- Models underestimate the atmospheric response to extratropical SST anomalies and the associated multi-decadal variability of atmospheric circulations (*Simpson et al. 2018; 2019; O'Reilly et al. 2021*)
- Resolving atmospheric mesoscale processes over ocean frontal zones may help to simulate the full atmospheric response to extratropical SST anomalies (*Smirnov et al. 2015; Czaja et al. 2019*)

Variable Resolution North Atlantic Grid

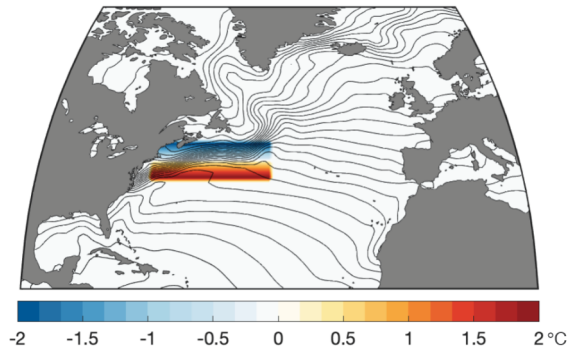


Idealized experiments with Gulf Stream SST anomalies in a variable resolution version of CAM-SE

Variable Resolution North Atlantic Grid



SST Anomaly

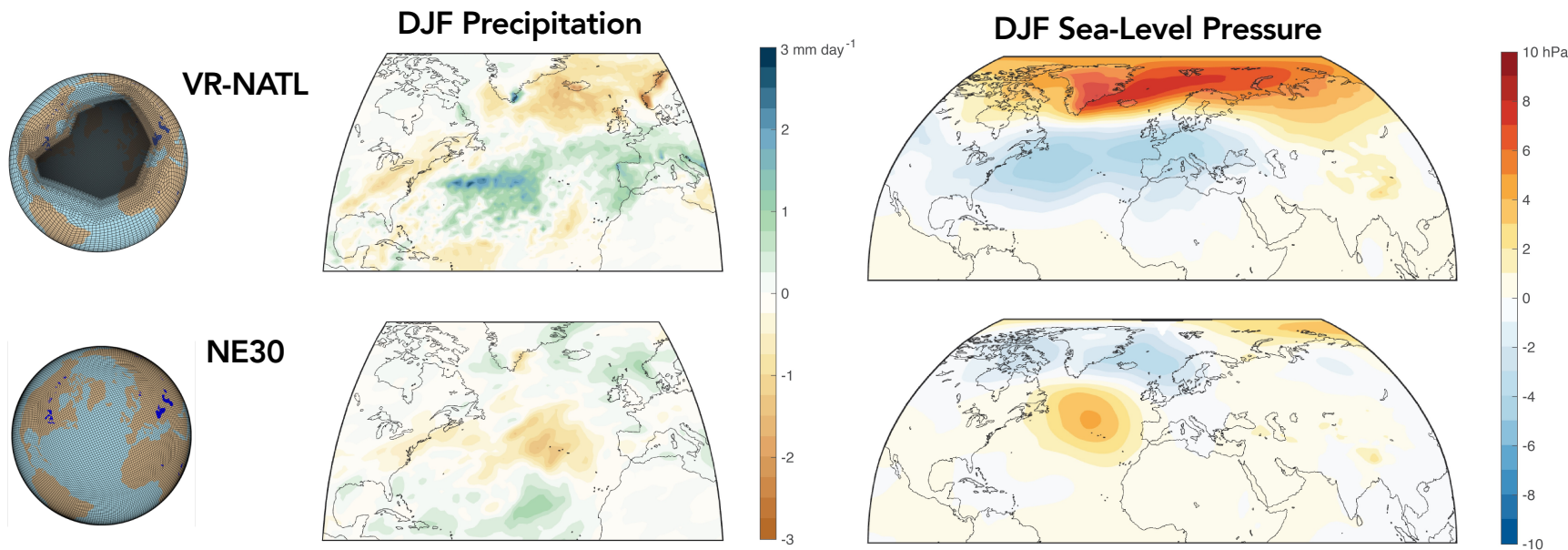


Reference: Atmosphere-only (CAM6-SE) simulations with specified seasonally varying climatological SSTs (1° res.)

Experiment: Added SST anomaly pattern in the Gulf Stream, strengthened SST gradient

- Both simulations run with the VR-NATL grid and with a 1° reference grid (NE30), each simulation run for 8 years
- Cost of VR-NATL is ~35x cost of NE30
- Other planned experiments include full AMIP run, uniform SST anomaly in Gulf Stream, response to realistic modes of decadal SST variability

Enhanced precipitation over warm Gulf Stream SSTs leads to NAO-like large-scale circulation response



- Large wintertime NAO-like response to Gulf Stream SST anomalies
- Mesoscale atmospheric processes increase precipitation over anomalously warm SSTs, leading to a large-scale circulation response through influence on free tropospheric latent heating (work in progress to characterize influence on individual storms)