Do interactive ocean dynamics affect North Atlantic SST variability?

Authors: Olivia Gozdz, Martha Buckley, Tim DelSole (George Mason University)

There is currently disagreement regarding the role of active ocean dynamics in Atlantic sea surface temperature (SST) variations. We investigate this by comparing sea surface temperature variations in a fully coupled atmosphere-ocean-ice model to those in a coupled model in which the atmosphere is coupled to a motionless slab (henceforth slab ocean model). Differences in variability between the two models are diagnosed by an optimization technique that finds components whose variance differs as much as possible between the two models. This technique reveals that SST variability differs significantly between the two models. The two leading components with larger SST variance in the slab model are associated with the tripole SST pattern and the Atlantic Multidecadal Variability (AMV) pattern. This result supports previous claims that ocean dynamics are not necessary for the AMV and, in fact, may be damping it. The leading component with larger variance in the coupled model resembles the Atlantic Nino pattern, consistent with the fact that ocean dynamics are required for Atlantic Nino. The second leading component with larger variance in the coupled model is a mode of subpolar SST variability; this component does not appear to be related to large-scale variations in the AMOC, but rather wind-driven shifts in the path of the North Atlantic Current.