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# Characterization of North Atlantic Multidecadal Variability

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Multidecadal climate variability in the North Atlantic was originally based on a spatial sea-surface temperature structure and a time scale of about 50 years. Since then the name 'Atlantic Multidecadal Oscillation' (AMO) has been coined, global signatures of the AMO have been discovered and many studies with GCMs have suggested quite different mechanisms of the phenomenon. In many GCMs, however,
a time scale closer to 25 years was found, although some find Atlantic variability on timescales of 70 to 100 years. The results indicate that there may be more than one mechanism causing this multidecadal variability and that to distinguish between possible mechanisms it is important to better characterize spatial
patterns and time scales of the AMO. In this study, sub-surface signatures of the AMO are identified using expendable bathythermograph measurements of temperature from the
surface down to a depth of 400 m. Basin averaged temperature anomalies in the North Atlantic at different depths display variability on 20-30 year time scales and there is a phase shift between temperature anomalies at the surface and at depth. Westward propagation of temperature anomalies is observable at depth, and there is a lag correlation between east-west and north-south temperature gradients, with the east-west temperature gradient leading. These sub-surface characteristics agree with those expected from the noise-driven
internal ocean mode view of the AMO, where the multidecadal variability
is caused by variations of the Atlantic Meridional Overturning Circulation. Analyses of the variations in sea surface height as measured by tide gauges around the boundaries of the North Atlantic and the Arctic are also consistent with this view.