Mechanisms of low-frequency SST variations in GFDL CM2.1 – atmospheric forcing and delayed ocean response

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We describe a diagnostic study of low-frequency North Atlantic SST variability in a long integration of the GFDL CM2.1 pre-industrial control run. We focused on a ~20 year quai-periodic variations in subpolar SSTs, which reflect variations in the region's upper ocean heat content. We show that the variability is forced by stochastic atmospheric variations in windstress and surface heat fluxes both mainly associated with the interannual variability of the North Atlantic Oscillation (NAO). The NAO generates SST anomalies through surface forcing such that when it is in a positive (negative) phase it forces negative (positive) anomalies in the subpolar gyre and positive (negative) in the subtropics. At the same time the NAO forces barotropic and baroclinic responses in the deep ocean which set up a slow process of northward ocean heat transport that acts as a negative feedback on the surface forcing. This interaction creates the quasi-periodic, stochastically driven oscillation.