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The North Atlantic Cold Bias

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The North Atlantic cold bias, associated with a too zonal path of the North Atlantic Current and a missing “northwest corner”, is a common problem in coupled climate and forecast models. The bias affects the North Atlantic and European climate mean state, variability and predictability. We investigate the use of a flow field correction to adjust the path of the North Atlantic Current as well as additional corrections to the surface heat and freshwater fluxes. Results using the Kiel Climate Model show that the flow field correction allows a northward flow into the northwest corner, largely eliminating the bias below the surface layer. A surface cold bias remains but can be eliminated by additionally correcting the surface freshwater flux, without adjusting the surface heat flux seen by the ocean model. A model version in which only the surface fluxes of heat and freshwater are corrected continues to exhibit the incorrect path of the North Atlantic Current and a strong subsurface bias. Removing the bias impacts the multi-decadal time scale variability in the model and leads to a better representation of the SST pattern associated with the Atlantic Multidecadal Variability than the uncorrected model.