Review 2 of the manuscript entitled “The role of buoyancy forcing for northern North Atlantic SST variability across multiple time scales”

The manuscript is much improved. I do, however, have some further minor comments and technical comments.

Minor comments:
In section 2.4 the model setup and results for the reference experiments is described. I think this is a good and clear setup. A bit confusing that figure 5 and accompanying text, which seems to be part of section 2.4, does in fact already present results from a non-reference experiment. Consider making a clear seperation between the methods and the results.

Figures 6 & 7: How sensitive are these results (spatially coherent versus spatially non-coherent) on the definition of the multi-decadal analysis period? It seems to me that in figure 6 you can also pick periods of the same duration for which you will find spatially non-coherent results? Similarly for figure 7, if you would not be forced to use 2068-2098, but could shift this frame back and forth in time by several decades, would you find very different results? Some discussion on this sensitivity (and perhaps thus the effect of decadal variability on multi-decadal averages) would make the manuscript stronger.

For the analysis of the pliocene data, observations and CMIP results, the North Atlantic region is defined as a region roughly between Ireland and the southern tip of Greenland. This would roughly correspond to the norther half of the subpolar gyre. In the results of the MITgcm, the same region is however defined as the very southern part of the model domain. This seems to correspond to the southern side of the subtropical gyre. Looking at figure 9, it seems that this definition could make a lot of difference. What is the rationale of using this definition of the North Atlantic region in the MITgcm and how does it impact the results?

Lines 625-626: Doesn’t this line imply that the changes are related to transient changes rather than equilibrium states?

Technical comments:
Line 260: ‘Has’
Line 303: How is sigma defined? Calculated after annually averaging the model SSTs?
Line 304: ‘restores’
Line 326: ‘SST anomaly’
Figure 9: in the panel of G1,P4-REF-2, I’m wondering if the scematic showing cooling in the North Atlantic, warming over the iceland basin and no change over the Norwegian current, is indeed correct. Looking at the anomaly map these signals are not apparent.
Line 624: ‘iare’
Line 794: mention the period that the observational data covers, not just the starting year.
Code/Data availability: it seems that this section is not yet complete.