The Gulf Stream and Kuroshio SST fronts affect the winter climatology primarily in the absence of cyclones
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This paper aims to determine the influence of SST gradients on extratropical cyclone intensification and changes to the environment due to cyclones in a world in which SST gradients are smoothed. The authors address these aims using 2 methods. Firstly, they artificially smooth SST gradients in the Gulf Stream and Kuroshio regions and examine cyclone development differences. They demonstrate that smoothing the SST gradients in both the Gulf Stream and Kuroshio regions does not result in significant differences to cyclone intensification but that the total number of cyclones reduces. Secondly, they partition the atmosphere into regions that are inside/outside the region directly influenced by cyclones and compare the differences in the control and smoothed SST gradient simulations. This demonstrates that the differences between the control and smoothed SST gradients simulations are larger when there are no cyclones present. While I understand the rationale behind the first aim, I do not follow the motivation for the second aim or totally agree with the conclusion that they reach. Therefore I think this paper requires revising before it is suitable for publication in WCD.

General comments

1. It is not clear to me what the motivation for this study is. Why perform the smoothed SST simulations in the first place? Are we expecting the SST gradients in the Gulf Stream and Kuroshio current to change in the future? Are the authors trying to say something about the response of the climate in coarse resolution models with low ocean resolution?
2. The conclusion from the second aim is ambiguous. The results show that the influence of cyclones on environmental changes due to smoothing the SST gradients is small. Does this mean that cyclones do not influence the environment in either simulation, or that their influence is large in both simulations but does not depend on the underlying SST gradients?
3. Furthermore, the authors conclude that ‘cyclones play only a secondary role in explaining the mean state differences between the smoothed and realistic SST simulations’. To what extent are the mean state differences because there are fewer cyclones, i.e., it is the absence of cyclones in the smoothed SST gradient simulations that results in the large differences. If this is the case, then you could say that changes in the storm track position and a reduction in the number of cyclones play the dominant role in explaining the mean state differences. Perhaps this perspective is what the authors are referring to with their ‘direct’ and ‘indirect’ terminology? If so, this needs to be clarified.
4. I did not understand the title. What climatology are they referring to?
5. It has been shown by Vanniere et al. (2017) and recently by Marcheggiani and Ambaum (2020) that cyclones tend to destroy the low-level temperature gradient within the cold sector due to a strong air-sea heat fluxes, but that it is restored within a few days following the cyclone passage. Could the authors comment on whether their spatially defined results for cyclone and non-cyclone environments are consistent with this temporal analysis.