Comments on " Bonino, G., Iovino, D., Brodeau, L., and Masina, S.: The bulk parameterizations of turbulent air-sea fluxes in NEMO4: the origin of Sea Surface Temperature differences in a global model study, Geosci. Model Dev. Discuss. "

This study focuses on the SST sensitivity to surface turbulent fluxes computation differences using various bulk parameterizations and by including or not specific processes (skin temperature and wind gustiness). The SST sensitivity is assessed using global 1/4° forced ocean simulations, which is comparable to climate models resolution.
This work is of great interest for the ocean modelling community, but also for the climate modelling community, because of the big uncertainties associated with surface turbulent fluxes estimates, and their role on ocean-atmosphere energy transfer. A original and interesting aspect of this work also relies on the quantification of the negative SST-STHF fluxes.
Despite these positive points, I suggest hereafter some major modifications to this study in order to improve the manuscript.

Major comments

A first important caveat of this study is the duration of the simulations, and consequently the significance of the results presented here. Even if the SST adjusts quickly and locally to surface turbulent fluxes modifications (from a few hours to a few days), the large-scale patterns and differences presented here might need more than one year to spin up and reach an new equilibrium state. The simulated interannual variability can also be modified between the sensitivity experiments, which can be misleading when interpretating the simulation differences. Another less important consequence is that spatial figures are quite noisy, which make them less readable.
Hence I would suggest to extend the different simulations to at least a 5-year period to make the results presented here more robust. As a comparison, Brodeau et al 2017 simulations which are referred in this manuscript discussions cover a 30-year period. If it not possible to extend the simulations for practical/technical reasons, I recommend to extend at least one simulation and compare the simulated turbulent fluxes and SST between the 1-year and the 5-year simulations to make this study more convincing.

Another important issue is that the manuscript does not contain any validation of the simulated oceanic state, and especially the SST. I understand that a detailed validation is out of the scope of this study, but SST is the only assessed oceanic variable here, and because it is a key variable in STHF computation, we should know about the potential model biases compared to observations, and how these SST biases can modify STHF estimates (through air-sea temperature and humidity differences), and more importantly the turbulent fluxes sensitivity. SST is a well observed variable, especially at global scale and over large time period, so it would not require too much work to include an observed SST map over the same period as a reference. The idea here is not to classify the "best" bulk parameterizations, but to have a global idea of model SST biases.

My last major point concerns the surface current effect into the surface stress computation. Considering absolute or relative winds in stress formula in forced ocean simulation is still debated, but an additional sensitivity experiment using relative wind could give additional insight (as it is done for wind gustiness for example) to this manuscript compared to Brodeau et al. 2017. From my understanding, as the prognostic SST does not influence surface stress (or very weakly through stability functions), your sensitivity experiments using different Cd is totally similar to Brodeau et al. 2017, and hence leads to the same already-known results. This additional experiment would allow to assess the current-stress negative feedback (as it is done for SST-STHF feedback in 3.5), and how it changes the stress sensitivity to the bulk choice. This would substantially enrich the 3.4 section of the manuscript, which is currently of limited interest.

Minor comments

A lot of English typos can be found in the text. A careful check is needed. Some punctuations are also missing.
Spatial figures must be improved to reach publication quality requirements. Here is some recommendations to improve them:
Spatial figures color extremes are often too much saturated and iso-contours are too thick. They are also very noisy due to the short experiments length. All these aspects make them hardly readable. Latitudes should also be extended from 70°S to 70°N as in Brodeau et al. to facilitate the comparison between those 2 studies.
A longitudinal average would also greatly improve and simplify figures interpretation as most of the results are mainly latitude dependant.
Some figures have resolution issue and appears blurry when zoomed in.