General comments:

The manuscript aims to investigate the impact of several new satellite products on global physical-biogeochemcial ocean reanalysis by a series of assimilation experiments. The work carried out analysis and comparisons in two period runs (13 and 3 years) and two model horizontal resolutions (1° and 1/4°). One of main conclusions is the satellite products and the reanalysis assimilating them are consistent in their representation of spatial features. Author also study the correlation relationship of net air-sea heat fluxes, phytoplankton biomass and chlorophyll concentration. Investigating the performance of new satellite products in a reanalysis is help for both numerical model development and ocean state analysis. Therefore, the topic in this study is relevant to the scope of Ocean Science. However, I think that the main points they should address are the following:

Specific comments:

1) Author did reanalysis with two model configurations and the same observations. However, there is nothing to compare these two runs in Section 5. Observations assimilated into different model configurations can resolve the observation representation of observations in explain some processes. Furthermore, the inter-comparison is help to study the consistency of observation and assimilation system in different horizontal resolution.

2) The manuscript analysed and compared the muti-year average of reanalysis results. This method for the analysis of the results is help to give the conclusion of the spatial features. However, it is also worth investigating the temporal features of these satellite products. Therefore, it is recommenced to address the study of temporal consistency of these products in the reanalysis and representation of major physical or biogeochemical process.

3) Author assessed the results with a series of cases studies. For example, in the section 5.2, the study only give one example in Agulhas. I don't think one example is enough to support the conclusion of fronts and eddies in the spatial consistency between satellite products and reanalysis. Numerical simulation may have performance in the different regions, especially for global numerical model.

4) This study assimilated several satellite products and in-situ observations. Most of the conclusions come from adding observation product to reanalysis individually or in combination. However, it lacks validation and analysis from independent observations except Section 5.4. this study is more like to focus on the impact of the observations from both satellite and in-situ on FOAM reanalysis system.

5) At the end of the spin up, you uniformly adjusted SSH to zero global mean for removing the SSH drift. I am concerned about some aspects of this method in simulation stability. I am curious whether the problem in your description at Line 161 is from this initial SSH setup.

6) In Section 2, the setup of model and data assimilation is too abbreviated, even lot of researches have been addressed based on FOAM system. Some important features and configurations need be detailed for easily reading.

Minor comments:

In abstract, author "Assimilating multiple variables together often resulted in larger mean increments for a variable than assimilating it individually, revealing ways in which the model and assimilation scheme could be improved." isn't consistent with that in summary. Further, it seems

“assimilating multiple variables …...” doesn’t support “revealing ways in which the model and assimilation scheme could be improved.”

L39-40 “It is not yet routine though to combine the assimilation of physics and biogeochemistry in a single ocean reanalysis.” is not true. There are lots of reanlaysis products right now. For example, the CMEMS products….

Remove the “Fig--” in subsection title.

L 108-110, in-situ SST is mentioned. However, the specified influence of adding these observations hasn’t been clarified in results.

L160-170 it needs to be detailed in the description of No data assimilation in some regions. For example, “the no increments were applied in the Malvinas Current region on a SMALL NUMBER of Dates”, “No assimilation was performed on 18 January 2000 in 1° runs including SLA assimilation, as a few large SLA observations were causing the model to fail.” Why assimilation is failed? If it is done by data assimilation system it will needs your further tune the data assimilation system before the reanalysis.

L 180 “The larger the increments, the larger the corrections being applied to the model to keep it close to the observations.” In some cases , larger increment can cause model failed and leave far way the observations.

L 222-225 these description is contrary to the sentences L180-L182

Figure 4 needs to be improved and adds the coordinates

L247-248 “….SLA gradients is improved, but the impact on SST and log 10 (chlorophyll) gradients is mixed”

In Section 5.3. please show where both Barents Sea and Bering Sea are in plots

L294 Adding the description of the observations from SOCAT v2 database in Section 3

L315-325, the discussion don’t need detailed and it is repeated in L 379-L382.