Comment on essd-2021-194
Anonymous Referee #2


Review of “Next generation of Bluelink ocean reanalysis with multiscale data assimilation: BRAN2020” manuscript.

The Next generation of Bluelink ocean reanalysis with multiscale data assimilation: BRAN2020” manuscript presents a new attempt to better estimate ocean dynamics in the multi-decadal global ocean arena. The structure of the manuscript is well organized and scientific ideas are correctly exposed.

General comment:

In the manuscript, the authors applied the EnKF-C method to propagate observations information inside the ocean model. In my opinion, omitting sea ice in the system is a major problem, it is an important phenomenon influencing dynamics in the Southern Ocean. Using analysis every 3 days seems too frequent for the global ocean model having a spatial resolution of 1/10 degree. For example, GLORY NEMO experiment is using a 14-days assimilation window. Some discussion along the lines would be necessary; how authors decided for 3-days as an appropriate assimilation window. Seems to me that it’s quite short (or is quite often – every 3 days) time span between analysis, and is a way of imposing stiff control over the ocean system i.e. suppressing model physics to fully develop. Initialization of the temperature fields by using the daily averaged values seems strange, the model vertical resolution in the surface layers is 5m which is prohibiting diurnal oscillations to fully develop. In that sense, the model is not resolving diurnal SST dynamics (not sure about the temporal frequency of atmosphere forcing), and this shouldn’t be the reason for using daily fields (which are dynamically unbalanced). As assimilation is done on the two different scales, could the time step for applying analysis be different (longer for large scale and shorter for mesoscale)?

Specific comments:

Line 54: Are authors referring to common term residuals of data assimilation when they talk about the difference between the analysis and observation?

Line 180: Not sure if this is a typo mistake: “ super-obing”. It sounds a bit strange,
usually, we refer to “super-obs” or “super-observations”.

Line 197: Analysis innovations are sensitive to the observation errors, and in that sense are the observation errors constant in space/time or they are varying (for specific observation type)? If not do authors think it would improve the assimilation system?