Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2021-235

Anonymous Referee #1

Referee comment on "Improvements in the regional South China Sea Operational Oceanography Forecasting System (SCSOFSv2)" by Xueming Zhu et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2021-235-RC1, 2021

Summary:

The manuscript represents updates of a South China Sea Operational Oceanography Forecasting System from version 1 to version2, which provide daily updated hydrodynamic forecasting in the South China Sea for the future 5 days. Comprehensive updates of model configuration and assimilation schemes have been mentioned. Among them, three major changes have been highlighted, namely the way of prescribing buoyancy flux, the tracer advection discrete scheme and data assimilation scheme. The model shows enhanced performance in the accuracy of the sea surface temperature and sea surface height.

Ocean states prediction has always been a challenging task and is of vital importance to the hazard prevention such as tropical cyclones and internal waves and so on. The South China Sea has unique monsoon system and topography and external Kuroshio forcing, which masks it a challenging region for ocean prediction. This paper is generally well written, and the way of improvement is well presented, which makes the comparison of results quite convincing. I believe this manuscript can be the basis of a useful publication after minor improvements.

1 There are too many acronyms and I sometimes have to go back to look for its meaning. I would recommend keeping some acronyms frequently used by other articles, such as SCS and OFS and SST, but don't use abbreviation for only two words (such as RTOFS, PI) and abbreviation that is too hard to recall (such as RSUP3, U3H and C4V).

2 Line 1: The improvements to the regional South China Sea Operational Oceanography Forecasting System include all the previous versions. I suggest removing the acronym of "(SCSOFSv1)".

3 Line 199: Please clarify the wards in this headline. What are the highlights and sensitive updates respectively.

4 Section 3.1, Line 220: The use of bulk formulation to calculate the buoyancy fluxes is reasonable, but it is not a real negative feedback because the atmospheric forcing, such as air temperature, relative humidity are prescribed, which are not adjusted from the modelled SST. Please clarify this sentence, e.g. how the SST is improved through the use of bulk formulation should be further elaborated.

5 Figure 3. For the SCSOFSv1, the area north of 24°N in the BulkFormula is even warmer than that in the no BulkFormula experiment. But the SST is much improved in the SCSOFSv2. Later results in Section 3.2 indicate that it may be related to the improved advection and mixing scheme. Please further explained this by providing more information.

6 Section 3.2: What about the temperature and salinity bias in the subsurface layer in the AAG scheme combination?

7 Line 335. Please explain the improvement of temperature and salinity with more detail. What is the diffusion term and advection term look like in the AGG scheme combination?

8 Line 360: Why do you set observational error for the SLA and SST as 0.09 cm and 0.5 °C? The along-track satellite data contains high-frequency noise, especially for the shallow area (Zhou et al., 2015). How do you filter out this noise?

Zhou, Xiao-Hui, Dong-Ping Wang, and Dake Chen. "Global wavenumber spectrum with corrections for altimeter high-frequency noise." Journal of Physical Oceanography 45.2 (2015): 495-503.

9 Line 428: In the section 4, I suggest introducing why the SST, SLA and T/S profiles are used to validate the model. Are those element enough to represent the outputs from the model? In addition, you provide the importance of SST in Line 210 to connect with the sea surface atmospheric forcings, but what kind of validations is related to section 3.2 and 3.3.

10 Table 1: In Line 145 you mentioned the the new SODA 3.3.1 and 3.3.2 reanalysis were used, but in Table 1 you still mention the SODA 2.2.4, please check all the settings in this table.

11 Figure 13: Why the RMSE of temperature is suddenly large in June in Fig. 6b? In the paper of a recently published paper (Ding et al., 2021), there is also a similar large bias in June, can you provide some explanations to this?

Ding, R., Xuan, J., Zhang, T., Zhou, L., Zhou, F., Meng, Q., and Kang, I. (2021), Eddy-Induced Heat Transport in the South China Sea, Journal of Physical Oceanography, 51(7), 2329-2349, doi: 10.1175/JPO-D-20-0206.1.

12 Please check the fontsize in all the figures to make sure it is clear. Also add title for similar plots.