Response to Interactive comment on "The improvements to the regional South China Sea Operational Oceanography Forecasting System" by Xueming Zhu et al.

Reply to Editor Andrew Moore

Dear Author,
While the two referees note that there are some results in your paper that may be of interest to the community at large, there are some significant and substantial deficiencies in your manuscript that must be addressed before your paper can be reconsidered for publication or sent for further review. Both referees are of the opinion that important details are missing, and referee #2 further notes that your manuscript is lacking in "rigorous analysis."
Your paper will therefore require major revisions before the review process can continue.
Yours sincerely
Andrew Moore

Thanks for your decision to let us make major revisions with our manuscript. We agree with all comments on our manuscript from two anonymous referees. We have tried our best to answer and response to all the comments and questions from referees. We have revised this manuscript by adding some significant and substantial information and details which was not given in the original manuscript, such as the difference between Akima scheme and fourth-order centered scheme, the configurations and many details of EnOI scheme. We also supplement some "rigorous analysis" lacked in the original manuscript, such as why the impact of moving eastern lateral boundary on the SCS, COARE 3.0 bulk algorithm does not work better than direct forcing at all time, the reason for results of Fig. 11d better than that of Fig.11c, and adding a new Figure 12.

In addition, the manuscript has been revised and proofread thoroughly according to the referees' comments by the co-author Ms. Miaoyin Zhang again, who is a professional of similar academic background with proficient English written skills and wrote her master thesis in English and received her master degree in England. Some paragraphs are rewritten and restructured, some figures (Fig.1, Fig.2, Fig.3, Fig.5, Fig.6, Fig.10, Fig.11, Fig.12, Fig.13, Fig.14) are redrawn to eliminate the countries boundaries in the land. Details of modifications are list as follow:

L11: "built up" revised to "constructed"

L13: "presents comprehensive updates had been conducted to" revised to "presents recent comprehensive updates of".

L14: deleted "in recent years"

L15: "sea surface" revised to "including sea surface"

L20: "version SCSOFSv1" revised to "version known as SCSOFSv1"

L45: "one or two decades" revised to "decade or two"

L47: "until 2015 in total" revised to "in total till 2015"

L54: "18km" revised to "18 km"

L108: "but the version of ROMS" revised to "while whose version"

L118: "a wall" revised to "closed boundary"

L120: "in the south of" revised to "across the south of

L121: "opened" revised to "involved"

L131: "bathymetry in the area near the coast of China mainland" revised to "topographic data in the coastal areas along China minland,";

L150: "open" revised to "opened"

L156: "changed" revised to "replace"

L157: "PSD" revised to "PSL"; "the website" revised to "their website";

L158: "http://www.esrl.noaa.gov/psd/ (Kanamitsu et al., 2002), to" revised to "https://psl.noaa.gov/ (Kanamitsu et al., 2002), with".

L159: "http://rda.ucar.edu/datasets/ds093.0," deleted.

L160: "http://rda.ucar.edu/datasets/ds094.0," deleted.

L161: " of them" deleted.

L164: "Barnier et al. (1995)" revised to "Barnier et al.(1995)'s method"

L167: "a constant number" revised to " a constant number of"

L168: "Meanwhile, we also replace the merged satellite's infrared sensors and microwave sensor, and *in-situ* (buoy and ship) data global daily SST (MGDSST) obtained from the Office of Marine Prediction of the Japan Meteorological Agency (JMA), with the infrared Advanced Very High Resolution Radiometer (AVHRR) satellite data, which is an analysis constructed by combining observations from different platforms on a regular grid via optimum interpolation and provided by National Centers for Environmental Information (NCEI)." revised to "Meanwhile, we use the infrared Advanced Very High Resolution Radiometer (AVHRR) satellite data in SCSOFSv2, which is an analysis constructed by combining observations from different platforms on a regular grid via optimum interpolation and provided by National Centers for Environmental Information (NCEI), instead of using the merged satellite's infrared sensors and microwave sensor, and *in-situ* (buoy and ship) data global daily SST (MGDSST) obtained from the Office of Marine Prediction of the Japan Meteorological Agency (JMA) in SCSOFSv1."

L180: "the NEC is separated into two branches since the model's eastern lateral boundary in SCSOFSv1, its main branch located at about 9.5°N-13°N, the other branch located at 14.5°N-17°N (Fig. 2a), which is clearly not in line with the fact." revised to "the NEC separated into two branches in SCSOFSv1 affected by model eastern lateral boundary setting, its main branch located at about 9.5°N-13°N, the other branch located at 14.5°N-17°N (Fig. 2a), which is clearly not in line with the fact."

L183: "This is because the Guam Island (Fig. 2, red circle) which located about (13°26′N, 144°43′E) is included in SCSOFSv1 and whose location is too close to the eastern lateral boundary." revised to "The cause for above result is that the Guam Island (shown in red circle in Fig. 2, located about 13°26′N, 144°43′E) is included in SCSOFSv1, whose location is too close to the eastern lateral boundary."

L191: "The left panel" revised to "The left panel (a)";

L192: "the right panel" revised to "the right panel (b)"

L193: "moving westward" revised to " moving 1 deg westward"

L203: "The modification for the time step is due to the change of the discrete schemes, which

would be illustrated in Section 3. Before the operational run, a 26 years climatology run is conducted for spinning-up, and is followed with a hindcast run from 2005 to 2018 (Wang et al., 2012). The daily mean of model results is archived and used to validate in the following parts of this paper." revised to "The reason for modifying time step is related to the change of the discrete schemes, which will be illustrated in Section 3. A 26 years climatology run is conducted for spinning-up at first, and followed by a hindcast run from 2005 to 2018 (Wang et al., 2012). The daily mean of model results is archived and used for subsequent evaluation."

L223: "the first option" revised to "one"

L225: "second" revised to "other"

L226: "the Fairall et al.(2003) COARE bulk algorithm" revised to "the COARE3.0 bulk algorithm (Fairall et al., 2003)"

L235: "would" revised to "could"; "one" revised to "method"

L236: "the second one" revised to "and the second"

L247: "Figure3 shows the distributions of monthly mean SST differences of SCSOFSv1, BulkFormula, SCSOFSv2 minus OSTIA SST in January, April, July and October, 2014 to stand for Winter, Spring, Summer and Autumn, respectively. It is found that the simulated SST are higher than OSTIA SST for all three results in general." revised to "Figure3 shows the distributions of monthly mean SST differences in January, April, July and October, 2014 to stand for Winter, Spring, Summer and Autumn, respectively. SST differences are calculated with SCSOFSv1, BulkFormula, and SCSOFSv2 subtracts OSTIA SST, respectively. It is found that the simulated SST are higher than OSTIA SST for all three sets of results."

L260: "bulk algorithm in both" revised to "bulk algorithm, which is employed in both"

L272: "algorithm, due" revised to "algorithm due"

L298: "(Fig.6b and 6c)" revised to "(Fig.6b and 6c) in deep layer"

L303: "on geopotential" revised to "along Geopotential"

L306: "of UCI and AAG based on" revised to "UCI in SCSOFSv1 and AAG in"

L308: "is in" revised to "reaches"

L351: "which is smaller" revised to "which is obviously smaller"

L352: "obviously" deleted

L353: " middle of the" revised to "central"

L357: "based on" revised to "judging from"

L429: "finish" revised to "finishes"; "output" revised to "outputs"L

L430: "is started" revised to "starts"

L431: "add" revised to "adds"

L458: "whole procedure" revised to "whole upgrading procedure"

L486: "SST for the whole" revised to "SST simulation for the whole"

L490: "It is noteworthy that" revised to "It is worth mentioning that"

L499: "smaller" revised to "less"

L536: "large values, and" revised to "large values in v2, and"

L543: Figure 12 added

L548: "Fig. 12a and Fig. 13a" revised to "Fig. 13a and Fig.14a"

L549: "Fig. 12b and Fig. 13b" revised to "Fig. 13b and Fig.14b"

L552: "in above" revised to "above"; "Fig. 12d and Fig. 13d" revised to "Fig. 13d and Fig.14d"

L557: "Fig. 12a,b and Fig.13 a,b" revised to "Fig.13 a,b and Fig. 14 a,b"

L560: "Fig. 12c and Fig. 13c" revised to "Fig. 13c and Fig. 14c"

L562: "Fig. 12d and Fig. 13d" revised to "Fig. 13d and Fig. 14d"

L564: "Fig. 12e" revised to "Fig. 13e"

L567: "Figure 12" revised to "Figure 13"

L571: "Fig. 13e" revised to "Fig. 14e"; "locate" revised to "locates"

L572: "in SCS" revised to "in the SCS"; "It is same" revised to "The trend is same"

L573: "show slightly" revised to "shows slight"

L574: "Since benefiting" revised to "Since it is benefited"

L579: "Fig. 12 and Fig. 13" revised to "Fig. 13 and Fig. 14"

L582: "Fig. 12c" revised to "Fig. 13c"

L584: "Fig. 12d" revised to "Fig.13d"

L585: "Fig. 13c" revised to "Fig. 14c"

L587: "Fig. 13d" revised to "Fig. 14d"

L589: "Figure 13: Similar to Fig.12" revised to "Figure 14: Similar to Fig.13"

L591: "Fig. 12f" revised to "Fig. 13f"

L592: "Fig. 13f" revised to "Fig. 14f"

L620: "technology" revised to "technique"

L637: "need" revised to "plan"

L671: "Þ" revised to "fi"

L675: "Beckmann, A., Haidvogel, D.B.: Numerical simulation of flow around a tall isolated seamount. Part I: problem formulation and model accuracy. J. Phys. Oceanogr. 23, 1737-1753, 1993." added

L717: "Ji, Q., Zhu, X., Wang, H., Liu, G., Gao, S., Ji, X., and Xu, Q.: Assimilating operational SST and sea ice analysis data into an operational circulation model for the coastal seas of China. Acta Oceanol. Sin., 34, 54-64, 10.1007/s13131-015-0691-y, 2015." added

L742: "Li, A., Zhang, M., Zhu, X., Zu, Z., Wang, H.: A research on the optimal approach of CFSR surface flux data correction based on different surface forcing modes. Haiyang Xuebao, 2019, 41(11): 51–63, doi:10.3969/j.issn.0253–4193.2019.11.006 (In Chinese with English abstract)" added

L821: "Xie, J., Zhu, J.: Ensemble optimal interpolation schemes for assimilating Argo profiles into a hybrid coordinate ocean model, Ocean Modelling, 33(3 – 4): 283 – 298, 10.1016/j.ocemod.2010.03.002." added