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Ocean Science Discussions

Interactive comment on "Testing the validity of regional detail in global analyses of Sea surface temperature – the case of Chinese coastal waters" *by* Yan Li et al.

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Dear Prof.Belkin:

Thank you very much for the helpful comments on our manuscript "Testing the validity of regional detail in global analyses of Sea surface temperature - the case of Chinese coastal waters" (No: os-2018-137). For the revision, we fully considered all suggestions and give the item-by-item reply. Also we try our best to improve the English writing in our manuscript. And revised portion are highlighted in yellow in the manuscript. We appreciate for your work. Much thanks for your comments and suggestions.

Best regards

Yan Li, Hans von Storch, and coauthors

Major Comments:

1. Why there are major discrepancies between LH and LA?

Reply: Thank you for pointing this out. Our study informs that the near-shore SSTs are below the open-sea SST products which may partly due to the effect of coastal upwelling. And we added the following sentences to further explain the point in the revision:

In the China Seas, most of the coastal upwelling currents occur at the ECS and the northern SCS, other small upwelling currents at the tops of the Liaodong Peninsula and Shandong Peninsula (see Figure 1 in the revision) (Yan 1991). The consensus of previous studies is that coastal upwelling currents results in cooling SST at these coastal areas (Xie et al, 2003; Guan et al., 2009; Su et al., 2012). In our study, we find that the in situ shoreline SSTs at the upwelling areas (e.g. Laohutan station, Shidao station and Dongshan station) are always colder than global gridded SST data, with the value of below -1°C (see Table 2, Table 3 in the revision).

We hypothesize that these negative differences are connect with coastal upwelling. To test this hypothesis, we examine the output of a numerical simulation of the currents in the South China Sea with a grid resolution of. 0.04°. The model is embedded in an almost global model with 1° grid resolution (Tang et al., 2018). The model used is Hybrid Coordinate Ocean Model (HYCOM) that is exposed to periodic climatological atmospheric forcing, with a fixed annual cycle but no weather disturbances. The atmospheric forcing comes from the Comprehensive Ocean-Atmosphere Data set (COADS). We extract simulated SSTs at three different distances (near the station, 50km, and 100km from each coastal hydrological station in SCS). Figure 7 in the revision shows that most shoreline SSTs are lower than ambient offshore SSTs, espe-

cially SSTs at 100km from shoreline. However, the Stations 22 (Beihai) and Station 23 (Weizhou) are not affected by coastal upwelling, and consistently, there are no notable differences among SSTs at three different distances from the two stations.

The result reflects that the homogenized SST data set for shoreline stations catch this relative cooling water effect of the regional upwelling currents. On the other hand, the global gridded SST datasets point to higher temperatures which may be caused by their coarse resolution or by the lack of near-shore observations when compiling near-shore box averages in coastal areas (Wang et al., 2018). Besides, there still some other local mechanisms with smaller scale can cause cooling water in the China Seas, such as China Coastal Current (CCC) (Belkin and Lee, 2014) and Ocean Fronts (Zhao, 1987; Ryan et al., 2000). In them, the shallow water shelf front and estuarine plume front are two major fronts in the Bohai Sea and the Yellow Sea at summer. Coastal current front, upwelling front as well as strong west boundary current front usually appear in the East China Sea and the South China Sea which may also have relationship with coastal upwellings (Feng 2000).

Minor comments:

(1) I have highlighted quite a few passages in the text that should be re-worded. The authors are able to improve the text themselves. Therefore, I have not suggested any specific edits. The annotated manuscript is uploaded.

Reply: We did our work to improve the language in the revised manuscript and these changes not influence the content and framework of the paper. Here we have not listed the language changes but all of them have been marked in yellow color in the revised manuscript.

(2) In Fig.1, stations should be shown with consecutive numbers (as in Table 2), not acronyms.

Reply: Thank you for pointing it out. Following with the comment, we display the 26

stations with consecutive numbers and the full names (see Figure 1 in the revised paper). And black circle represents the locations.

(3) Coordinates (lat, lon) of all 26 stations should be documented in the paper.

Reply: Sorry, the accurate latitude and longitudes of hydrology observational stations in China may not be made public. Instead, we show the distribution of these stations in the Figure 1.

(4) Perhaps, the text would be easier to read should the authors cite full names of 26 stations (complete with their numbers) vs. 26 acronyms. I would argue that full names are easier to memorize than respective acronyms, especially when the full names are accompanied by respective numbers. For example, it is easy to remember that there is a large spatial gap between Station 10 (LYG) and 11 (SPU) (Fig. 1 and Table 2).

Reply: Thank you for your suggestion. We have cited full names of 26 stations in the revised paper.

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