Title: "The Regional Coupled Suite (RCS-IND1): application of a flexible regional coupled modelling framework to the Indian region at kmscale"

Summary

Using a kmscale high-resolution regional climate model, the authors examined two tropical cyclone cases (Titli in Oct 2018 and Fani in April 2019) in the Bay of Bengal. Especially, five different simulations have been performed based on combinations of different components of the regional climate model. Major finding is that air-sea coupling can improve the simulated Typhoon track and intensity. It is also shown that the vertical turbulent mixing (K-profile parameterization, KPP) and frictional heating are important for the variation and intensity of air-sea variables during Typhoon period.

Recommendation: Accept after minor revisions.

The paper is generally quite well written, despite the minor points below. The authors have presented a clear description of model configuration and a convincing set of experiments in simulating the sea surface temperature, Typhoon characteristics and precipitation by comparing them with observations. In terms of kmscale high-resolution, the regional coupled model resolves the limitation of local parameterization (e.g., turbulent mixing, convective process) and provides a more realistic presentation of physical process and also saves computation resources (compared to global coupled model). The study would be of relevance and interest to the regional coupled model community as well as to the Typhoon-related studies in regional areas.

Here are some specific points below:

Major point:

The choice of boundary condition is a challenging issue for regional modelling. As shown in Figure 1, **the southern boundary of OCN** may not include the whole path of the Monsoon Currents which exchange water and mass between Bay of Bengal and Arabian Sea (Schott et al., 2001), and the equatorial undercurrent current, which may transport water and high-salinity into the Bay of Bengal (Matthews et al., 2019). Hence, there is a possibility that influence of those currents to the Bay of Bengal is underestimated. Please explain the above-mentioned issue. Also, please add longitude and latitude axises to Figure 1.

References:

Schott, F. A., & McCreary Jr, J. P. (2001). The monsoon circulation of the Indian Ocean. Progress in Oceanography, 51(1), 1-123.

Sanchez-Franks, A., Webber, B. G. M., King, B. A., Vinayachandran, P. N., Matthews, A. J., Sheehan, P. M. F., et al. (2019). The railroad switch effect of seasonally reversing currents on the Bay of Bengal high-salinity core. Geophysical Research Letters, 46, 6005–6014. https://doi.org/10.1029/2019GL082208

Minor points:

1. Line 370, please explain how this “frictional heating” term is calculated. Perhaps a formula would be better for the readers to understand the related physical process.

2. Storm surge disaster caused by Typhoon is another important issue. It is found that the sea level variation is mainly related to tide, wind and topography-induced friction and so on (Xuan et al., 2021). Since this study included those factors, it would be interesting to find out the performance of sea level variation (in terms of periodicity and correlation) under kmscale coupled framework, especially for the AO and AOW cases. Although the authors left this topic for future research in the discussion, it is related to your current study and can be used to evaluate your main results (wind, tide). So, I’d be glad to see some analysis at least in the supplementary information, if feasible.

Reference:

Xuan, J., Ding, R., and Zhou, F. (2021). Storm surge risk under various strengths and translation speeds of landfalling tropical cyclones. Environmental Research Letters. doi: 10.1088/1748-9326/ac3b78.