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Ocean Science Discussions

Interactive comment on "Effect of mesoscale eddy on thermocline depth over the global ocean: deepen and uplift" *by* Xiaoyan Chen and Ge Chen

Katsuro Katsumata (Editor)

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The reviewer 1 suggests a major revision. The reviewer points out (comment 4) that Fig.2 includes the effect of "the background temperature". The authors added the black line, showing the results from the analysis performed outside the eddies. The variability of red and blue lines are mostly attributable to the variation of the black line, i.e., non eddy effects. It is suggested to consider the effect of float distribution (comment 5). The authors responded with a figure produced from the floats outside of the eddies. I fail to see how this new figure supports the authors claim that the float distribution will not affect the main effect. The reviewer also suggested to look at the relationship of the thermocline depth with other parameters (comment 6). The authors calculated relationships with geostrophic current and EKE. Under the geostrophic balance, the

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eddy amplitude, radius, surface current, and EKE are all correlated and I do not think the new figures add much to the results in the original manuscript.

The reviewer 2 points out problems with the analysis – the effect of thermoclines (permanent and seasonal) contaminates the results. This point is similar to the first point by the reviewer 1. The reviewer also mentions the lack of consideration for salinity. The authors reply is based on a statement that "thermocline defined by maximum temperature gradient is a more stable stratification structure, so the displacement of the thermocline is less interfered by other factors such as air-sea interface interaction while is mainly captured by mesoscale dynamics". This statement is not supported by the analysis but with references which I failed to see a direct link to the reviewer 2's point. The effect on salinity was left for future.

The reviewer 3 again raises the importance to separate the effect of the seasonal thermocline from eddy effects and points out an important reference; Gaube et al. (2018). The reply is based on the same statement that the authors used in their reply to the reviewer 2, and again not supported by data.

Based on these reviews and my own reading, I am not convinced that a revision will improve the manuscript to the point where publication in OS is appropriate (https://www.ocean-science.net/peer_review/review_criteria.html). I discourage submission of a revised manuscript.

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