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Interactive comment on "The circulation of the Persian Gulf: a numerical study" *by* J. Kämpf and M. Sadrinasab

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This paper is a well-presented modeling study of circulation in the Gulf. Kämpf and Sadrinasab claim in the abstract to provide a "detailed comparison with observational evidence." While a comparison is indeed made with several aspects, it is puzzling that three significant features of the observed water mass distribution in the Gulf are ignored or contradicted. It would be helpful if the authors could address these issues.

1. The most prominent feature of the subsurface structure in the southern half of the Gulf is the front between Indian Ocean Surface Water (IOSW) and denser water masses bounding it below and to the south. The seasonal change in the front is a sensitive indicator of changes in the circulation in this part of the Gulf. The front is the major feature in Section CC' from February 1977 published in Brewer and Dyrseen (1985, Prog. Oceanog., 14, 41-55, Fig. 5-6) and in Sections G and F from the Mt.

Mitchell cruise published in Swift and Bower (2003, Fig. 8). Extrapolating between surface and bottom conditions in Figs 10 and 11 in the present paper, the front appears for at least part of the year, but it seems to be located well south of that in the observed data. In the present paper the front is confined to shallow water north of UAE, whereas in the observed data from both 1977 and 1992, the front extends north to the basin margin off Iran. The authors could help make their case that their model matches the observed data if they can show a figure with similar structure. This is more than a trivial exercise because the seasonal variations in this front are key to understanding the dynamics of this region.

2. The observed data suggest that there is a current that flows along the northern Iranian coast from the Tigris-Euphrates-Karun delta southward to at least 28°N. This current appears in the Mt. Mitchell sections published by Reynolds (1993) Figs. 16-17 winter, Figs. 21-22 summer). On p. 39, Reynolds (1993) points out that the current appears in the remote satellite images in his Fig 4. There is sedimentological evidence that current is a long-term feature that significantly affects sediment transport in the northern Gulf (Fig. 14 in Uchupi et al., 1996, Marine Geology, 129, 237-269). I can find no evidence for this current in any of the figures in the manuscript by J. Kämpf and M. Sadrinasab.

3. The authors clearly show that their model produces the densest water in the Gulf on the shallow south coast off UAE from December through August. They also indicate that this contradicts the observed data gathered during this period and published by Brewer and Dyrseen (1985, Fig. 6), Reynolds (1993, Figs. 11-12), and Swift and Bower (2003, Figs. 6-8), which indicates that the densest water in the Gulf occurs northwest of Bahrain. In effect, the authors use some of the observed data to validate their model while rejecting other aspects of the observed data because it does not agree with their model. This seems inconsistent. I hope other reviewers more skilled at modeling than myself can suggest what aspects of the physics or boundary conditions used by Kämpf and Sadrinasab can be adjusted so that their simulations can more

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completely reproduce the density structure of the Gulf and be a more reliable tool for investigating the circulation.

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