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Ocean Science Discussions

Interactive comment on "Dense CTD survey versus glider fleet sampling: comparison of the performance for regional ocean prediction West of Sardinia" *by* Jaime Hernández-Lasheras and Baptiste Mourre

Anonymous Referee #1

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General Comments: The manuscript investigates the impact of the assimilation of different datasets on simulations and forecasts performed with a mesoscale resolving regional model (ROMS) implemented in the Western Mediterranean sea. I generally like the paper. Authors investigate the impact of new technologies and sampling strategies on the description of the ocean state. My main concern is about the behaviour of the model without assimilation. In particular, as the authors state (p.12 l.2-4) "min and max are shifted by 0.2 kg/m3 in the panels corresponding to the simulations due to a persistent bias in the model density field": it seems that something is going wrong with

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temperatures. Temperatures at 50 m (Top-left panel of fig.8) seem up to 2 degree celsius warmer than data, that is quite a lot for this depth and period. I wonder if this could be an issue related to surface fluxes and/or to a bad vertical discretization (maybe the model fails to match stratification and thermocline position). Or, it could be a BIAS due to the lenght of the (drifting) simulation? I ask the Authors AT LEAST to discuss the sources of such bias and possible (future or present) ways to fix it. Further, to better understand the relevance of such bias on simulations (and thus the impact of assimilation) it would be good to see also layers shallower than 50 m: I suspect an even higher temperature and density bias on shallower layers. If the BIAS is larger than 1-2 °C it should be better to fix it BEFORE assimilation.

Specific Comments, grammar and typos: Title: I would suggest a change in the title as in its present form it misses to inform about Analyses/Data assmilation. Something like "Sampling strategy does matter: impact of assimilation of glider data compared to dense CTD survey in a regional ocean model West of Sardinia". Or maybe shorter but I suggest with the information of the performed ocean synhteses.

Abstract is ok.

Intro and or Methods: The paper misses a description of the known circulation of the area. There are papers specifically devoted to the circulation of the Sardinian sea (Ribotti et al. 2004 about surface mesoscale circ; Testor et al. 2003, 2005 about LIW transport mediated by Sardinian eddies; Olita et al. 2013 about surface circulation and upwelling; papers already published in the same special issue as the present manuscript; some other references to the area can be found in Mediterranean-scale studies). -p4 line 17: a description/reference of the EnOI method and algorithms is missing. Is the software developed by Authors? If yes, it should be referenced or described (even in an Appendix)- -p6 line 30: "an horizontal" should be "a horizontal" -p8 line 5: it is not clear if the observations used for RMSD are independent (i.e. are them also assimilated during spinup?). -P15 line 17: "The domain localization approach guarantees that the assimilation of dense profile observations from gliders and

CTDs over a reduced area does not degrade the results over the whole modelling domain". Please repeat also here what the "domain localization" procedure/alghorithm do. PLease also show somewhere the impact of such procedure on the whole modelling domain (for instance by showing some sensitivity test to the chosen radius) -p17 line 7-9 " In this study, the CTD initialization survey results in a similar forecast performance after data assimilation as an 8-glider continuous monitoring of the area flying along predefined paths with regular spacing": Please also specify that such "regular spacing" is the same as the meridional spacing of CTD sampling grid. This is important to be specified as it seems that the larger number of data (higher along trasect resolution) from glider data does not imply an improved ocean state description after assimilation, which on the contrary is "just" function of the maximum resolution of your grid (resolution is larger across transect than along transect). This would suggest of course that CTD sampling would benefit by an equally spaced grid, and that probably glider data assimilation would benefit a finer maximum resolution (that could be able to catch submesoscale you observed to be smoothed by your system). -p18: Adaptive sampling procedure (finalized to assimilation) would probably lead to better description of some specific features BUT with the limitations of what said here above, i.e. limited (in resolving features) by the maximum resolution of the sampling grid in a given area (combined with the resolution of the model itself).

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