Earth Syst. Sci. Data Discuss., 8, C178–C181, 2015
www.earth-syst-sci-data-discuss.net/8/C178/2015/


Open Access Earth System Science Data Discussions

# *Interactive comment on* "Objective mapping of Argo data in the Weddell Gyre: a gridded dataset of upper ocean water properties" *by* K. A. Reeve et al.

**Anonymous Referee #1**

Received and published: 21 July 2015

General Comments

The manuscript "Objective Mapping of Argo data in the Weddell Gyre: a gridded dataset of upper ocean water properties" by Reeve et al. describes an algorithm to objectively interpolate Argo float data on a grid and its application to data collected in the Weddell Gyre. This is a very technical manuscript trying to resolve the challenges when dealing with the data sparse region of the Weddell Gyre. It is overall very well and clearly written, so that the readers can evaluate the work and can reproduce the algorithm and apply it to their own data. The manuscript is therefore highly suited for this journal. I recommend acceptance after minor changes and addressing my concerns



regarding the spatial scales (see section 2.5 below).

Specific Comments

INTRODUCTION You give a good introduction to the Weddell Gyre and the interpolation schemes available. You also highlight the lack of in situ data. However, there are other data sources available in this region: ships, moorings, drifters, animal-borne instruments. You should expand the paragraph on ships and moorings to include all other emerging technologies and make clear why you limit yourself to only use Argo float data.

METHODS 2.1 While you discuss the linear location interpolation of Argo float profiles later in the discussion, you should highlight this in the method section as this has a big effect on the structures in your mapped fields. Some information is necessary, e.g. how long are surface locations apart. How many of the locations do have an 'interpolated' location. Was the increased uncertainty taken into account as an increase error later in the interpolation scheme?

2.3 You say that "the sub-surface Weddell Gyre is relatively invariant". Could this only be a result of the lack of in situ data not resolving the temporal changes?

2.5 You base your length scales on the spatial structure of the dataset and not on the spatial structure of the ocean. You force your scale so high that you have more than 95% of your grid cells covered. I do not think that this is a good idea. The result is that you decide how many grid cells will not have data instead of the interpolation scheme together with the dataset 'telling' you that not enough data are available for this grid point. Please make a point why you choose to use only numbers to define your scale instead of using oceanographic knowledge.

Your cut-off for profiles is only based on your large length scale. Which means that e.g. if you have 40 profiles 900km due east of your grid point the algorithm would still calculate an estimate. For example, you provide estimate west of 35W and south

of 70S. Your interpolation scheme has added the weighting based on the distance between profiles, but when there is a lack of data and/or they are bunched together it treats them as being Gaussian distributed in space (as it does not know direction). I would therefor advise to calculate straight lines between the outermost profile locations as boundaries and remove all estimates outside of this polygon. In other words, each grid point should at least sit on a line between two profile locations.

2.6 I am not sure why you apply this step. Basically, you remove outliers. Shouldn't they be included in your interpolation? Their main impact would be to increase the error value of you mapped field and therefore represent the potential spatial and temporal variability in your field, which is the main reason for your second step in the interpolation.

RESULTS 3.1 Some parts e.g. about the grid size are not results, but based on your method and are already mentioned there. Please remove.

3.3 This is the only place salinity is mentioned. Please properly present the results of the salinity fields as well including the structure and errors.

DISCUSSION

4.1 Please but the results into context. Do the temperature and salinity pairs at each grid point correspond to the known ranges of water masses. This check is important as you interpolate on pressure levels and not along isotherms or isopycnals.

4.2 A very important and interesting step. As we assume the profile data to be the truth, they should be with the uncertainties of the mapped field as they represent not only the error of the mapping scheme but also the spatial and temporal uncertainties. Latter will not be resolved properly, when using sparse datasets. So, while your figures show only small errors based solely on the interpolation scheme, this test shows that the error in temperature of your gridded field is on the order of 0.2C. Please make this clearer. Did you include this uncertainty in the final error estimates of your gridded



fields?

REMARKS 5. Could you also please give a recommendation on how to improve the dataset? Would it improve by adding other data sources and data from the shelves?

Technical Corrections

p.510 l.24 Is "buffer" the correct term here? The role of a buffer is not to transfer properties, but to buffer them. So maybe "pump" is a better term or make it clearer why it acts as a buffer.

p.512 l.23 "There are symbols distributed along straight lines; these represent the linearly interpolated ..." This hoes into the caption of the figure and should not be in the main text.

p.512 l.27 You not only provide a gridded field. You also introduce a new interpolation scheme. So maybe change the sentence to "The aim of this paper is to introduce an improved interpolation scheme and provide a spatially gridded dataset ..."

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Interactive comment on Earth Syst. Sci. Data Discuss., 8, 509, 2015.