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Ocean Science Discussions

Interactive comment on "Observed and simulated full-depth ocean heat content changes for 1970–2005" *by* Lijing Cheng et al.

Anonymous Referee #1

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Review of the Manuscript "Observed and simulated full-depth ocean heat content changes for 1970-2005" by Lijing Cheng et al.

This is an interesting paper, which along with other recently published and in-press publications stress the importance of the ocean heat content calculations for the climate monitoring and provides an update of both the observation- and model-based ocean heat content estimates.

General comments

1) I believe the paper should more strongly underline the conclusion that the existing (CMIP5) models are characterized by the extremely large spread in their estimates of the total OHC. This spread exceeds by far the estimated observational uncertainty in the OHC change even for the upper 0-700m where the the model drift is expected to

be less important compared to the deeper layer. This finding poses the question about the ability of the existing models to simulate the OHC change.

2)There is a small discussion in the manuscript regarding the OHC decrease after the major volcano eruptions (page 6). The OHC time series shows several other OHC-decrease events of similar magnitude (1976 2001, 2004, 2007) which are obviously not connected to any big volcanic eruption. Consequently, the interpretation of the OHC-decrease events near 1983 and 1993 as being most probably due to the volcanic eruptions allows alternative explanations as well.

Minor comments

P.1 Lines 25ff: "Numerous efforts have been done to detect the historical OHC change" . The list of references which follows in parenthesis is incomplete: for instance the earlier estimates done by the Levitus group are missing, as well as the estimates provided by Gouretski&Koltermann, 2007. The reader thus gets a wrong impression that the cited studies are the only available in the literature where the OHC estimates have been reported. Please, extend the list of relevant studies. P.2, lines 16ff Please, reformulate the sentence: for instance, the following piece of text "to construct the climatology based on data with near-global data coverage" definitely needs improvement.

P.2, line 30: "The gridded method". Though this term has already been used by the authors in the earlier paper, I suggest to change the name to, say, "multiple grid method", or "flexible grid method", because otherwise the name of the metod states that the method itself is subjected to gridding, whereas it is the data what is gridded.

Data and Method section: there is no mention here about the usage (or not usage) of the Mechanical bathythermograph data. This is a large data set, with the data being biased. Gouretski&Reseghetti 2010 provided a correction scheme for the MBT data, which successfully reduces the overall bias.

Page 4, line 3: change to "less land and no boundary currents"

Page 4, line 14ff: “The five ensemble members ... sample plausible uncertainties” - 1) how the uncertainties can be sampled and 2) what is the method to decide if they are plausible???

Page 4 line 21: change “from choice” to “from the choice”

Page 4, line 29ff: Is the assumption about the proportional increase in heat uptake in the deep ocean justified?

Page 5, line 9: “i.g. spurious long-term trends arising the slow model adjustment....” - are the words “due to” missing here??

Page 6 line 10: “The total OHC change ... has increased ...” - please, indicate the time period here.

Page 9, line 24: change “is shown to small” to “is shown to be small”

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