Overview: In this study, observed and simulated full-depth ocean heat content changes for 1970-2005 has been compared in detail. It is found that the rate of the observed full-depth OHC increasing for 1992-2005 is nearly twice than that for 1970-2005.In addition, the ensemble mean of the CMIP5 models is consistent with the observation. The paper can be published in Ocean Science. Specific comments are listed as below:

1 In the Abstract, the authors noted that "We suggest that OHC be a fundamental metric for climate model validation and evaluation." I think this conclusion can be revised like "We suggest that the ensembles of the CMIP5 models be appropriate for mechanisms for the OHC changes".

2 In the Introduction, the authors stated that "We note that the work presented here is broadly similar to the recent study of Gleckler et al (2016) and provides an important independent verification of some of their key findings."This statement is confused because if the results of this study is broadly similar to the recent study of Gleckler et al (2016), why your studies are different ?

3 In the Data and Methods, the authors used two approaches to map the OHC data. I think these approaches may be not perfect because the ocean state in data-rich areas is not the same to that in data-sparse regions. These approaches should be supplemented with the different ocean dynamic conditions.

4 In the Data and Methods, the authors noted that "Because the upper 700-2000m oceans show an approximate tripling of the heating rate from 1992-2005 compared to 1970-1991 (as shown in Fig. 2, green curve), we assume a proportionate increase in heat uptake in the deep ocean (2000m-bottom)." I think the upper 700-2000m oceans are controlled by the wind while the deep ocean (2000m-bottom) is controlled by the thermohaline circulation. The dynamic conditions are very different. So the assumption is not so appropriate. You can give some observation evidence for this assumption.

5 In the Observation-based full-depth OHC estimates, the authors stated that "The OHC change after the two volcano eruptions is approximately assessed by subtracting the OHC one year before the eruption from the OHC in the second year after

eruption" I think the ocean response to the volcano eruption is not so quick, you can remove the effects of volcano eruptions by longer time delay.

6 In the Observation-based full-depth OHC estimates, the authors noted that "There is also indication of substantial heat discharge from the upper 700m ocean following the extreme 1997-1998 El Niño event". What is the reason of substantial heat discharge from the upper 700m ocean following the extreme 1997-1998 El Niño event?

7 In the Observation-based full-depth OHC estimates, the authors wrote that "Although the comparison between the observational and CMIP5 full-depth OHC results in an insignificant difference, CMIP5 models show a large spread (Figure 3, 4, 5)". What is the dynamics of large spread in these models? I suggest you can explain it in detail.