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Ocean Science Discussions

Interactive comment on "Variability of Antarctic intermediate water properties in the South Pacific Ocean" *by* M. Tomczak

Anonymous Referee #1

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This study examines the variability of Antarctic Intermediate Water (AAIW) salinity by using time-series data from Argo profiling floats, with an assumption that each float visits different parcels of AAIW every time it surfaces, thus observing spatial (horizontal) structure of AAIW as it drifts. The author demonstrates that the distribution of AAIW salinity minimum is much more turbulent than the climatological field, by comparing the standard deviation of AAIW salinity for each float with that calculated from WOA climatology for the same trajectory. Then, possible causes for the high turbulence are discussed, with several examples of salinity variations obtained by the floats. Although the analysis and its results are quite simple, the manuscript is well written with sufficient discussion, telling us that the real ocean field is so different from the climatological field even in middle layers. I only have some relatively small comments, and recommend

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that this manuscript be accepted after minor revision.

Comments: p.2022, l.9-10, “but most are more likely produced by interannual variations of the AAIW salinity field.”: Does the author demonstrate and mention this explicitly in the text?

p.2025, l.14-16, “To investigate AAIW variability, time series of the AAIW salinity minimum were constructed by extracting the salinity minimum from the depth range 500-1200 m of every float profile.”: Is the maximum depth of 1200m deep enough to detect deeper salinity minima? The bottom panels of Fig.15 for the float 5900443 suggest that some of the AAIW salinity minima exist at depths greater than 1200m.

p.2025, l.21-22, “the AAIW salinity minimum along the track of each float was reconstructed from the World Ocean Atlas (WOA).”: Which version of WOA is the author using? Also, the reference for WOA should be shown.

p.2026, l.8-9, “No attempt was made to recalibrate dubious profiles.”: Does this mean that the authors used real-time quality controlled data but not delayed-mode quality controlled data?

p.2026, l.20-21, “171 Argo floats passed the detailed data quality review and form the basis of the study. Figure 1 shows their launch locations.”: I compared Fig.1 with some past Argo float distribution maps and felt that data from many floats are not used in this study although they were launched around the same time or earlier than the floats used in this study. (For example, about 20 floats launched by USA around July 2003 along the track between Panama and New Zealand are not used. About 15 floats launched by Japan around October 2003 along 33S are not used either, while about 15 floats launched by USA probably in the same cruise are used.) Why doesn’t the author use those float data? It is hard to believe that all such floats provide bad data.

p.2027, l.28-29, “The Argo team guarantees an accuracy of 0.01 for delayed mode quality controlled data”: I think this sentence is unnecessary because the present study

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(probably) does not use dQC data.

p.2027, l.29-30, “despite the fact that the instrument stability is often close to 0.003”: Japanese Argo team estimated salinity drift of -0.004 per year, based on recalibration of several recovered floats (Oka, 2005, J. Oceanogr.).

p.2031, section 4.2: I think it better to move this section after section 4.5.

p.2032, l.18-22: “The floats did not spend their lives in a data-sparse region, and there is no reason to think that the AAIW salinity field given by WOA should not be accepted as representative of the long term mean situation north east of New Zealand. This suggests that AAIW that reached the area was about 0.03-0.06 less saline during the years 2001-2005 than the climatological average.”: The author needs to consider data in which period mainly construct the WOA climatology used in this study. My intuition is that the WOA consists of data mainly from around 80’s (70’s- 90’s). Then, it might be possible to interpret that the authors detected AAIW freshening of 0.03-0.06 during roughly 20 years, like the freshening clarified by Wong et al. (1999, Nature).

p.2034, “Situations that can be interpreted ... is transported as an eddy.”: Is it possible to confirm these possible eddies in satellite data? An example of a subsurface eddy was shown in the previous paragraph, but I believe it does not apply to all eddies.

p.2038, l.9, “(from September 2003; Fig.9)”: To what date (on x-axis) does Sep. 2003 correspond? Maybe better to mention it.

Figure 15: The depths of salinity minima are unnaturally identical among many profiles (particularly in the top and middle panels) although the author mentions in section 2 that each profile was interpolated at 10m intervals.

Interactive comment on Ocean Sci. Discuss., 3, 2021, 2006.