

## ***Interactive comment on “Sea ice draft in the Weddell Sea, measured by upward looking sonars” by A. Behrendt et al.***

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We thank the reviewer for his useful comments and suggestions, which will definitely help us to improve the quality of our paper. The following changes were made according to the first review.

Specific comments: \_\_\_\_\_

page 806 (2), line 23: changed to: oceanic meridional overturning circulation...

page 807 (3), line 1: reference added: Lemke, P. et al.: Observations: Changes in Snow, Ice and Frozen Ground. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M.

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Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2007.

page 807 (3), line 8: two references added: (1) Wadhams, P., Davis, N. R.: Further evidence of ice thinning in the Arctic Ocean, *Geophys. Res. Lett.*, 27(24), 3973-3975, 2000. (2) Rothrock, D. A., Percival, D. B. and Wensnahan, M.: The decline in arctic sea-ice thickness: Separating the spatial, annual, and interannual variability in a quarter century of submarine data, *J. Geophys. Res.*, 113, C05003, doi:10.1029/2007JC004252, 2008.

page 807 (3), line 12: changed to: biased towards undeformed ice classes...

page 807 (3), line 12: two sentences added: The recently launched satellite CryoSat-2 has the capability to provide basin-scale information on sea ice thickness. However, it has so far not been applied to Antarctic sea ice.

page 809 (5), line 10: The main reason is that the Weddell Polynya - which occurred in the period 1974-1976 near Maud Rise - was expected to reappear. (not mentioned in the text, as we then would have to specify the reasons for each position)

page 810 (6), line 3: sentence added: The data are provided on a 1.125 degrees grid and were processed especially for AWI.

page 810 (6), lines 4-5: sentences changed/added: Not correcting for atmospheric pressure would cause an error in the ice draft of about 10 m. Another serious error source is the variation of the vertical mean sound speed in the water column above the ULS. [...] Not correcting for sound speed would cause an ice draft bias of up to 60 cm.

page 815 (11), line 15: "rate" changed to "period"

page 818 (14), line 4: sentence added: The depth of this point corresponds to the depth of the physical mixed layer.

page 818 (14), line 18: "linear" changed to "constant"

page 819 (15), line 2: sentences added: The way between sea ice and ULS consists of different layers, each of which having different temperature and salinity that affect the sound speed. For calculating the average value of sound speed from model or CTD profiles, we assume that all layers have the same thickness. Therefore, the average sound velocity is obtained by the harmonic mean of the individual velocities.

page 825 (21), lines 8-10: see conclusions

page 825 (21), line 13: sentence added: Results are presented for three ULS positions, two of them (AWI-207 and AWI-232) showing the most striking changes in sea ice thickness. The third record (AWI-231) is among the records with the largest amount of measured data.

page 825 (21), line 25: word "significant" removed

page 826 (22), line 3: sentence added to 827, line 16: For the above reasons, a bias was not subtracted from the ULS data published in the PANGAEA archive.

Technical corrections: \_\_\_\_\_

page 806 (2), line 15: "under" changed to "from"

page 807 (3), line 3: paragraph attached to the one below

page 807 (3), line 23: "primarily" added

page 809 (5), line 25: on page 808 (4), lines 10-11 we wrote: 8-bit (software version 1.0) or 16-bit (software versions > 1.0)

page 810 (6), line 7: sentences changed: For example, if a colder water mass drifted through the vertical path of the ULS sound signals, it would lower the thermocline and thereby reduce the vertical mean temperature. This in turn would reduce the...

page 810 (6), line 23: sentence changed: In step two, the programme checks whether the data are within realistic boundaries and calculates the pseudo draft.

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page 813 (9), line 5: sentences changed/added: They were processed with a different procedure which also allowed for a simple interactive correction of the data. However, this method was technically not as sophisticated as the one described above.

page 814 (10), line 6: sentences changed: The overall error of the pressure sensor results from contributions that depend on the measured pressure and contributions that are independent of pressure. Both contributions include a temperature coefficient, statistical errors and long-term stability (drift).

page 818 (14), line 13: sentence changed: For a ULS at 150 m and  $T_{uls} = 1.2$  degC, a change in depth of the inflection point from 40 m to 80 m would alter the mean sound velocity between the surface and the ULS by about 3.8 m/s.

page 823 (19), line 3: word "statistical" added

Figures/Tables: \_\_\_\_\_

Fig 1: Caption changed

Fig 2: Figure changed

Fig 8a: Caption specified

Fig 12: Caption changed: Detection of sonar signals and measurement threshold for the two-way travel time (time of flight). Top panel: Example of a detected signal that passes the threshold of 100 mV. The arrival time of the echo is measured when the signal voltage equals 100 mV. Bottom panel: Example of a weak signal that does not pass the detection threshold and hence is not recorded by the ULS.

Figs 13/14: Figures changed

Table 2 removed (information now included in text)

Interactive comment on Earth Syst. Sci. Data Discuss., 5, 805, 2012.

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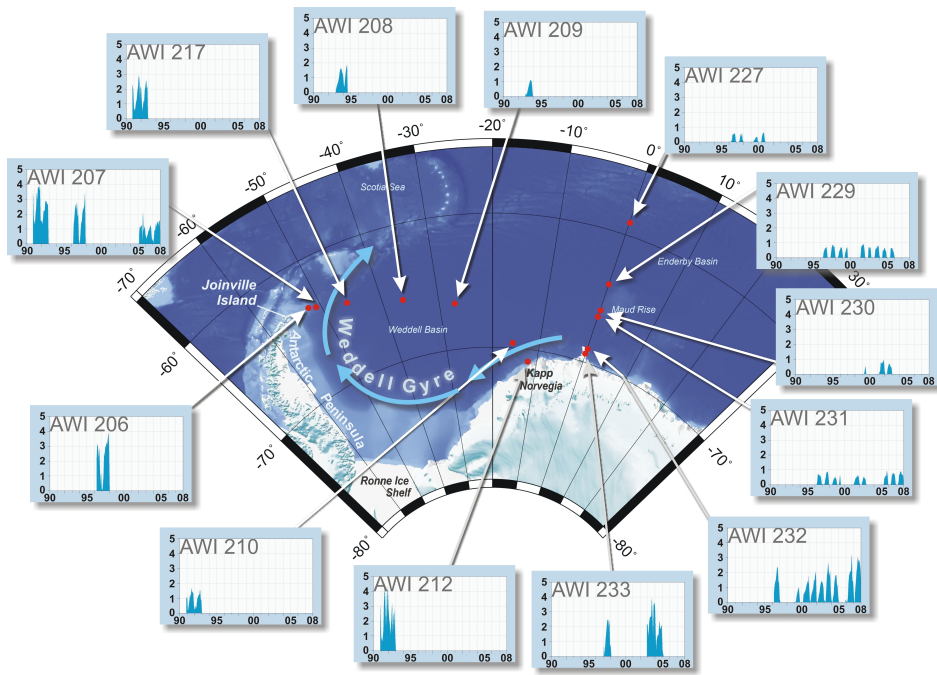


Fig. 1.

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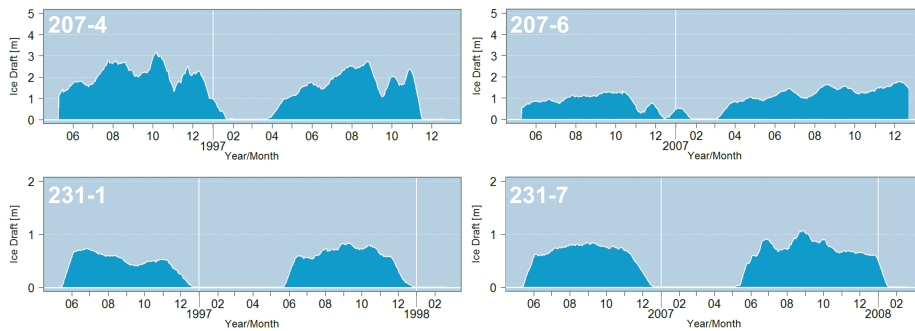
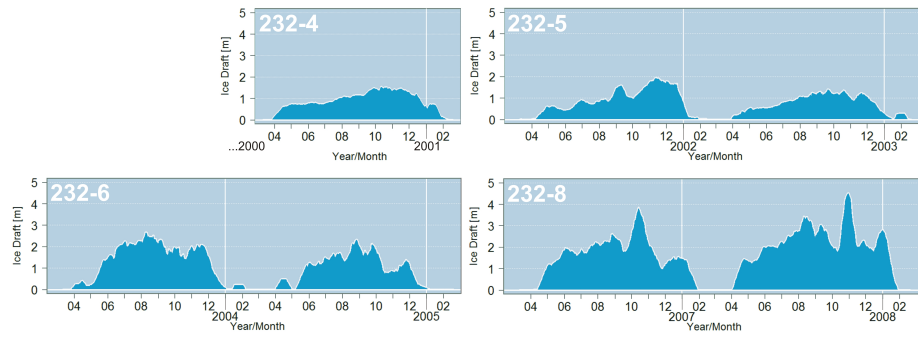


Fig. 2.

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**Fig. 3.**