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Interactive comment on "Late Pleistocene Glacial–Interglacial related shell size isotope variability in planktonic foraminifera as a function of local hydrology" *by* B. Metcalfe et al.
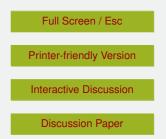
J. Bijma (Editor)

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I thank the referees for their valuable support and insights. I also thank the authors for their replies. There are a few issues that I like to bring up in my editor comment.

Referee 1 raises the issue of the effects/influences of the 'carbonate ion effect, temperature and dissolution' of foraminiferal d18O and d13C and asks (Page 148, line 25-26.) '..is a progressive enrichment in 13C for increasing size.' Could this observation be due to changing sea water temperature of carbonate ion concentration during TIII? The authors response is very appropriate and I suggest that this finds its place in the revised msc.

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This referee also asks "Is there any correlation of these studies with shell size and mass?". Interestingly, the authors state that: "Our shell mass for these species do however show that G. bulloides and G. inflata follow a similar pattern as the pCO2 curve from Vostok." because they also argue that "A visual inspection, plus the shell weight signal would indicate that dissolution is minimal", one could argue that shell mass (size normalized weight?) might be the expression of changes in carbonate ion concentration, which does have a strong impact on d18O and d13C of specifically G. bulloides. Although, the authors discuss the carbonate ion concentration in the carbon section of the discussion, their data set would allow to play around and try to isolate some of the effects. I understand that this would be too much to discuss in this paper but would be delighted to see a follow up paper specifically on this issue!

As requested by referee 2, when referring to enrichment or depletion of a specific isotope, please state which one is being discussed.

The authors state that "As an individual, a foraminifer does not have the ability to actively seek favorable conditions (it does not have a flagellum or biological mechanism in which active swimming can occur). Whilst this is correct, they do have the ability to control buoyancy. Having said this, it is important to note that studies on the population dynamics of several (symbiont bearing) planktonic foraminifera have revealed that all ontogentic stages are found at every depth of their general habitat at every point during their life cycle and that only statistical analysis allows to demonstrate a species' general migration pattern and timing of reproduction. As we also know that only gametogenetic specimens are archived in the sediment, it follows that size differences of sedimentary specimens of a species reflect differences in conditions throughout their lives. Temperature, food, and light in case of symbiont bearing planktonic foraminifera, have been shown to strongly affect final size. I would argue that, as a general rule, larger specimens have seen more favourable conditions than smaller ones. In this context, Ezard et al. (2015) state that: "Trends in body size and isotopic composition, particularly in dinoflagellate bearing taxa, suggest that much of the size-dependent isotopic variation

observed in death assemblages (i.e., core tops and sediments) relates to factors influencing the maximum size obtained by adults rather than ontogeny." As suggested by referee 2, I suggest that the authors do consider this paper as well.

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Interactive comment on Biogeosciences Discuss., 12, 135, 2015.

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