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Interactive comment on "Repercussions of differential settling on sediment assemblages and multi-proxy palaeo-reconstructions" *by* A. G. M. Caromel et al.

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Comment: First of all, the authors should describe the methodology (especially for detailed processes estimating the numbers shown in Table 1) in this paper rather than reporting it in a different paper currently in prep. Otherwise, this paper cannot be critically evaluated by the reviewing process. I strongly recommend that the authors should combine the informations to make a single paper.

Response: Due to a delay in the publication of the other paper in which the methodology is described, we agree that a description of the settling experiments used to generate the values for the settling speeds of individual species of planktic foraminifera is

needed here. The following paragraphs were added to the Materials and Methods after the first sentence: "Specimens from nine species of planktic foraminifera, representing a broad range of morphologies, were picked from the >250μm size fraction from deep-sea core samples: near-spherical *Globigerinoides conglobatus* (n=29) and *Orbulina universa* (n=30); globular *Globigerinoides trilobus* (n=26), *Globigerinoides sacculifer* (n=28), and *Globigerinoides ruber* (n=24); discoidal *Globorotalia menardii* (n=30), and *Globorotalia tumida* (n=30); lowly conical *Globorotalia hirsuta* (n=29); and highly conical *Globorotalia truncatulinoides* (n=29). For each specimen, a maximum diameter measurement was taken using ImageJ (version 1.44p; National Institutes of Health, USA).

The specimens were soaked for two weeks to remove air bubbles, and were then allowed to settle individually in a cylindrical tube of 155mm depth and 140mm diameter. This setup was deemed sufficient for the foraminifera to reach terminal velocity with negligible wall effects (calculated following Di Felice, 1996), and this was verified by measuring settling velocity over several depth intervals. Settling was recorded using a high-speed camera (Vision Research Phantom v.9.1 at a sampling rate of 100pps with a 1440x720 pixel resolution and 3000μs exposure) and terminal velocity was confirmed by calculation from 20 consecutive image frames from the lowest 30mm."

Comment: Transfer function of plankton shells was constructed by comparing assemblages between sediment and surface water. Therefore, the transfer function itself includes the information of transport of shells in the water column. What the authors discuss in the discussion section may be true, but they did not estimate how the transport process quantitatively affects the paleo-record estimated through transfer functions that already include travel process in the water column. The authors should carefully discuss this point.

Response: The reviewer's comments would be correct if there were no change in flow over time. Certainly, transfer functions are calibrated against the modern conditions which include lateral transport. As geostrophic flow changes, for example between glacial and interglacial conditions (e.g. Lynch-Stieglitz et al., 2011), these changes in current velocities, and therefore transport potential, could have an influence and this is what we went out to test. We have clarified this in the text.

Comment: In addition to the surface current, the bottom current also transports the fine particles as well. Especially in some areas in the ocean, it has been known that strong bottom current resuspends and transports the sedimentary particles. Can't this process be assessed in the authors' method?

Response: A bias in sediment assemblages can be envisaged based on the potential differential resuspension of particles of different sizes, shapes and densities, though this was not the focus of our work, as it is a completely different question and setting. The threshold velocities for reentrainment of certain species of planktic foraminifera were measured by Kontrovitz et al. (1979), and were found to be up to an order of magnitude greater than the velocities for gravitational settling as presented here (0.129-0.226m/s, Kontrovitz et al. 1979). Comparable estimation of the threshold velocities for diatom detritus was in the range 0.08-0.16m/s (Beaulieu, 2003). At none of our sites were the velocities of this magnitude at depth; such velocities are more likely to be found in shallow-water basins, streams or tide-influenced settings.

References: Beaulieu, S.E., 2003. Resuspension of phytodetritus from the sea floor: a laboratory flume study. Limnology and Oceanography, 48(3): 1235-1244.
Di Felice, R., 1996. A relationship for the wall effect on the settling velocity of a sphere at any flow regime. International Journal of Multiphase Flow, 22(3): 527-533.
Kontrovitz, M., Kilmartin, K.C. and Snyder, S.W., 1979. Threshold velocities of tests of planktic foraminifera. Journal of Foraminiferal Research, 9(3): 228-232.
Lynch-Stieglitz, J., Schmidt, M.W. and Curry, W.B., 2011. Evidence from the Florida Straits for Younger Dryas ocean circulation changes. Paleoceanography, 26: PA1025.

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