

Interactive comment on “Controls on benthic biomass size spectra in shelf and deep-sea sediments – a modelling study” by B. A. Kelly-Gerreyn et al.

Anonymous Referee #2

Received and published: 7 November 2011

General comments: The above manuscript presents an interesting modelling exercise aiming to investigate controls on benthic biomass. However, the ms would benefit significantly from a clear statement defining its aims and objectives, (including which potential controlling factors will be examined), and from a wider discussion of its results in an ecological context. Specific comments The three stations chosen for this analysis differ so widely with regard to their locations and environmental characteristics (from ambient temperature and oxygen concentrations, to productivity of overlying water column etc) that their choice seems arbitrary, but at the same time insufficient to adequately cover a wide range of environmental conditions. The criteria for choosing these stations therefore should be explained further. The deep Faroe-Shetland

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Channel does not strike me as a good representative for cold, deep-water habitats. Deep-water current speeds in the Faroe – Shetland Channel are much higher than in most continental margin settings, resulting in coarse sediments, with consequences for both benthic community composition and size distribution. Benthic communities in OMZs, on the other hand, are strongly influenced by ambient oxygen availability. Macrofauna are often absent in the OMZ core, where oxygen levels are lowest; whilst high abundance, low diversity assemblages are typical at the OMZ boundaries. By contrast, some meiofauna such as specialised foraminifera and (some) nematodes are very abundant in the OMZ core. Size distribution of an OMZ core community therefore is likely to differ considerably from stations in the OMZ boundary, or outside the impact of the OMZ. (see for example Levin et al., 1991, 2000; 2009; Gooday 2009). Would it not have been meaningful to include into the modelling exercise other stations from the OMZ transect ? The statement that all benthic size classes ‘rely on a common detrital pool’ for food is misleading. Many small benthic organisms are known to feed on bacteria, for many others, particularly in the deep-sea, food sources are unknown. At the very least, the authors should insert ‘ultimately’ into this statement. The further discussion on this matter (p.8297) is also not very clear. The authors claim that ‘the two taxa nematoda and polychaeta occupy the same’ trophic level’ – but there is a huge body of literature showing that at this coarse taxonomic level this term is simply not meaningful and that the reason isotope signatures overlap is their vast range, often spanning several trophic levels (the study referred to here was actually carried out at 4800 m depth, i.e. representative of abyssal plains not tackled in this study). The authors then leap to the absence of predatory behaviour amongst benthic metazoan in OMZs to conclude that predation between sampled fauna is negligible. (Although e.g. deep-sea isopods are known to prey on foraminifera, and there is likely to be predation at FG ?) Lead by the choice of stations, I expected the potential controls of benthic C flow and size classes under investigation to be environmental parameters (for example food availability (e.g. vertical POC flux or PP) , oxygen availability, water depth, etc), and was surprised when they turned out to be mortality, predation, ingestion etc – all factors no-

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toriously difficult to constrain for a benthic ecosystem due to a significant lack of data to underpin model assumptions . Likewise, I was disappointed to see no reference to/ comparison with other studies investigating controls on benthic C flow and biomass, such as the inverse modelling studies from the group at NIOO (van Oevelen/ Soetart group), or the Wei et al 2010 paper (PLoS ONE) 'Global Patterns and Predictions of Seafloor Biomass Using Random Forests'.

Interactive comment on Biogeosciences Discuss., 8, 8189, 2011.

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