

Interactive comment on “Sources and transport of dissolved iron and manganese along the continental margin of the Bay of Biscay” by A. Laës et al.

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In this study the authors seek to investigate the contribution of benthic Fe and Mn flux from continental margins sediments to the trace metal budget in offshore waters. The motivation for this study is the recent assertion by several researchers that benthic Fe flux from shelf sediments are an important Fe source to the overlying water column, which could account for nearly half the reactive Fe input into the ocean and thus be equal in magnitude to atmospheric deposition. This is a very timely study, and I am in support of publication in BGD. This paper is well written, the data from a transect across the continental slope and shelf are of high quality. My only concern is that the

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authors are a little hasty in their conclusion that “The influence of continental margin on the distribution of trace metals is confined to this region and transfer of the metals into the open ocean was not observed.” The reasons for my concern are as follows:

1. The authors do not take into account the seasonality of the benthic Fe flux. Samples were collected in early spring, but how does that relate to factors controlling sedimentary redox-recycling and advective transport of the benthic efflux to the surface waters? Berelson et al. (2003) demonstrated that Fe flux is closely coupled with organic carbon remineralisation and thus - albeit with a time lag - surface primary production. Other factors to consider are the availability of reactive Fe and Mn in the coastal shelf sediments, and the upwelling intensity, which supply nutrients for surface primary production and would deliver benthic metal flux to the surface waters. Maybe the reason why the authors did not observe a more pronounced influence of the shelf sediments on the abundance of trace metals in the surface waters off-shore was because benthic metals fluxes at that time of year are relatively low.

2. The authors did not quantify porewater gradients or benthic fluxes in the Bay of Biscay sediments directly; instead they use published data from Hyacinthe et al. (2001) to argue that the benthic Fe flux in the Bay of Biscay is an order of magnitude higher relative to the benthic Fe flux in Monterey Bay (Berelson et al., 2003). I was surprised to read that the benthic metal flux should be so much higher in the Bay of Biscay, and after my own reading of Hyacinthe et al. I think this is a misinterpretation of their data. My understanding is that the values listed in Table 2 of Hyacinthe et al. and discussed in their section 4.4 do not represent benthic exchange between sediments and bottom water, but an upward porewater flux from the base of the cores to a sedimentary horizon below the sediment-water interface. I therefore believe that the benthic Fe flux in the Bay of Biscay is likely to be of similar magnitude or maybe even lower than fluxes on the California continental margin.

3. I am not sure that quantification of dissolved metal concentration alone is sufficient to assess the relative importance of metal inputs from the continental shelf for the off-shore

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metal budget. For example, it is possible that low dissolved metal concentrations in the surface waters indicate rapid consumption and scavenging? If primary production off-shore is Fe limited, then most of the Fe would be immediately taken up into biogenic material. Therefore, to truly evaluate the importance of metal transport from the shelf to the surface waters off-shore would require a much more comprehensive study that includes monitoring of metal and nutrient concentrations, quantification of benthic exchange and primary productivity, over a seasonal cycle with particular emphasis on the upwelling season.

Minor points:

Many of the figures are too small and very hard to read, maybe some of the figures could be in colour.

I would ask the authors to define TDFe and explain what proportion of particulate Fe is extracted in this procedure. For example, does this relatively mild acid extraction dissolve any Fe that is incorporated in biogenic material?

Berelson W. M., McManus J., Coale K. H., Johnson K. S., Burdige D. J., Kilgore T., Colodner D., Chavez F. P., Kudela R., and Boucher J. (2003) A time series of benthic flux measurements from Monterey Bay, CA. *Cont. Shelf Res.* 23, 457-481. Hyacinthe C., Anschutz P., Carbonel P., Jouanneau J.-M., and Jorissen F. J. (2001) Early diagenetic processes in the muddy sediments of the Bay of Biscay. *Mar. Geol.* 177, 111-128.

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