

Liviu Giosan - Interactive comment

This is an excellent paper all around that shows the potential of distal delta deposits for paleoenvironmental reconstructions. Here are some weaker points that need to be addressed:

1. the paper needs a better justification for radiocarbon data rejection.
2. inversions in radiocarbon ages are indicative of reworking, which is a well-known fact of life in these environments regardless of the facies discussed in the paper. Note that I am not talking about reworking of very old microfossils that show on their morphology or color that they are old and reworked; I am talking of specimens that could be 1000- 2000 years older and look like new. But 1000 years is a long time in the Holocene. In these conditions the paper needs a discussion on reworking and transport of microfossils used in this study. Do they matter and how much? Can reworked shallow species mimic a hydrological event? This request might seem hard but it is important if prodeltaic records are to be used for paleohydrology. And the authors have the right data to make a good case that reworking is secondary.

Within high energy transgressive deposits, reworking processes appear important, and will directly affect AMS dating in incorporating reworked benthic meiofauna into modern benthic meiofauna assemblages. Within highstand deposits, reworking processes are also regularly observed in shallow-water environments. They are thought to be the result of transport processes during periods of increased river discharge. They are thus transported further offshore within the river plume. The distribution pattern of these reworked benthic meiofauna within highstand deposits can directly reflect hydrological fluctuations in the past.

We added a paragraph at the beginning of the discussion to discuss reworking and transport of microfossils in shallow-water environments.

“In subaqueous deltaic environments, reworking processes appear to be common within transgressive deposits (Cattaneo and Steel, 2003). In the Rhone subaqueous delta, transgressive deposits consist of tempestite deposits (seismic unit U500) which are the result of regular occurrence of high energy hydrodynamic processes (including combined storm and flood events; Fanget et al., 2014). These processes regularly winnowed the seafloor and generate erosion, reworking and transport of sediments. Thus, it is likely that benthic calcareous meiofauna are reworked from older deposits into modern deposits having the same faunal assemblages (Cearreta and Murray, 2000). These reworked benthic meiofauna cannot be considered as in situ, but it appears impossible to distinct them from the

unreworked modern tests and carapaces. It will directly affect AMS dating with measured ages older than true ages, as observed within the transgressive seismic unit U500. Such phenomena have been observed in Denmark (Heier-Nielsen et al., 1995) and in Spain (Cearreta and Murray, 2000), and highlight the difficulty to obtain reliable AMS dates from high energy transgressive deposits.

Within the recent most prograding units of the Highstand Systems Tract (4.5 to 0.3 ka cal. BP in the present study), we also observe the regular occurrence of reworking and transport of benthic meiofauna. Reworking processes are regularly encountered in shallow-water environments (e.g. Frenzel and Boomer, 2005; Loureiro et al., 2009; Fanget et al., 2013a). Conversely to the Transgressive Systems Tract, reworked benthic meiofauna are easier to identify since they originate from shallow-water environments and deposit into deeper settings. Reworking processes in AMS dating are thus considered as less important and problematic in Highstand Systems Tract. It is likely than these allochthonous benthic meiofauna are transported and redeposited further offshore within the river plume during periods of increased river discharge (Fanget et al., 2013a). Thus, it can be relevant to use allochthonous meiofauna as bio-markers for better understanding transport and reworking processes (Cronin, 1983; van Harten, 1986; Zhou and Zhao, 1999; Fanget et al., 2013a; Angue Minto'o et al., 2015), and study paleo-hydrology. The distribution pattern of reworked benthic meiofauna through highstand deposits is likely to reflect hydrological fluctuations in the past (see section 5.3.).”

I am looking forward to read the revised discussion including these points.