

Interactive comment on “Historical record of the effects of anthropogenic pollution on benthic foraminifera over the last 110 years in Gamak Bay, South Korea” by Da Un Jeong et al.

Anonymous Referee #1

Received and published: 24 November 2017

The authors discuss anthropogenically induced environmental changes over the last 100 years in South Korean bay by traditional method. Benthic foraminifera are one of the most useful organisms for environmental assessment, because they can be used not only as recent environmental indicator but also as paleoenvironmental indicator. The manuscript is generally well written, but I think some discussions should be added before its acceptance.

The most critical point is the age model of the cores. The unusual distributions of ^{210}Pb in the sediment cores should be evaluated carefully. It may indicate sediment mixing or erosion. Indeed, the authors indicate the possibility of the effect of the dredging on

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benthic foraminifera. Discussion with raw data plots of ^{210}Pb is needed. Accumulation rates of geochemical elements and benthic foraminiferal number (BFAR) are more suitable because sedimentation rates vary over time.

Diagenetic processes influence TOC, TN, and C/S. This needs to be evaluated. Natural variability, such as precipitation and flood, affect the benthic foraminiferal assemblage. This needs to be discussed.

The authors discuss the effects of pollution on benthic foraminifera mainly based on the changes in the relative abundance of *Elphidium subarcticum*, the bioindicator of organic pollution in Gamak Bay. *Ammonia beccarii*, which is known as the pollution tolerant species in coastal seas throughout the world, decreased after the progress of pollution. In addition, *Buccella frigida* has also been reported as tolerant species of contaminated waters. Discussion of this manuscript is mainly based on own data, and many references on foraminifera as indicators of human impacts are missing. This point makes this manuscript local subject.

The authors correlate the benthic foraminiferal assemblages among sites, but the validity is not discussed. Why are those assemblages comparable? If you compare the assemblages, you should perform cluster analysis for all samples. The authors correlate the Ab-Bf-Ea assemblage of site 11285 with the Ab-Ea-Ec assemblage of site 10863, but the authors point out that the Ab-Bf-Ea assemblage has already been affected by anthropogenic impact. If this is true, these two assemblages are not comparable. Moreover, the authors correlate the Es, Ab-Es-Th and Es assemblages of site 11285 with the Es-Ab assemblage of site 10863. The authors argue that the Es, Ab-Es-Th and Es assemblages of site 11285 were affected by local mussel farming, and Es-Ab assemblage of site 10863 was affected by local oyster farming. Mussel farming and oyster farming are different pollutant sources, and these two pollutant sources are not correlated. So, the changes of foraminiferal assemblages in two sites are distinctive.

The authors argue that pollution has already started in the inner part based on

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foraminiferal diversity and abundance. However, it may indicate natural environmental gradient (i.e. salinity gradient). Foraminiferal diversity is usually low in the brackish area because of its low salinity environment. So, please indicate spatial distribution of surface and bottom water salinity in Gamak Bay.

p. 12 line 20 to 26: The authors argue that the rapid increase in the abundance of *Ammonia beccarii* have been caused by an improvement in the benthic environment via dredging. However, geochemical data do not show the improvement in the benthic environment.

5.4 Pollution variation: Many geochemical elements negatively or positively correlated with foraminiferal species, but the authors focus on the TOC content. How can you separate the TOC content with other types of pollutants?

Figure 9 shows exactly the same thing as figure 6. I think figure 9 is not necessary.

minor suggestions

P. 1 Line 31: *E. subarcticum* should be italic.

P. 2 Line 2: *Mytilus galloprovincialis* should be italic.

P. 10 Line 18: *A. beccarii* should be italic.

Best regards,

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-383>, 2017.

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