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## ***Interactive comment on* “The benthic foraminiferal community in a naturally CO<sub>2</sub>-rich coastal habitat in the southwestern Baltic Sea” by K. Haynert et al.**

### **Anonymous Referee #2**

Received and published: 20 August 2012

A solid paper whether the dissolution of biogenic carbonate produced by Foraminifera in the field. It provides an enlightening extension to the laboratory experiments published one year before about the same species, *A. aomoriensis* (Haynert et al. 2011). Most important to mention, the ambiguous effects of enhanced partial pressure of CO<sub>2</sub> and carbonate saturation within the microhabitats (e.g. pore water chemistry) for different species are well presented. These results indicate some possible pitfalls for lab and in situ measures: a) foraminiferal responses on enhanced CO<sub>2</sub> concentrations in lab studies may be different, depending on their culture in either naked glass bowls, or in carbonatic sediments. b) Thresholds for in situ undersaturated pore waters may vary with sediment depth, and/or carbonate content. c) Elevated pore water pCO<sub>2</sub> may re-

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sult from enhanced biogenic activities at sites with an overload of sedimentary organic matter (as indicated by stable isotope measures), as well as from bottom water chemistry. Overall, an interesting publication for researchers on raising pCO<sub>2</sub>, sediment composition, and biogenic carbonate production.

Diversity studies were named among the aims of the study (p. 7787), and Shannon H and Fisher alpha planned for data analysis (p. 7790), but neither nor raise up within the text. I wouldn't be surprised, if these theoretical measures show no imprint at all; however, results should be stated, or the respective chapters can be deleted. On page 7804, you quote " foraminifera .. precipitate 0.2 Gt CaCO<sub>3</sub> per year on a global scale .... of which one-third is produced by planktonic foraminifers". I'm not sure whether you mean "production" or "burial" of tests. Regardless, the given values do not cohere with the referenced sources at all.

Schiebel 2002: "global planktic foraminiferal calcite flux rate at 100 m depth amounts to 1.3–3.2 Gt yr<sup>-1</sup>, equivalent to 23–56% of the total open marine CaCO<sub>3</sub> flux..... On average, 25% of the initially produced planktic foraminiferal test CaCO<sub>3</sub> settles on the seafloor. The total planktic foraminiferal contribution of CaCO<sub>3</sub> to global surface sediments amounts to 0.36–0.88 Gt yr<sup>-1</sup>, ... "

Langer 2008: "Benthic foraminifera from reefs, continental shelves, slopes, and the deep sea are estimated to contribute another 200 million tons of carbonate annually (data from Langer 1997; Langer et al. 1997a, b and from adjusted carbon biomass data computed by Altenbach and Sarnthein 1989, and benthic–planktic ratios). It follows, that benthic and planktic foraminifera currently produce approximately 1.4 billion tons of CaCO<sub>3</sub> per year that is ultimately buried in the oceanic sediments."

It is very important to clearly separate between turnover, production, flux rate, or deposition of biogenic carbonates. If the burial by planktic (Schiebel 2002: 0.4 - 0.9 Gt) and benthic (Langer 2008: 0.2 Gt) foraminifera ranges at 0.6 to 1.1 Gt (total value by Langer 2008: 1.4 Gt), than production (?precipitation?) must be significantly larger. In

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case of planktonic foraminifera, their rapid production and dissolution of tests steers marine open ocean alkalinity in first (Schiebel 2002). As most readers will not be familiar with those magnitudes and conversions, this should be explained in more detail. If you still consider your given value of 0.2 Gt as correct, it would be mandatory to explain it's derivation.

Technicals:

page 7791, line 11: I guess you mean -0.9, but not 0.9, because -0.9 was given as the minimum temperature in line 5, same page.

page 7800, line 1-2: What dominance do you refer to, living, or dead, or total assemblages ?

line 10: You quote Ellison 1986, but this is not referenced; I guess you mean Ellison et al. 1986 (as given under References) ?

line 21: same with Allison 2010 (not referenced), but Allison et al. 2010 (see References) ?

page 7802, line 24: Stouff et al. 1999b cited (and found as such under References), but only one reference given, thus delete 'b'.

References: Alphabetic order of single, double and multiple authorships must be checked, see for example Dickson, A.G., or Langer M.R.

Figure 9: modify the 'formerly considered taxon' *A. beccarii*

Only suggestive for grammar and typo's:

page 7783: of the SW Baltic Sea

page 7794, line 13: delete 'the'

page 7785, line 4: remember coal and peat. Deforestation nowadays is estimated to account for 20-25% of anthropogenic CO2 release!

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page 7786, line 26: examples

page 7788, line 16: The fractions 63-2000  $\mu\text{m}$  and  $> 2000 \mu\text{m}$

line 17: The fraction 63-2000 ..

line 20: whereas unstained tests

page 7789, line 1: and an Electron Probe

line 26: directly into

page 7791, line 15: pycnocline

page 7792, line 26: from the depth-interval 0 to 1 cm

page 7794, line 10: no colon before that

page 7795, line 2: no colon after )

line 9: , respectively (Fig. 5

line 21: stages of test dissolution

page 7796, line 1: were destroyed, and only the inner organic lining was left in nearly all individuals during October and February

line 16: these natural fluctuations are common in eutrophi ..

line 26: no colon

page 7797, line 3: remove thereby with thus

line 27: remove fauna by population

page 7798, line 20: moved into

page 7799, line 22: remove 'They' by 'Both stations'

page 7800, line 18: foraminifera will respond

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line 19: remove lowered by hampered

page 7801, line 14: adapted to high

line 21: remove 'and' by 'but'

line 23: remove in by within

line 27: Biogenic calcification is expected to

page 7802, line 2: remove colon after water, place colon after observed, remove highly by significantly

line 11: remove colon after forces

page 7803, line 1: ranged in average from 306  $\mu\text{m}$  in minimum up to a maximum of 461  $\mu\text{m}$ . (same for next line)

page 7803, line 9: Thus infers = ? This infers ?

line 6 to 8: statement absolutely unclear, use two sentences

line 9: remove Thus by This

line 11: factors prevailing at

line 13: than others which may lead to future shifts in community structure.

line 22: as well as dissolution features, might be

page 7804, line 2: remove additional by 'increasing CO<sub>2</sub> levels'

line 8: Fjord, in comparison to open ocean environments.

line 10: colon after However,

line 11: colon after aomoriensis,

line 14: species, such as *E. incertum*, (two colons)

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line 19: delete 'in the water coumn' (where else ?)

line 25: precipitates

page 7805, line 2 remove 'In this habitat, bottom' by 'Bottom'

line 6: in consequence of

line 15: The dissolution response also differs

line 19: remove 'could be' by 'offer', and remove 'in' by 'for'

line 22: delete 'it is'

line 25: modeled; remove to by towards

line 28 remove 'in' by 'for'

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Interactive comment on Biogeosciences Discuss., 9, 7783, 2012.

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