

Interactive comment on “Trace elements in shells of common gastropods in the near vicinity of a natural CO₂ vent: no evidence of pH-dependent contamination” by J. B. McClintock et al.

Anonymous Referee #2

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McClintock et al. present element concentration data for different gastropod species as a function of pH and distance from a carbon dioxide vent field. The goal of the study is to distinguish pH- versus other vent-related effects (e.g., higher element concentrations in vent fluids or mobilization from sediments) on the element content in gastropod shells. The results are meant to help evaluating the utility of carbon dioxide vent fields as an analogue for the acidified future ocean.

General comments and questions: 1. Most of the studied elements were below the detection limit of the chosen method. I assume that ICP-MS measurements would have yielded meaningful concentrations for most of the elements. Measuring arsenic and mercury with OES requires a hydride-generation system or another dedicated in-
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strument. Elements that cannot be properly measured should not be included in the paper. I assume that three out of four detectable elements (strontium, manganese, uranium, zinc) are of subordinate importance with respect to potentially harmful contamination in the vicinity of vents. 2. The authors do not provide concentration data for the vent fluids or ambient seawater. Consequently, effects from pH-driven sediment dissolution, element discharge at the vent or pH-driven speciation changes (that are independent from the vent) cannot be distinguished. 3. Studies on element concentrations in carbonate shells as a function of environmental conditions typically report element/Ca ratios (Sr/Ca, Mn/Ca, etc.) and compare distribution coefficients, i.e., (element/Ca)_{shell}/(element/Ca)_{seawater}. Were calcium concentrations measured? What is the overall response of gastropod shells to low pH conditions? 4. The comparison of element concentrations in gastropod shells with element concentrations in bulk sediments has little significance as the mineralogical host phases are very different (carbonate versus mixed siliciclastic, organic matter, sulfides with a higher uptake capacity for most of the toxic metals). 5. The studied element's behavior is very heterogeneous which is not accounted for in the discussion. For instance, manganese has slower oxidation kinetics than iron which is why manganese concentration may be high, even at greater distance from the vent (e.g., Klinkhammer and Hudson, 1986, EPSC 79, 241-249); uranium forms carbonate complexes in seawater and its partition coefficient in forams depends on carbonate ion concentration and pH (e.g., Keul et al., 2013, Gcubed, doi:10.1029/2012GC004330). The authors seem to expect that uranium is released at the vent but uranium concentrations in reducing vent solutions are lower than in seawater (Michard and Albarede, 1985, Nature 317, 244-246).

In summary, I have serious doubts that general conclusions regarding the origin of trends or the lack of trends can be drawn from the data presented.

Technical corrections: Line 25: It should be 'hydrogen sulfide' instead of 'sulfur'. Seawater generally contains about 28 mM of sulfur as sulfate.

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