Biogeosciences Discuss., 7, C2913–C2915, 2010
www.biogeosciences-discuss.net/7/C2913/2010/

Biogeosciences Discussions

Interactive comment on "Carbonate sedimentation and effects of eutrophication observed at the Kališta subaquatic springs in Lake Ohrid (Macedonia)" *by* M. Matter et al.

Anonymous Referee #3

Received and published: 14 September 2010

General comments. The study is a contribution to the understanding of shallow-water, groundwater-mediated carbonate precipitation (with the complication of and sediment transport in Lake Ohrid, a future scientific drilling target and an oligotrophic lake with recent anthropogenic nutrient inputs. The methods are well presented and justified, although some could be better supported by references. Some of the conclusions (including the anthropogenic nutrient loading source) are equivocal due to problems with sedimentary chronology and the dynamic nature of the shallow water environment, which make it difficult to reach conclusions about paleoenvironment and changes over time.

Specific comments. Throughout the paper the authors casually shift between use of "TIC," "carbonate," and "calcite" when referring to analytical results and sediment composition. TIC is carbon *in* carbonate, carbonate is a class of minerals or the carbonate ion, and calcite is the specific carbonate mineral, and they are not interchangeable. This inconsistency is confusing, but more importantly in some cases (especially when referring to percentages) is incorrect. For example, 4716 / 13, "carbonate contents of up to 96%" is clearly referring to carbonate *mineral* content, as it is impossible to have 96% TIC; whereas 4724 / 4-5, ". . . measured carbonate content (TIC)" mixes mineral or anion and carbon fraction. Also, the authors assert that the carbonate mineral fraction was confirmed to be all calcite, but it is not possible to determine mineralogy conclusively by either of the methods listed (petrography or SEM/EDX); petrographic smear slides are an excellent method, since carbonate crystal form is indicative of mineralogy, but it is not certain. If carbonate is indeed all calcite (as verified by x-ray diffraction, for instance), say "calcite" instead of "carbonate" for clarity.

With respect to the authigenic calcite crystals, "idiomorphic" is a less commonly used, and less descriptive, word to describe these grains than "euhedral" or "rhombic." To be extremely picky, "idiomorphic" in fact means that the crystal growth has not been interfered with, while the paper gives examples of cyanobacterial or picoplanktic mediation and disruption of the crystal form. The paper lacks references for the interpretation of calcite shape significance; what physical and (bio)geochemical processes are implicated in formation of the very large calcite crystals (or aggregates) putatively transported from shallower water?

4723 / 15 magnetic susceptibility values are missing factor of 10ˆ-6. This is a common error in reporting MS from Geotek instruments.

The issue of reworking and sediment transport in these littoral environments may more important than acknowledged in the paper, given (1) the problematic radiocarbon, lead-210, and cesium-137 dates, and (2) the difficulty in correlating cores along the transects, which could be due to the removal of entire sedimentary units. In addition to

BGD

7, C2913–C2915, 2010

longshore transport, wave action may be important: what is the depth of wave base in Lake Ohrid, with respect to the depths at which cores were taken? These are not of course problems particular to this study, but to any shallow-water depositional environment, and I laud the authors for taking many cores and attempting to relate their composition to both local and littoral-wide processes. The sediment traps in the study were deployed for only a short time; it would be more convincing to see longer time periods, especially when reworking is a major process.

4731 / 4-5, decrease in %TIC is probably due to dilution by other components (TOC, diatoms, Fe-bearing minerals, etc.) that are seen to increase over the same period; that is, overall sediment accumulation rate may have increased under anthropogenic forcing. Dilution is mentioned in the last paragraph of the conclusion, but not earlier in the discussion of anthropogenic effects.

While the absence of corrosion features on the calcite surfaces is good evidence that waters were (almost) always above calcite saturation, but I would ideally like to see more seasonal water chemistry data (only May and September are shown) as well as more data and saturation indices for bottom waters, where conditions may be more corrosive.

Interactive comment on Biogeosciences Discuss., 7, 4715, 2010.