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

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General Comments This paper is an interesting study on the role of subaquatic springs in precipitation of authigenic carbonate sediment in Lake Ohrid. Lake Ohrid is targeted for the deep drilling in ICDP and, so, detailed knowledge of the role of the springs is relevant to a better understanding of deposition of lake sediments and the paleoenvironmental significance of sedimentological changes throughout the lake cores. The study concludes that the subaquatic springs influence sedimentation locally, but not widely across the lake. Accumulation rates are significantly higher in the spring area. The data and methods are generally robust and the conclusions seem, in general, well

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substantiated. The images of the precipitated calcite and the proposed role of picocyanobacteria add more data to our understanding of microbes in authigenic calcite precipitation. My concerns are that there are significant problems with the age model that and not adequately discussed. I also recommend more comparison with shallow areas of the lake that aren't influenced by springs.

Specific Comments Lake sediment core studies are inherently constrained by the ability to date the sediments. This study is heavily so - and not for lack of effort. Although I don't disagree that pre and post- 1955 is a useful distinction for Unit L-T boundary, I do think that the authors should be more upfront about the possibility that the sediments are very highly bioturbated and that there is significant local movement of the sediment that makes estimation of accumulation rates very very difficult to even approximate. It is highly speculative to say anything about accumulation rates in the sediments - particularly in the Spring zone. For example, it's surprising to be that Unit T should vary in thickness between 10 cm and 28 cm within a rather small zone. There might be some useful information in more careful thinking about why dating techniques don't seem to work in these sediment cores. For example, is there a reason that the charcoal ^{14}C dates, while unrealistically old, are consistent with each other? Without a robust age model, sediment accumulation rates in the cores remain very highly speculative. Therefore, I wonder if figure 4, which details accumulation rates in the water column, adds information to this study. I don't think it's necessary. The authors provide core data from one deeper water site, 20, that don't indicate a Unit T. Is this consistent with other cores from deeper parts of the lake? Do the authors conclude that nutrient loading (eutrophication) is a shallow water condition? The decreasing trend of TIC values in most cores (Figure 9) could be developed and discussed more completely in the text. Interpreting wt % data can be compounding by a the variety of factors that would influence wt %. For example - TIC % would decrease as a function of a OC% increase – all other constituents being constant. Because this TIC decrease is seen in most cores – independent of the water depth – could this be indication of lake-wide eutrophication. The authors might consider revising their wording on eutrophication

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in the introduction (pg. 4718 lines 20-25) to indicate more strongly the possibility for eutrophication (which is discussed throughout the paper) and to indicate the thresholds between oligotrophic and eutrophic conditions. It would be interesting to see some data from sediment trap and core data from other shallow areas of the lake which are completely outside of the influence of the subaqueous springs – to really dissect the influence of the springs. Table 1. The text suggests that there is data since 2004, and the data suggests that there is a significant seasonal component. Although I realize that carbonate precipitation is a summer phenomena, is there more water chemistry data to include that would fill out the season? Also, it would be useful to compare with late water chemistry data from an area outside of the spring zone. The careful SEM documentation of the calcite crystals and description of the idiomorphic crystals and their clusters from the sediment traps adds to our understanding of the role of microbes in calcite precipitation. It would be interesting to have pictures from calcite crystals in the cores from the deeper part of the lake and also shallow part with that are outside the influence of the subaquatic springs to compare. Also, further development of the differences in the crystal shapes between Unit L and Unit T could be added to the discussion. Technical comments – Table 1 – Formatting for the first date, April 3, 2007, is not consistent with the rest of the formatting for dates in the table. Also the Ca^{2+} [µM] data from 27 September 2007 1m looks inconsistent with the reported mg/l concentrations. Is this a typing error? Pg 4722 line 4 – I suggest you change “in the lowest trap of mooring 2” to “in the deepest trap of mooring 2”. Figure 6. Why are pictures of the cores from the Eastern Transect not included? Figure 7. This figure should be enlarged. It’s difficult to see the information. Cores 12 and 13 seem to be mislabeled as Southern Transect (where they are positioned on the Northern transect in Figure 2). It seems inconsistent to include pictures of the Southern transect cores (but not geochemical data), but geochemical data from the Eastern transect (without presenting the pictures).

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