Biogeosciences Discuss., 7, C2018–C2022, 2010
www.biogeosciences-discuss.net/7/C2018/2010/

Biogeosciences Discussions

Interactive comment on "Spatial variability of recent sedimentation in Lake Ohrid (Albania/Macedonia) – a complex interplay of natural and anthropogenic factors and their possible impact on biodiversity patterns" *by* H. Vogel et al.

Anonymous Referee #1

Received and published: 26 July 2010

General Comments: The paper fits pretty well into a series of special articles focussed on different aspects of Lake Ohrid research. Investigations of lake surface sediments presented here for Lake Ohrid are novel and needed to understand major aspects of the lake system, e.g. changing lithofacies in long sediment records, dispersal of pollutants, or distribution of benthic fauna and flora. However, the reader gets the strong

impression that the whole paper is focussed from the very beginning on the assumption that sediment deposition of Lake Ohrid is mainly controlled by a counter-clockwise surface current. The data presented are very selective (see specific comments, e.g. grain size), and relations between sediment data and the surface current are entirely based on visual comparison of maps. Discussion of other influencing factors, like turbidity currents or sediment redeposition and focusing caused by complete water column overturns, is missing, as well as discussion on sporadic or regular occurrence of the counterclockwise current (with e.g. meteorological data). The second major part of the paper, interaction of sediment dispersal- and biodiversity patterns, needs to be clarified as well, and at least one figure showing relations between biodiversity patterns and sediment distribution.

Specific Comments and Technical Corrections: - The paper is based only on visual evaluation and comparison of estimated sediment parameters.

- Distribution of different grain sizes and their relation to basin morphology is not shown.

- Distribution of chemical elements could be strongly influenced by sediment grain size and water depth, usually there is an enrichment of metals in the finer sediment fraction (see e.g. Boyle 2001 for discussion of relationships between particle flux, trace element flux and sediment trace element concentration in deep lakes).

- Discussion of percentages could be misleading as accumulation rates may be distinct from that. If there are no accumulation rates available, use of element ratios could be more straightforward.

- The authors decide to use a very restricted set (selected for which criteria, e.g. only Cr, Ni, or very coarse silt?) of chemical elements and other parameters and discuss it qualitatively. However, without using any kind of statistics (e.g. scattergrams, correlation matrix, factor- and cluster analysis) discussion of inter-relations of different parameters remains speculative, particularly with respect to position (i.e. water depths) of sampling sites.

- Discussion of sediment dispersal focussed too much on the counterclockwise surface currents – no discussion of possible turbidity currents from steep basin slopes, and in general of sediment resuspension and –focusing (transport and redeposition at different locations) (e.g. Hakanson 1982, Bloesch 1995, Wetzel 2001 p.633-635) – although at least some data are available (sediment focussing in near-bottom sediment trap, Matzinger et al. 2007 Fig. 6a). If surface currents are thought to be important, it would be helpful to discuss them in more detail and to refer comprehensive studies and examples from other lakes (e.g. Michigan or Ladoga). Lake surface water gyres may not simply lead to increased sediment accumulation, and also could affect productivity patterns (e.g. upwelling in the centre of a gyre).

- Although claimed to be one of the main topics of the paper even in the title, relations between sedimentation patterns and biodiversity are discussed without showing any data or figure, only based on references – hence it is hard to follow the arguments presented here.

Some details:

Page 3912, Line 24 – it should be probably Albrecht et al., 2009, not 2006.

Page 3914, Line 15 – "irregularly every seven years" – better to give the period of observation and the number of total overturns. Page 3914, Line 24 – what does "highly" oligotrophic means? Better to cite some data.

Page 3915, Line 15 – what is the accuracy of the sampling positions?

Page 3916, Line 5 – ICP-OES: what about other elements (e.g. Ti, Fe, Mn) – have they been estimated as well and not used here, or not estimated at all?

Page 3916, Line 22-23 – "... to remove organic material" – is there any control on the amount of e.g. diatom frustules, precipitated calcite crystals, phytoliths etc. in the remaining samples?

Page 3916, Line 28 – "160 grain size classes" – from which min. to which max.?

Page 3916, Line 29 – "calculations of grain size parameters and statistics" – but where are the data ???

Page 3917, Line 14-16. Figure 3 shows only "very coarse silt", text here is "coarse silt and fine to medium sand" – it should be a bit more precise, and again, is there any control/idea on the composition of the coarser sized classes? Why the amount of clay is so small (rather unusual for such a large and deep lake)?

Page 3917, Line 20 – why the only explanation could be wind induced surface currents? What about bottom currents, turbidity currents from the steep slopes, and aeolian influx?

Page 3919, Line 19-20. C/N ratios of <12 does not imply a priori autochthonous sources of organic matter – see e.g. Table II in Meyers and Teranes 2001 (lake algae 6-9, soil organic matter 13-20) – so better to give mean values. Apparently strong positive relation between TOC and C/N (Fig. 3 g, h) could points to terrestrial influence.

Page 3920, Line 10 – what about calcite precipitated from subaquatic springs (Matter et al. 2010)?

Page 3921, Line 17 – distribution of endemic molluscs is shown in Hauffe et al. 2010 4d, not c, and shown there is species richness, not frequency.

Page 3921, Line 24 – not Trajanovski et al., 2010, but Kostoski et al., 2010.

Page 3925, Line 18 -20, see comment above.

Figure 2 – Please cite the source of the bathymetric data.

Figure 3 – Some details are a bit confusing, e.g. the Feldspar plot is the only one with orange colour why?; dots on the Chl-a map are only green and blue, why are there larger amounts in the legend as well? Water depths should be indicated, and colour bars should be explained in figure caption.

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Interactive comment on Biogeosciences Discuss., 7, 3911, 2010.