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Biogeosciences Discussions

Interactive comment on "Authigenic formation of Ca-Mg carbonates in the shallow alkaline Lake Neusiedl, Austria" *by* Dario Fussmann et al.

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Dear anonymous Referee #2, we thank you for the clear and thorough review. The authors agree with both referees that the displayed XRD spectra do not provide unequivocal evidence for a possible cation ordering of the VHMC phase. Nevertheless, the supposed-to 01.5 dolomite ordering peak in figure 6 belongs to phyllosilicate phases like muscovite and illite. Furthermore, the 10.1 reflection fits Ca-Na feldspar phases (anorthite). To support this statement, an excel file with XY-Processed XRD data and a figure with peaks of abundant mineral phases is added to the digital supplement folder. As the sediment-powder spectra include a certain amount of noise, a "non-stoichiometric-dolomite" as defined by Sibley et al. (1994) cannot be fully excluded in this study. We further acknowledge the editorial comments. If they are not mentioned

below, they are included, according to your suggestions, in the new manuscript version.

67-77: I think the statement about breaking Ostwald's step rule needs some explanation.

Reply: We agree that the statement of Deelman (1999) about "breaking Ostwald's step rule" needs clarification. In fact, Ostwald's step rule is not really "broken". It is always valid. It is rather a consequence of Ostwald's step rule that under fluctuating conditions the metastable phase forms during high supersaturation and the stable phase (dolomite) forms during low supersaturation by replacement of the metastable phase. Thus, a new sentence will be paraphrased accordingly, e.g. "...dolomite can form due to such fluctuations in pH and temperature, according to Ostwald′s step rule via undersaturation of other metastable carbonate phases."

378: I do not understand what "dolomite d" refers to

Reply: In a previous version of figure 10, disordered dolomite (dolomite d) was used instead of VHMC as a caption. The term "dolomite d" is deleted in the present manuscript version.

453-466: This is an interesting discussion about dissolved silica. Is there a chance that clay minerals (such as smectite) can precipitate in situ?

Reply: The possibility of in-situ smectite formation is difficult to evaluate, as no data for dissolved aluminium are available. In any case, the precipitation of Mg-clays, i.e. sepiolite, is favored in the open water of Lake Neusiedl, e.g. due to the high pH and Magnesium content (Galán and Pozo, 2011). PHREEQC calculations provide a SI of 3.4 for sepiolite in the open water. In contrast, lower pH values argue against an authigenic Mg-clay formation in the pore water (SIsepiolite varies between -1 and -2). Furthermore, clay minerals commonly form when amorphous silica is supersaturated (Birsoy, 2002), which is not the case in the investigated sediment cores (SISiO2 = -0.5; less diatom tests observed in the lower core, SiO2 release into the pore water). All in

all, there is currently no indication of in-situ (authigenic) smectite or Mg-clay formation in the pore waters due to undersaturation and no identification of sepiolite in the XRD-Spectra.

References: Birsoy, R.: Formation of sepiolite-palygorskite and related minerals from solution, Clays and Clay Minerals, 50, 664 736, https://doi.org/10.1346/000986002762090263, 2002.

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Galán, E. and Pozo, M.: Palygorskite and Sepiolite Deposits in Continental Environments. Description, Genetic Patterns and Sedimentary Settings, Developments in Clay Science, 3, 6, htpps://doi.org/ 10.1016/B978-0-444-53607-5.00006-2, 2011.

Sibley, D.F., Nordeng, S.H. and Borkowski, M.L.: Dolomitization kinetics of hydrothermal bombs and natural settings. Journal of Sedimentary Research, 64, 3a, https://doi.org/10.1306/d4267e29-2b26-11d7-8648000102c1865d, 1994.

Please also note the supplement to this comment:
https://www.biogeosciences-discuss.net/bg-2019-449/bg-2019-449-AC2-supplement.zip

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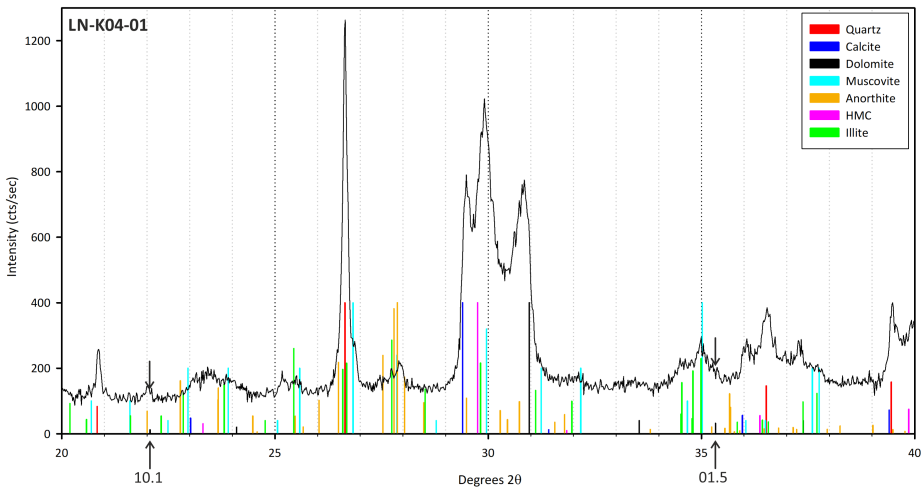

Fig. 1.