

Interactive comment on “Deciphering tectonic, eustatic and surface controls on the 20 Ma-old Burdigalian transgression recorded in the Upper Marine Molasse in Switzerland” by Philippos Garefalakis and Fritz Schlunegger

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Dear Editor, Dear Reviewer,

Thank you very much for the very constructive and detailed comments, which we considered as detailed and very helpful.

We have addressed the suggestions made by the reviewer and listen below point by point of how we have modified the paper.

General comments: The authors have integrated a large data base consisting of previous studies and new observations to discriminate the effects of tectonics, eustatic sea level changes and variations in sediment flux in explaining the Upper Marine Molasse in the Swiss Alps. Discriminating between these controls in understanding the stratigraphic record has long been a subject of discussion amongst stratigraphers and sedimentologists and the authors are to be complimented on their contribution to this to this ongoing debate. The paper consists of 3 main sections, Chronology, Sedimentology and Controls. The first and third sections are well argued but the sedimentology sections requires major revision including drastic shortening and reference to modern and ancient analogs in support of the conclusions of depositional environments. Such references are surprisingly lacking but are essential to presenting convincing interpretations. Also, the sedimentology section contains numerous examples of interpretations within the descriptive sections and vice versa. In its present form, the paper contains too much sedimentological detail that detracts from the overall message of the paper. I suggest reducing the sedimentological descriptions and interpretations by at least 50% in this paper and to prepare a separate paper that focusses on the sedimentology. The parts of the sedimentological analysis that are germane to this paper the recognition of shoreline and offshore subtidal sand shoals whereas the other details are not necessary for this paper.

Our response:

Thank you for your detailed review and the constructive comments. The sedimentological descriptions and interpretations have been split into two chapters (4. Results and 5. Sedimentological interpretation) and have been substantially shortened. We now present key information only, which will be crucial for following the discussion about tectonics, sediment flux and eustasy as possible controls on the Burdigalian transgression. For the sake of completeness, however, we list all sedimentological details in a table together with the references to previously published work on this topic. We also

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include a plate with photos from the field as required by reviewer Ogata.

Referee:

Specific comments: 1. Use of the term “surface controls” in the title and throughout the paper is vague and confusing. Both eustasy and sediment flux are surface controls as noted by the authors so why not just specify eustasy and sediment flux and do away with “surface”?

Our response:

This has been improved. We specified the term surface controls, which include changes in sediment flux and shifts in the eustatic sea level. These processes have been placed in a geodynamic framework together with deep crustal processes. These mechanisms encompass tectonic changes at the slab scale in the mantle lithosphere, and related to these mechanisms crustal-scale processes at a more regional scale.

Referee:

2. I was not able to access the Table or Appendix but it seems to me that the 2 seismic sections should be included as a figure in the paper because they are referred to in many parts of the text.

Our response:

We apologize for this inconvenience. In the supplement file the reader finds a detailed description on how we calculated the palaeo-bathymetrical conditions from wave ripple marks and from the set-thickness of sedimentary bedforms. Furthermore, also in the supplement file, we marked the relevant part of the seismic line BEAGBE.N780025 in Fig. S4. The seismic line 8307 has been fully published in Schlunegger et al., 1997a (see revised manuscript), so we have not reproduced this section. The original table S2 of the supplement file has now been included in the main text and split into 5 individual tables where each contains the abbreviations of the facies assemblages, the description of the bedforms and the resulting depositional setting together with a list of

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references.

Referee:

Technical suggestions: 1. The attached document contains numerous grammatical and editorial suggestions and comments on both the text and figures for the authors to consider in their revision.

Our response:

We have considered all suggestions upon revising our paper.

Referee:

2. As part of my review, I have prepared a document of revised figure captions, which is attached for the authors' consideration.

Our response:

We greatly acknowledge the careful and detailed work and have considered all points upon revising our paper. Please note, however, that we have rephrased most of the sections to comply with the comments of reviewer 1 and 3.

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2019-27>, 2019.

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