

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

Anonymous Referee #3

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Review of paper by Garefalakis and Schlunegger entitled Deciphering tectonic, eustatic and surface controls on the Burdigalian transgression recorded in the Upper Marine Molasse in Switzerland

General comments In this manuscript authors used new sedimentological and existing geological and geophysical data to assess tectonic, eustatic and surface controls on the Burdigalian transgression in the Molasse Basin. Even though most of the data and ideas appear interesting and important; there are some fairly significant items that need modification prior to publication. The comments provided below will require ma-

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Discussion paper



for revision of the manuscript. Manuscript structure needs reorganization. 1) There is no clear separation between existing data and author's own original data. Result and Discussion section include background information that should be presented earlier in Geological setting (section 2); 2) a clear separation of observations and interpretations is missing in Result section; 3) Scientific methods and workflow are not clearly presented; 4) Headings are not informative; 5) Remove of unnecessary repetitions would cut text significantly. Manuscript needs clearer explanation of the links between their own data and conclusions. Authors often jump into conclusions without showing clear link to either their own field data or literature. First, key sedimentary features observed during this study, that could be used to decipher tectonic, eustasy and surface controls, should be better described. Most of important observations in that respect are mentioned for the first time in Discussion section. Second, there is a confusing separation of the processes operating at the lithospheric - and crustal - scale like they are not interacting at all. These processes are poorly defined in the paper and their links to author's field data are not clear. This needs to be improved prior to publication. Detailed examples of problem areas in the text are given below and in the attached pdf.

Specific comments Introduction. Opening paragraph of the introduction needs to be focused. Motivation to undertake this study is not clear. What is so controversial about Molasse Basin, i.e. Burdigalian transgression to be further studied? It is not clear what is considered by term surface controls? Settings. Section on geological background should be extended. I recommend starting by adding information on formation and geodynamic evolution of the Alps. Special attention should be given to Aar Massif, Simplon detachment and Lepontine dome (i.e. kinematic, geometry, evolution, lithology of the units involved in faulting etc.) that are in the further text marked as important controls on deposition in Molasse Basin. Section 2.2 - Molasse Basin - state of the art, particularly studied Upper Miocene Unit, is poorly defined, most of important background information appears in Results and Discussion. Methods. I suggest to explain and list all the methods used in your study. Also, list the methods in the same order that they will appear in the results. Avoid general sentences with vague point. Explain

which sequence stratigraphic approach was used. Heading 3.1 is misleading because this section mentions stratigraphic methods as well. Subchapter 3.2. is not needed. It is difficult to distinguish background data and methods. It looks like reinterpretation of the literature data. Results. I recommend to start with describing your data and avoid mixing it with interpretation in this section. As written - the text is currently hard to follow. Moreover, section 4.1. includes background information that should be part of Geological setting section and Discussion. In the subsection 4.2. please systematically lay out your observations. I suggest grouping already defined lithofacies types into facies associations that are typical for particular depositional environment. This should be followed by definition of stratigraphic sequences that can be further link to suggested controls. Furthermore, this should be associated with illustrations such as your own logs or field photos that show characteristic sedimentary packages and/or stratigraphic surfaces. By doing so, you would be able to follow vertical and lateral transitions and interpret them in the light of tectonic and eustatic controls on the basin evolution. Very important in the section 4.2 Interpretation part – references are completely missing! Discussion. Section 5 should be moved to Discussion. I recommend starting this section with the ideas on basin evolution based on your own findings. Some basin features e.g. backstepping of the alluvial mega fans are described for the first time in this section. Furthermore, it is not clear which mechanism controlled it.

Figure comments Minor comments are included in attached pdf. Figure 5. How did you construct mean water depth curve? In some instances, you have contradiction between your sedimentological and paleo-depth data. Please revise curve.

Please also note the supplement to this comment:

<https://www.solid-earth-discuss.net/se-2019-27/se-2019-27-RC3-supplement.pdf>

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

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