Solid Earth Discussions

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Comment on se-2021-46

Fritz Schlunegger (Referee)

Referee comment on "Chronology of thrust propagation from an updated tectono-sedimentary framework of the Miocene molasse (western Alps)" by Amir Kalifi et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-46-RC2, 2021

Dear Authords, dear Editor

It is usually a significant challenge to intergrate various sources of data into a comprehensive and conclusive framework. This paper is an excellent example of how this can be achieved. I congratulate the authors for their work, which I enjoyed reading. This has been very well done!

The material is presented in such a way that the reader can follow the way of how the authors reach their conclusions, and why. The readers are given access to a wealth of material that has been integrated in this manuscript. Therefore, from a scientific point of view, this work is very solid, reproducible and should be published.

What has not been fully clear to me is the separation of previously published data (in the authors' Sedimentology paper) and their original contribution presented in this work. In this regard, chapter 3 (Materials and Methods) should be more specific and clear.

It is true that chronological data for the Burdigalian is sparse for the Molasse deposits. However, the authors might have a look at the magnetostratigraphic work done at the Univ. Bern c. 25 years ago where some terrestrial sections of Burdigalian age have been calibrated through magnetostratigraphy and mammal biostratigraphy (Schlunegger et al., 1996, Eclogae Geol. Helv., Kempf et al., 1997, Int. J. Earth Sci.; Strunck and Matter, 2002, Eclogae Geol. Helv.). Therefore, the first sentences of the Abstract need to be tuned town. I understand that the authors refer to the Western part of the NAFB and the Alpine orogen, because it is not true that the chronological records are poor for the Swiss, German and Austrian segments of the NAFB (perhaps see also Hülscher et al., 2019, Front. Earth Sci.)

As a final, but not mandatory aspect, I think it would be worth while placing the sedimentary history of the western part of the NAFB into a broader context, if possible. In particular, following Berger (2005; Int. J. Earth Sci.) and Ford and Lickorish (2004; Geol. Soc. London Spec. Publ.), the pre 20 Ma sediments in the western part of the NAFB are characterized by gypsiferous marls, freshwater carbonates and paleosoils, suggesting a sedimentary environment that is indicative for a basin margin which opened towards the Swiss, German and Austrian Molasse basin that was the depositional sink at that time. After 20 Ma and particularly after 18 Ma, the situation changed as the dispersal direction became reversed and as sediment was routed from the Eastern Alps and the Bohemian massif through the German and Swiss Molasse basins and finally to the French part of the NAFB, which started to take the role as a depositional sink. Interestingly, this is the time when active deformation at the orogen front started, as documented in this work, while thrust front activity came to a halt in the Austrian basin.

Finally, there are a couple of typos to be revised (my review might also contain typos, for which I apologize):

Line 184: samples collected in the field (not on the field)

Lines 189 and 190: The terms 'comprised' sounds odd to my in this context.

Line 232: outlier samples and not outliers samples

Line 267: The term 'allocated' sounds odd to me in this context.

Line 394: The marls did not deposited.... -> The marls were not deposited.

Line 396: They rather deposited....(they deposited what?) -> They rather accumulated

Line 401: a boxed anticline overlyied by -> overlain by

Line 446: the faults strike N3, 40°E -> something is missing @N3

Line 566: I could not find the South Jura transfer zone on a map.

Line 570: I could not find the left-lateral and right-lateral faults

Lines 583 and 584: I guess that the thicknesses of 1838 m and 1716 m are taken from a seismic line, which will have their uncertainties. If correct, the precisions given here (to the meters) need to be tuned down.

Line 600: Firstly -> First, then second (not secondly), and then third (not thirdly)

Line 629: use a different term than 'brutally' (perhaps appropriate for a movie, but not really in a scientific article)

Line 632: A thickening can also be associated with a backstepping of depocenters (in case where sediment supply is lower than formation of accommodation space). Therefore, the inference that a rapid accumulation of sediment implies a depocenter migration is only correct if the sedimentary facies is considered as well. Please adjust accordingly.

Line 636: 'It was never recorded thicker' sounds a bit odd to me. Please rephrase

Line 691: This interpretation of a complex inherited topography warrants further specifications.

Line 759: According to DeCelles and Gilles (1996; Basin Research), Schlunegger and Kissling (2015; Nat. Comm.; my apologizes for this self citation), orogenic loads can have different components such as slab loads, topographic loads (both downward directed) and buoyancy forces exerted by a crustal root. Is it possible to be more specific when you talk about 'in response to orogenic load'?

Line 773: Why is the deposit illustrated on the photo (the details are hard to see) a seismite? This interpretation is hard to appreciate without further information.

Line 833: What is the evidence for a rebound, and a rebound related to which process?

Line 836: ECMs = external crystalline massifs (please in full)

Line 885: Seismite, same as above

Line 887: 'brutal', same as above

Please do not hesitate to contact me if you have questions on my review.

Sincerely

Fritz Schlunegger, Bern, August 12th