

Interactive comment on “Implications from palaeoseismological investigations at the Markgrafneusiedl Fault (Vienna Basin, Austria) for seismic hazard assessment” by Esther Hintersberger et al.

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Response to RC1 (Ryan Gold):

First of all, thank you for the detailed review that help us not only improve the manuscript, but also pushed us to use OxCal to better present the correlation between the trenches.

Major comments 1: Probabilistic framework. This topic has been also brought up by RC2 (Dan Clark). We were not aware that OxCal can also be used for IRSL dating

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results; we thought that it was mostly used for calibration of radiocarbon ages. Since all the time constraints for our trenches come from IRSL dating, we thought that OxCal was not applicable in this study. But following the suggestion of both reviewers, we managed to transfer our IRSL dating results into OxCal and obtained good results. However, the results are comparable to the results previously shown in the manuscript. We added the resultant occurrence intervals to table 3.

2: Earthquake correlation between sites. Again, this topic was also raised by RC2. We were not aware that the numbering that we used suggests 8 earthquakes in total (when there is evidence for 5-6). What we had in mind was the overall number of possible correlations between trenches and an easy way of reference to each single correlation. Unfortunately, this caused more confusion than the intended clarification. Therefore, we changed the labeling in text, figures and tables in the way suggested by RC1 (E1, E2, E3, E4a, E4b, E5a, E5b, E6a). We also changed the seemingly confusing term “event line” to “slip model”. Regarding the comment on earthquake occurrence times given as ranges vs. as PDFs: The dating constraints along the MF in the Vienna Basin are loose for each single event. The resultant PDFs for earthquakes along the MF are broad distributions with large standard deviations. Therefore, we thought that it would be more straight-forward to rather show the time brackets than to construct mean dates with large error bars. However, we added the OxCal results to table 3 to provide both types of information.

3: Periodic vs. clustered. Yes, you are right, the uncertainties for the recurrence rates are large. Nevertheless, we wanted to stress out the importance of such possibilities. We did calculate the COV for each slip model and obtained higher COV for the clustered slip model than for the periodic slip model. However, we are hesitant to use it because of the small sample size. Most studies, where COV were applied to distinguish between periodic and aperiodic behavior, had at least 10, or even 25 earthquake occurrence times. In such cases, the COV are more meaningful than in the study here.

4: Characteristic vs. super-cycle. Yes, you are right, we got confused here. The

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reason why we mentioned it here was because it seems that these faults also are quiet for a long time and then are switched on (maybe triggered by the VBTF). Hence the comparison to the characteristic vs. super-cycle. But in hindsight, we agree that it is better to stick with the discussion about periodic vs. clustered. We changed the introduction in this sense.

5: Unit ages. Yes, we agree. It was hard to find the right place within the paper to describe the dating results. We did not want to present the dating results before the method. By including a methodology section into the manuscript, this problem is solved, and we added the age of the units, where available.

6: Linkage to the Vienna Basin Transfer Fault. We do think that the MF is connected to the VBTF via the common detachment, and we also mention it shortly that in the discussion about the possible activation of the detachment during an earthquake along the MF. However, there is no final/published paleoseismological data yet to link both faults.

7: Geomorphic site/topo profiles. In order to keep the number of figures in check, we thought that Figure 3 would be enough to present the general situation along and below the trench sites. But as suggested by all three reviewers, we have added a close-up geomorphic map for both trenches as well as topographic profiles and hope that this gives a better understanding for the reader.

Moderate/general comments: 1: Event lines. We changed the seemingly confusing term “event line” to “slip model”.

2: Subjective word choice. Thanks to your detailed supplementary commentary, we changed/deleted the respective terms.

3: Mmax for the Vienna Basin. You are right, a combined rupture would lead to a larger earthquake magnitude. And we also think that this a very important part to keep in mind. But since we focused in this paper on data for the MF and the impact of this fault

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to the seismic hazard, we thought that the scenario of a combined rupture of the VBTF and the MF might be beyond the scope of this manuscript. There is a study by Hinsch & Decker (2011) presenting different rupture scenarios along the VBTF. The resultant M_{max} are in the order of 5.9-6.8 for different segments of the VBTF. So, therefore, a possible combined rupture of the VBTF and the MF would include several parameters and additional options that is better addressed in a manuscript by its own.

4: Luminescence dating. Following the suggestion, we have reduced the chapter about dating and placed it into the methodology part (see also response to major comment 5 on unit ages above and methodology section below).

5: Uncertainties. We added the information in the tables and explicitly stated in the methodology section that the luminescence dating results are given with 1σ uncertainties (see below).

6: Methods section. Thank you for the suggestion. We restructured the manuscript and added a methodology section including the photomosaic generation, logging, sampling and dating, and details of the OxCal calculations.

7: Haiti earthquake. Sorry for the typo. As far as I remember the discussion, you were right that the fault that generated the earthquake was already mapped, but was assumed to be not the active fault strand within the fault system. We will check this again and, if this was wrong, change the relevant sentences.

Table 1 and Table 2: We added the additional information to avoid confusion.

Table 3: We changed the numbering of events to make clear that they are only different correlation scenarios. We added also the obtained occurrence interval for each earthquake. Figures: We made the changes to the figures as suggested by all reviewers, added the uninterpreted photo mosaics to the supplementary, added also a figure of the geomorphic/geological situation around the trenches, and rearranged Figure 10 using the OxCal results.

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Please also note the supplement to this comment:

<https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2017-126/nhess-2017-126-AC1-supplement.pdf>

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2017-126>, 2017.

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