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Geoscientific Model Development Discussions

Interactive comment on "Bayesian earthquake dating and seismic hazard assessment using chlorine-36 measurements (BED v1)" *by* Joakim Beck et al.

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Earthquake dating poses the highest limitations to the seismic hazard assessment. The introduced Bayesian code BED v1 of this manuscript allows for the first time to account for several highly relevant uncertainties during the modelling of cosmogenic 36Cl data, resulting in more relevant modelling results. This runs in a very good combination with recent advances in the 36Cl sample preparation and measurement techniques, as well as new determined production rates.

In comparison to existing codes, BED v1 has several advantages:

- Significantly faster calculation

- The amount of coseismic offset per EQ can be treated as unknown instead of using rather arbitrary values

- The so far used arbitrary "pre-exposure component" is not required

- The consideration of uncertainties of the different production rates, soil density is easily accountable

The manuscript is very well written, easy to understand and the high-quality figures underline to content very well. I tested the code BEDv1 with the Matlab version 2016b, which runs without any problems. The handing is very easy out resulting figures easy to interpret and so demonstrative that they can be used directly. The extension, which directly applies a Bayesian regional probabilistic seismic hazard assessment, allows quick implications of the dataset results.

Here, I summarize some minor points to further improve the manuscript:

1. It would be helpful to provide more detailed supplementary information to better understand the code. For instance, some of the folders and parameters are not yet fully explained yet. E.g. the meaning of parameters.lambda_Sp and parameters.lambda_mu is probably not clear to most of the applicants. Furthermore, it would be helpful to differentiate "gamma" further. It is described as "upper eroded scarp dip (degrees)". Is this meant as being the footwall or the degraded scarp?

2. If feasible, the inclusion of some further parameters could allow a broader use of the code. As of now, the surrounding topographic shielding and the erosion of the fault plane is not accounted for (page 5 line 13: erosion does never stop completely). Maybe also uncertainties of the site geometry might be an interesting point for the future.

3. Fig. 2: description of y-axis is missing.

4. Fig. 3ff: It appears to be more intuitive to have the height on the y-axis.

5. Fig. 4b,7b: Intensity figure: please show the modelled and the true intensity of the input data for comparison. Like the blue dots used in Fig. 4c,7c.

6. The reference of the most recent 36Cl production rates is missing: Marrero et al. 2016, CRONUS-Earth cosmogenic 36Cl calibration, Quaternary Geochronology (e.g. page 3 line 21).

I feel that this code will be very useful particularly for the community of active tectonic research and I would like to emphasize that the manuscript represents a valuable contribution to GDM.

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