This manuscript investigates the timing of earthflows in the Teanaway basin, WA, and seeks to link earthflow activity with climate, geology, and the development of salmon habitat. The paper presents a relative dating technique (MADstd) for earthflows as well as 6 radiocarbon and 3 lake sedimentation dates for earthflows in the basin to constrain the absolute ages to the mid-late Holocene. They show that earthflows occur more frequently on southwest facing slopes, which suggests a structural control on earthflow location as the local formations dip southwest. They also measure valley width and show that earthflows impact valley width in the study area and that more active earthflows (those with higher MADstd) are correlated with locations with anomalously narrow valleys. They hypothesize in the discussion that earthflow activity is climate-modulated and that, because salmon populations stabilized in the mid-Holocene, these earthflows must not have negatively affected habitat.

I found this manuscript to be overall scientifically sound and well-written, but a bit confusing and in need of some figure revision and tightening around a clear hypothesis.

One thing I found confusing is the discrepancy between the model MADstd values and the MADstd values for earthflows in the Teanaway basin. I don’t understand how mid-Holocene ages were estimated for the older earthflows in the Teanaway when MADstd values are much lower than the lowest in the model. Perhaps this can be expanded. Unlike reviewer #1, I don’t think it matters that there is poor correlation between the absolute ages presented here and the MADstd – I think it’s clear how much uncertainty there is in the earthflow ages, particularly the older ones. That said, I think it might be nice to show in a figure that where you do have field evidence of relative ages (e.g., cross-cutting relationships), it does work. Also, I think this part of the discussion should be moved to the results.
There is too much focus on salmon habitat. Although I think it’s a good motivation for investigating the timing and controls on earthflows and how they impact valley width, the focus on it (e.g., section 2.2) implies there will be a solid conclusion relating to it. In the end, the claim is that given that earthflows were active when salmon populations stabilized, they don’t seem to have negatively impacted salmon habitat. It’s not a big conclusion, but reviewer 1 may be right that the data still doesn’t support it. We can never know what fish populations would be if there were no earthflows. I think all you can say is that earthflows contribute to topographic heterogeneity and that non-catastrophic disturbances and topographic heterogeneity are generally good for biodiversity.

The hypotheses about climate control on earthflow activity seem like a bit of a stretch given the uncertainty on earthflow ages. But, if you’re going to discuss this, Bennett 2016 probably ought to be referenced (see below). Perhaps though, instead, more focus should be on the main results: earthflows are active in the Teanaway basin, are structurally controlled, and act to modify valley width and hence floodplain habitat, as well as sediment flux and most likely grain size. Much of the discussion could instead be used to discuss limitations on the techniques employed and areas of future work.

I suggest deleting everything about rotational and translational slides to better focus on earthflows.

Figure comments

Fig. 3 I think this could be moved to a supplement

Fig. 7 I think this could be moved to a supplement

Fig. 8 Why isn’t valley width plotted against discharge as in May, 2013? It would also be really nice to see some lidar hillshade images of these constrained and upstream widened reaches.

Fig. 9 I think this figure should be moved up to the methods or results

References

- L. Bennett, J. J. Roering, B. H. Mackey, A. L. Handwerger, D. A. Schmidt, B. P. Guillod, 2016, Historic drought puts the brakes on earthflows in Northern California, GRL