

Referee comments for manuscript nness-2021-280 titled “Ground motions variability in Israel from 3-D simulations of M6 and M7 earthquakes”, by Jonatan Glehman and Michael Tsesarsky

General comments

The manuscript describes a study of ground motion variability associated with simulations of 3D ground motions from M7 and M6 earthquakes, along major seismogenic sources in Israel. The authors use a 3-D model of the sub-surface that describes the main features of the spatial heterogeneity in Israel, and simulate the ground motions at 129 measurement locations in the northern part of Israel. Then the authors derive a statistical attenuation model based on the simulations, and analyse the residuals, single station variability and significant durations.

This is of importance to low-moderate seismicity regions, and specifically to Israel. Complementing the instrumental catalogue with simulated strong ground motions is important, as well as understating and evaluating the variability associated with the simulated ground motions.

Specific comments

Why is there no subfigure for the minimization of the residuals to all 3 predictor variables in Figure S3 for magnitude 6?

When comparing the simulations to CB14 – can the authors elaborate as to the predictor variable values used in CB14? Did they use 608 m/s for V_{s30} ?

It seems like the AM over-predicts GM at the sedimentary wedge rupture distances (Figure 9), can the authors comment on that? It would seem that most of the data at these distances is lower, and will result in a lower model that under-predicts.

Lines 354 – 363: I really don’t see this in the data. I don’t see the triangles lower than the squares, and it is very difficult to tell them at all from the other symbols. I suggest thinking of a clearer way to present the data, as presently the figure does not support the statements in the text.

In lines 389 – 391, the authors state that the AM wasn’t able to capture the full site effects of the Zevulun Valley and the sedimentary wedge, and further model refinements are required. Do the authors think that such effects can be incorporated successfully into a regional GMM?

Technical corrections

The acronyms GMM and GMPE are used throughout the manuscript, please select one and be consistent.

The past and present tense are used interchangeably to describe what is / was done. Please select one and be consistent.

Line 70 – what is a magnitude limited GMPE? Unclear. Please explain.

Line 93: Israel should be Israeli.

Line 93: ranges should be range.

Figure 1 caption (lines 121, 123): I think it should say Israel seismic network **stations**.

Line 135: “the Israeli coastal plain, “ - the comma is missing, and the word “is” should be deleted.

Line 143: delineate rather than delimit.

Lines 159 – 166: the word rupture is misspelled many times.

Line 179: “ground motions records”- the ‘s’ should be deleted.

Line 182: the sentence “we developed the regional velocity model of Shimony et al (2021) is unclear. If the model is Shimony et al.’s – then it wasn’t developed by the authors. If it is a modification, or based on their results, then please explain what was done.

Line 183: the word “following” here seems awkward. Please consider rephrasing.

Line 185 – “statistical analysis of the synthetic database”.

Line 203: in the Gvirtzman et al. quote the comma should be deleted. Also, the capital T in The Zevulun Valley is unnecessary.

Line 255: station 123 is not visible in Figure S1.

Line 281 – it seems like there should be a better way to start a sentence than “Following, “. Perhaps: “We then examine the simulated...”.

Page 14 – Fig. 6 – it seems that the SF scenario is missing from the figure altogether, but referred to in the text. This is also true for figure 5. I also recommend that in the captions of figures 5 and 6 the abbreviations of the faults and source characteristics be explained again.

Line 299: the tradeoff sentence is a bit unclear (what trades off here). I suggest adding: “.... between the ground motion intensity in the Zevulun Valley (triangles) and the *ground motion intensity* in the Sedimentary wedge....”.

Line 300 – a comma is missing before “...in an asymmetric rupture...”

Figure 7 – the color bar of the mean peak ground velocity isn’t very visible, I advise you to pick different colors, and make them vivid, say green – yellow – orange- red. Right now it is very difficult to observe the colors. Also, since you give just two locations as examples (station 129 and stations 127), it would be more convenient to identify these in the figure, rather than refer to a figure in the supplementary material.

Lines 369-375: this paragraph seems more suited to a summary section.

Line 399: the word is is missing: “noteworthy to mention **is** that...”

Line 404: when using the GMM acronym, the word model is redundant.

Line 406: define IM.

Line 419: “four simulated ground motions datasets” – the s of the plural for ground motion should be omitted.