

Interactive comment on “Assessment of potential seismic hazard for sensitive facilities by applying seismo-tectonic criteria: an example from the Levant region” by Matty Sharon et al.

Anonymous Referee #2

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General comments

The manuscript presents an interesting review of the existing data for Israel in terms of instrumental seismic catalog and Quaternary faults. From this database, the Authors try to derive some criteria for seismic hazard assessment. My main comment is that the manuscript objectives as described in the title and abstract are not in line with the presented data and methodology.

The database compiled by the Authors is a high quality one, still far from being complete. I find nothing new in terms of methodology. If the goal of this research is to describe a new approach for seismic hazard assessment for critical facilities, this goal

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is not achieved. First of all, the manuscript deals with Israel region, and I do not see how this approach can be exported to other seismotectonic settings. Even for the Israel region, the manuscript does not address the most critical issue, that is the potential for $M > 6$ earthquakes and accompanying surface faulting in the areas that are not close to the Dead Sea Transform, such as the Sinai peninsula and the coastal region along the Mediterranean Sea. This topic should be discussed based on the data presented in the manuscript. Several critical facilities in the Levant region are located, or are in the process of being located, relatively far from the DST. The reason is obvious, the seismic hazard along the DST is clearly very high, and whenever this is possible sites along the DST are immediately discarded during any process of siting for high risk plants and infrastructures. The manuscript should be revised in order to take into account ground motion and ground rupture hazard evaluation in the less active areas.

Moreover, the criteria used for interpreting Quaternary faults as capable faults are not very clear. Some marginal fault of the DST is interpreted as “source of $M > 6$ earthquakes”, some other as “capable fault”. This is misleading. If the definition of capable fault is “a fault with significant potential for earthquake surface faulting”, a fault capable of surface faulting is by definition a source for $M > 6$ earthquakes; of course, assuming that hypocentral depth is shallow crustal, as clearly stated in Wells and Coppersmith (1994). If the problem is the probability of surface faulting events, there should be a discrimination in terms of seismotectonic setting. Along the DST, that is a very active structure, the time window to be considered for capable faults should be relatively short, like the Holocene, or 13 kyr BP (the Lisan Lake shoreline criterion used in the regulatory framework for Israel). For the Sinai region, the Quaternary criterion is much more reasonable. The choice of different time-windows for fault capability takes into account the regional plate tectonic setting of the Levant. Using the Quaternary time windows for the whole region does not.

In fact, from the historical seismicity perspective, all along the Dead Sea Transform you have a sequence of large events with epicentral intensity X or XI in the MM scale.

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This implies that virtually every fault along the DST might have been reactivated by coseismic surface faulting in the past 2000 years or so. This macroseismic evidence should be properly taken into account.

Specific comments

In Figure 7 from the manuscript, there is no Quaternary fault East of the DST, and very little West of the DST. Is this a real feature, or is controlled by the completeness and resolution of the instrumental and geological database?

The manuscript describe and discuss the available instrumental earthquake catalogue. No discussion and description is available about the historical catalogue. Integration between instrumental and pre-instrumental datasets is fundamental for seismic hazard assessment. Please discuss.

Several other detailed specific comments are available in the annotated manuscript sent to the Authors.

Technical comments

A few papers cited in the text are not included in the list of references; find this in the attached annotated manuscript.

Please also note the supplement to this comment:

<https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-67/nhess-2019-67-RC2-supplement.pdf>

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2019-67>, 2019.