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Comment on nhess-2022-114

Anonymous Referee #1

Referee comment on "Spatiotemporial seismicity pattern of the Taiwan orogen" by Yi-Ying Wen et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2022-114-RC1, 2022

Taiwan RTL paper review result

This paper applied a weighted analysis algorithm for time (T) / distance (R) and size of an earthquake (L) developed mainly by Sobolev and his Russian colleagues to a magnitude 6 class earthquake that occurred in Taiwan.

Major Problems:

The conclusion of this paper was drawn with only one RTL parameter. We know that even a small change in the RTL parameters can change the conclusion, which is dangerous. See Nagao et al (2011) for a comparison of multiple RTL parameters.

Both Sobolev et al. and Wyss reported that seismic quiescence occurs shortly before the impending earthquake (e.g., Wyss et al., 2004., Huang et al, 2001, Huang and Nagao, 2002).

Furthermore, it cannot be proved that the seismic quiescence that occurred many years ago is not related to the earthquake that occurred several years later, but it is meaningless for practical earthquake prediction.

The RTL value is the product of the standard deviations. It takes a value of -8 when it is -2 sigma in terms of time, -2 sigma in space, and -2 sigma in terms of the size of the earthquake. Sobolev et al., also find that the RTL value fluctuates and basically makes sense for the seismic quiescence that exceeds around -8.

Nagao et al (2011) proposed another algorithm for L in the RTL method (RTM algorithm). This is because L appears twice in the definition of L proposed by Sobolev et al. It seemed this dual appearance of Ri seems to be in contradiction to the original concept of the RTL algorithm.

Therefore, the reviewer has previously contacted Dr. Sobolev directly and asked, "Why does the distance (Ri) appear twice in L's formula?" Dr. Sobolev's answer was, "This is to make it easier to detect seismic activation."

This means that once a relatively large earthquake occurs in the vicinity of the RTL calculating point, the RTL value becomes large and discontinuous (e.g. Nagao et al., 2011).

Furthermore, although it is written in Japanese, there is a paper that seismic quiescence and activation occur in pairs (Matsumura, 2005). To briefly summarize Matsumura's hypothesis, "Seismic quiescence is recognized as a macro-scale view due to stress reallocation caused by activation of local seismic activity, and for the micro-scale, there seems a locally activated region does exist."

In the current content, it is hard to say that this paper properly uses the characteristics of the RTL algorithm, and it cannot be said that it explains the characteristics of Taiwan's seismic activity very much.

In conclusion, a major extensive revision is required, and it is judged that publication is not possible at the present stage.

Minor Problems:

Figure 2

q-type

Much greater quiescence than the authors point out as "quiet" has appeared before that. Furthermore, the quiescence value (RTL value) is extremely small, and it seems like a range of fluctuations.

a-type

Similar to the q-type, a large activation period may have appeared before that, or it may take more than a year and a half from the end of activation to the actual occurrence of an earthquake. The orange curve is drawn in the two graphs, but there is no explanation for it.

LINE 180:

Rundle et al., 2000 does not exist in the references. According to the authors, this paper describes the SOS model. There is no description of the self-organizing spinodal model in Rundle et al 2003.

References:

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Matsumura, S., Why does the precursory change of seismicity rate tend to be quiescence?, Zisin, 57, 441–444, 2005 (in Japanese with English Abstract).