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Comment on nhess-2021-378

Anonymous Referee #1

Referee comment on "Hidden-state modeling of a cross-section of geoelectric time series data can provide reliable intermediate-term probabilistic earthquake forecasting in Taiwan" by Haoyu Wen et al., Nat. Hazards Earth Syst. Sci. Discuss.,
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Review on the manuscript entitled "Hidden-State Modelling of a Cross-section of Geoelectric Time Series Data Can Provide Reliable Intermediate-term Probabilistic Earthquake Forecasting in Taiwan" by Haoyu Wen, Hong-Jia Chen, Chien-Chih Chen, Massimo Pica Ciamarra, Siew Ann Cheong

General Comments: In this manuscript (ms), the authors follow up a recent model (GEMSTIP) that uses the skewness and kurtosis of geo-electric time-series (TS) to make statistically significant short-term earthquake (EQ) risk assessments by applying the Hidden Markov Model (HMM). Twenty geo-electric measuring stations located at Taiwan (see Fig. 1) are used in this study. HMM is applied on the correlation, variance, skewness, and kurtosis of the EW and NS geo-electric TS that form an 8-vector to identify two Hidden States (HS) with different distributions of these statistical indices in each one of the 20 geo-electric measuring stations. This is achieved by employing k-means clustering and the Baum-Welch algorithm (see Fig.5). The authors test whether these HS could separate time periods into eras of higher/lower EQ risks and find that the HS TS are useful for potential EQ risk assessments in appropriate cells, which are cells whose discrimination reliabilities are above a user-defined threshold. This is achieved by dividing the map of Taiwan into a 16X16 grid map (see Fig. 6) and quantifying how well the HS TS could separate times of higher/lower EQ risks in each cell in terms of a discrimination power measure D that the authors propose in Eq.(15). They conclude that geo-electric TS indeed contain EQ-related information with a statistically significant forecasting skill and the HMM approach can extract this information regardless of the choice of the hyperparameters used.

The ms is original both in its combination of mathematical methods and in its application. As such, it advances our understanding of forecasting natural hazards. The methods used are scientifically sound and the presentation is clear, concise, and well-structured. According to my opinion this a ms of excellent scientific significance and quality.

Specific Comments: The authors should add a link in the ms to the Supporting Information, mentioned in lines 291, 337, 499, 512, 591, which is not available to the reader in the present version of the ms.

Technical Corrections: Although, I carefully went through the ms I couldn't find any point other than the one mentioned above in the Specific Comments.

Summary: In view of the above, I gladly suggest the publication of the ms in Natural Hazards and Earth System Sciences upon the addition of the link to the Supporting Information.