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Reply on RC2

Haoyu Wen et al.

Author 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., https://doi.org/10.5194/nhess-2021-378-AC2, 2022

We thank the referee for his/her careful review and constructive suggestions. We apologize to the referee for the confusion. We understand that for all earthquake forecasting, whether short-, medium-, or long-term, we must specify a time window, a space window, and the magnitude of the earthquake expected. We realize that these three elements were not clearly explained in our sentence claiming that our method is equivalent to a medium-term earthquake forecasting method. We shall explain that carefully here, and also in the updated manuscript.

- Time window

Let us consider an HMM that started out in the passive state (note: in the passive state, earthquakes of all magnitudes are less frequent, compared with the active state). In most stations that we tested, we noticed that once an active state has persisted for a few weeks, it is unlikely to switch back to the passive state until a few months have elapsed. This minimum lifetime found in historical data can be used as a prediction time window. Based on this time scale, we can say that our HMM model can be useful for short-to-medium-term earthquake forecasting, depending on the station of interest.

- Space window

Next, let us consider the grid cells covering Taiwan. For a given grid cell, it may be satisfactory (Discrimination Reliability being high-enough) for stations A, B, …, and X. The more stations in this list becoming persistently active, the more likely large earthquakes within this grid cell should occur. This is the spatial window we work with for making 'predictions'.

- Magnitude

Finally, let us describe how our HMM model can help assessing the magnitudes of earthquakes expected. To answer this question, we can examine the distribution of earthquake frequencies across magnitudes 3.0 to 6.0 for both active states and passive states (in Section E, Supporting Information). It turns out that for a given grid cell with high Discrimination Reliability, the active state has proportionally more earthquakes than the passive state across all magnitudes. Therefore, we expect earthquakes of all

magnitudes to be more frequent in a positive ‘prediction’.

For the minor comments from the referee, we will remove the parts in the Introduction about large historical earthquakes. We will also relocate some mathematical contents in 2.4 and 2.5 to the Supporting Information to aid the flow. For minor comment iii), we apologize for not knowing which phrases the referee is referring to. Please let us know and we will make improvements accordingly. For minor comment iv), we are not so sure what the referee means by ‘generic’. We therefore apologize for not knowing how we should improve. We would like to hear more from the referee to make further improvements.