

## ***Interactive comment on “Deep Learning of Aftershock Hysteresis Effect Based on Elastic Dislocation Theory” by Jin Chen et al.***

**Jin Chen et al.**

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We would like to thank the anonymous referee for the thoughtful review of our manuscript and for giving these constructive comments and suggestions, which substantially helped us improve the quality of the paper. Almost all the points that were raised have been adopted in the revised manuscript. All the details in the supplementary documents have also been adopted and revised. We believe the new version of the manuscript has been significantly improved.

Response to the comments:

1. Add the references Kapetanidis et al. (2015) and Papadimitriou et al. (2018) regarding the spatial and temporal evolution of earthquake sequences.

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Response: Corresponding references have been added at line 56 in the text. V. Kapetanidis, A. Deschamps, P. Papadimitriou, E. Matrullo, A. Karakonstantis, G. Bozionelos, G. Kaviris, A. Serpetsidaki, H. Lyon-Caen, N. Voulgaris, P. Bernard, E. Sokos and K. Makropoulos, 2015. The 2013 earthquake swarm in Helike, Greece: Seismic activity at the root of old normal faults. *Geophys. Journ. Int.*, 202, 2044–2073. P. Papadimitriou, I. Kassaras, G. Kaviris, G.-A. Tselentis, N. Voulgaris, E. Lekkas, G. Chouliaras, C. Evangelidis, K. Pavlou, V. Kapetanidis, A. Karakonstantis, D. Kazantzidou-Firtinidou, I. Fountoulakis, C. Millas, I. Spingos, T. Aspiotis, A. Moumoulidou, E. Skourtsos, V. Antoniou, E. Andreadakis, S. Mavroulis and M. Kleanthi, 2018. The 12th June 2017 Mw=6.3 Lesvos earthquake from detailed seismological observations. *Journal of Geodynamics*, 115, 23–42.

2. Page 2, Line 64: Add the references Kaviris et al. (2017) and Kaviris et al. (2018) regarding stress accumulation

Response: Two articles on stress accumulation have been added to line 64 of the text. G. Kaviris, I. Spingos, V. Kapetanidis, P. Papadimitriou, N. Voulgaris and K. Makropoulos, 2017. Upper crust seismic anisotropy study and temporal variations of shear-wave splitting parameters in the Western Gulf of Corinth (Greece) during 2013. *Physics of the Earth and Planetary Interiors*, 269, 148-164. G. Kaviris, C. Millas, I. Spingos, V. Kapetanidis, I. Fountoulakis, P. Papadimitriou, N. Voulgaris and K. Makropoulos, 2018. Observations of shear-wave splitting parameters in the Western Gulf of Corinth focusing on the 2014 Mw=5.0 earthquake. *Physics of the Earth and Planetary Interiors*, 282, 60-76.

3. Page 3, Line 89: Add the reference Mai and Thingbaijam (2014) regarding SRCMOD.

Response: A reference to SRCMOD has been added at line 89 in the text. P.M. Mai and K.K.S. Thingbaijam, 2014. SRCMOD: An online database of finite element rupture models. *Seismological Research Letters*, 85(6), 1348-1357.

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4. Page 3, Line 104: Add the reference Bondár and Storchak (2011) regarding the ISC catalogue.

Response: A reference to the ISC earthquake catalog has been added to line 104 of the text. I. Bondár and D.A. Storchak, 2011. Improved location procedures at the International Seismological Centre, *Geophys. J. Int.*, 186, 1220-1244,

5. What is FCNN? The authors must explain in detail what this acronym is.

Response: The full name of FCNN is “fully convolutional neural network”. This is an error in expression, and I am grateful to the reviewer for his comment here. The convolution operation is not used in the model structure in the article, and all "FCNN" have been replaced by "DNN". The explanation of the abbreviation "DNN" has been mentioned in the 8th reply.

6. Page 4, Line 167: Add the reference Gutenberg and Richter (1944) regarding the G-R law.

Response: A reference to the G-R law has been added at line 167 in the text. B. Gutenberg and C.F. Richter, 1944. Frequency of earthquakes in California. *Bull. Seism. Soc. Am.*, 4, 185–188.

7. Page 5, Lines 168-169: “A low b value is related to a high stress background, i.e., 168 the b value is relatively low during strong aftershock activity (Yi et al., 2011).” The b value of aftershocks is widely known to have high values. The work you cite is in Chinese and obviously I am not able to read it. I suggest that the authors delete this sentence.

Response: This reference is prone to ambiguity, and the citation of the Chinese reference has been deleted at lines 168-169 in the article.

8. Figure 1: What is DNN? The authors must explain in detail what this acronym is.

Response: The abbreviation DNN mentioned in Figure 1 has been explained in the

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text. The full name of DNN is “deep neural network”. Neural network is based on the extension of the perceptron, and DNN can be understood as a neural network with many hidden layers. Multi-layer neural network and deep neural network actually refer to one thing. DNN is sometimes called Multi-Layer perceptron (MLP).

9. Page 5, Line 211: What is ROC? The authors must explain in detail what this acronym is.

Response: The abbreviation ROC mentioned in line 211 has been explained in the text. The full name of ROC is “receiver operating characteristic curve”, which considers the results obtained under a variety of different criteria. In this article, the ROC curve can reflect the prediction results of the model under multiple thresholds.

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