Author Reply

Authors Name: Xian-QiongCheng , Qi-He Liu, Ping-Ping Li , Yuan Liu

Paper Name: Inverting Rayleigh surface wave velocities for crustal thickness in eastern Tibet and the western Yangtze craton based on deep learning neural networks

Revision Date: 7 /12/ 2018

Summary of Responses:

We thank the referee for his working for this paper, who has given many good suggestions, which we are incorporated in this revised work.

Below are the responses of work we have done.

Comments and Suggestions	Response
1) **The paper has not told the reasons selected eastern Tibet and western Yangtze craton, while this study solves the problems.**	We add the reason selected eastern Tibet and western Yangtze craton in revised paper in page 1 from line 29 to line 36
2) What is the theory of the sSAE to inverse the crustal thickness with phase and group velocities of Rayleigh waves? The details to get the dispersion data, phase velocities, and their combination for the sSAE inversion?	(1).the theory of the sSAE to inverse the crustal thickness with phase and group velocities of Rayleigh waves is finding the relationship between the two variables by machine learning. A stacked autoencoder is a neural network consisting of multiple layers of sparse autoencoders in which the outputs of each layer is wired to the inputs of the successive layer. Firstly taking therotical phase velocities with random noise as inputs and theoretical crustal thickness as outputs we train the deep learning neural networks. Then taking observed phase velocities as input into the trained neural network and can attain an output. The output is seen as estimation of real crustal thickness. (2).Theoritical dispersion based on normal mode [Dziewonski,1981]. $c = {}_n\omega_l \alpha \big/ \left(l + \frac{1}{2}\right)$(in which *c*-phase veloicty; n-radial order;*l*-angular order; ω - eigenfrequency; α -radius of earth.) Observed dispersion is based on (Xie et.al,2013)from ambient noise, which Rayleigh wave phase speed measurements are obtained from cross correlations of vertical-component ambient noise,the vertical-vertical (Z-Z) cross correlations.
3) How to understand the inverted results for eastern Tibet and western Yangtze craton? The geological background needs to be added.	The geological background about eastern Tibet and western Yangtze craton are added in revised paper in page 10 from line 23 to line 36
4) What are the merits of sSAE over other methods in fact? For instance, deep seismic sounding profile is the direct evidence of crustal thickness, what happens when two kinds of results are mapped together? Not the digital	Comparable crustal thickness model crust2.0 adopted in this paper based on refraction and reflection seismics as well as receiver function studies, the comapration result is shown in the middle of figure 8

number listed in the table.	
5) How to understand Table 1?	Table 1 states that different test errors and comparison results between our model and other models based on 11 different neural networks.
6) What is the difference between the results by sSAE and by other method? Not just the similarity.	Compared with other crustal thickness models,our result reveals more details discussed in paper in page 10 from line 9 to line 20. And we add the diffference in tha abstact from line 19 to line 24