Dear editor,

Dear authors,

This manuscript entitled "***Inverting Rayleigh surface wave velocities for crustal thickness in eastern Tibet and the western Yangtze craton based on deep learning neural networks***" presents an example of applying the deep learning neural network method to invert for crustal thickness using surface waves.

While I found the method that the authors introduced is quite interesting, I do have some serious concerns about the readability of the manuscript. Also, it is not clear to me whether the authors' approach is indeed superior to conventional nonlinear inversion techniques (e.g. the Bayesian Monte Carlo algorithm used in Shapiro & Ritzwoller, 2002).

In summary, I would like to recommend that this manuscript to be published with major revision.

Please find more detailed comments and suggestions below.

Grammar mistakes

I must say, unfortunately, that there are grammar mistakes almost everywhere in the manuscript. Below I list a few of them:

1) P1L15-L20: "… deep learning neural network based on data driven with the highly nonlinear mapping ability **can be widely used by geophysical inversion method**"

This sentence simply does not make sense to me. I suggest changing it to "**widely used by geophysicists**" or "**widely used by researchers**"

2) P1L35: "Especially, **a newest** crust model called crust1.0…"

I've never seen such a saying of "a newest", I think what the authors mean is "***one of the newest models***"

3) P2L7: "their results are heavily depended on…"

It should be "their results heavily depend on…"

4) P3L5: "The more deep…"

The deeper

5) P4L8: "without sparsity **constrain**"

constraint

6) P6L8: "according (4)"

according **to** (4)

7) P6L12: "As we all know,…"

It is NOT appropriate to use this phrase in scientific writing.

8) P9L2: "is **consistence** with"

consistent

I understand that it is common to make grammar mistakes in a manuscript. However, there are so many mistakes in this manuscript making it hard to read and understand. Please try to rewrite the sentences making them more readable.

Significance of the manuscript

The authors used the deep learning neural network algorithm to invert for crustal thickness and compared their results with the crustal model presented in Shapiro & Ritzwoller (2002). It seems to me that the manuscript is not significant enough for publication because the authors failed to demonstrate two important things:

1. Is the new method indeed better?

I do not see any advantages of the authors' method compared with the Monte Carlo method used in Shapiro & Ritzwoller (2002). Indeed, as the authors mentioned in their manuscript, their result reveals more details (P8L15). However, this could be because the phase/group speed maps the authors used in their inversion have better resolution. It is entirely possible that Shapiro & Ritzwoller (2002)'s method could also yield crustal thickness map with more details by applying to Xie et al.(2013)'s datasets. In short, **the author need to demonstrate that their model has higher resolution because the method they used is different, not because of the differences in the datasets.**

2. Is the authors' model indeed better than Shapiro & Ritzwoller (2002)?

The authors' model reveal more details, but **details do NOT necessarily mean better**. It is possible that the small-scale features in the authors' model are artefacts and thus unreal.

In P9L2, the authors argued that the detailed information of their model is consistent with Wang et al.(2010), however, they failed to provide more details for the readers. The readers will have no idea how similar the authors' model is compared with Wang et al.(2010), because Wang's paper was written in Chinese. I strongly suggest the authors provide a figure comparing their model with Wang et al.(2010)'s model to demonstrate that their model indeed **reveals more details that are captured in another study**.