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Solid Earth
Discussions

Interactive comment on "The formation of North-South Seismic Zone and Emeishan large igneous province in Western China: Insight from teleseismic tomography" *by* Chuansong He

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Interactive comments on "Formation of the North-South Seismic Zone and Emeishan large igneous province in Western China: Insights from teleseismic tomography" by Chuansong He Anonymous Referee #1 Received and published: 21 August 2019 Dear Editor, the purpose of the submitted paper by He "The formation of North-South Seismic Zone and Emeishan large igneous province in Western China: Insight from teleseismic tomography" matches the aim of the SOLID EARTH magazine. I think the Author made a fairly good work in the interpretation of the tomographic anomalies related to the geodynamic processes occurring both underneath the NSSZ and the ELIP ar-

eas. The paper itself is not innovative from the methodological point of view, while part of the described results show the interpretation of the teleseismic tomography anomalies in order to describe the processes of crustal delamination and mantle upwelling beneath the ELIP. In my opinion the teleseismic tomography discussed and interpreted in this paper is, more or less, the same shown in the paper of the same Author (He et al., 2019 – Scientific Reports). The greater differences in the velocity anomalies are due to a different damping parameter value used during to trim-down the smaller eingenvalues. Anyway, the intepretation discussed in this paper provides a not negligible contribution in the studies addressed to the formation of the large igneous provinces worldwide, an argument still debated in the scientific literature. The most important criticism I noticed in this paper is the main message that it carries. I guess by the DISCUSSION paragraph the main goal of the Author is the description of the crustal delamination in the NSSZ area and, also, the description of the formation processes of the ELIP. In my opinion, the main goal of the paper should be the new hints about the LIP formations, discussed by the interpretation of the tomographic images, in order to address new knowledge to the debate still in progress. This change makes the paper certainly more original (in particular respect the He (2019) Scientific Report), at least for the debate about the Emeishan LIP in China. Finally, I think this paper, with some focused minor revisions, might be acceptable for publication. In the following points I carried over my observations about the text:

Response to reviewer's comments: Thank you for your encouragement. In this version, I have carefully revised my manuscript so that it can be accepted for publication in Solid Earth. ——————————————————————————————

DATA AND METHOD paragraph: In the first few rows the number of earthquakes and stations used were described. However, I cannot understand which station networks have recorded these 585 teleseismic earthquakes. For instance, for each earthquake, how many stations have recorded it?? Then, the networks listed in the paragraphs seems to have no overlapping times. For a more clear comprehension, I suggest to the

Author to add information in the manuscript. For instance, The Author could describe the mean number of stations that have recorded each earthquake and the station cover in space and time. Those information could be required also to evaluate the actual resolution of the networks used.

Response to reviewer's comments: Thank you. In this version, I have provided the average number of events recorded by each seismic station. I also added the station coverage in space and time. Please see below: In this study, 585 teleseismic events were recorded by 513 permanent seismic stations (China Earthquake Networks, 2007-2014, region: 21°-40 °N, 93°-115°E) and partial events were recorded by the temporary seismic stations within the study region, including the Namche Barwa Experiment (XE, 60 temporary stations, Sol et al., 2007, region: 35.35°-36.27°N, 93.45° -95.27°E), the Tibetan Plateau Broadband Experiment (XC, 3 stations, 1991-1992, region: 29.77°-36.20°N, 93.91°-97.02°E), and Northeast Tibet Seismic experiment (ZV, 36 stations, 2008-2010, region: 32.45°-38.89°N, 99.44°-103.62°E; Z1, 7 stations, 2006-2007, region: 35.58°-36.76°N, 97.79°-101.22°E), respectively. Each event was recorded by an average of 145 seismic stations. ———————————————————————

Line 56: the boundaries of the NNSZ zone are not clearly visible in Figure 1. I can't see black dots but only blue dashed lines.

Response to reviewer's comments: Thank you for this comment. This information has been revised. ———————————————————————

Line 70: I suggest to add a Figure with the main tectonic features of the study area. This figures will permit the reader to better understand the discussion and conclusions of the paper.

Response to reviewer's comments: Thank you for this comment. "(Fig. 1)" has been inserted as indicated. ———————————————————————

Line 136: is the mean distance between stations comparable with the grid mesh distance??

Response to reviewer's comments: This sentence has been revised as shown below: Based on the 60 km average distance between the seismic stations, I adopted a 1° lateral grid and 50, 100, 200, 300, 400, 500, 600, 700 and 800 km vertical grids. ——————————————————————

Line 141: The Author should argue the choice of the 2.5 % instead of 5%,10%, : : :.

Response to reviewer's comments: This has been revised. Please see below: Based on the anomaly value of the velocity perturbations in the mantle, $\pm$2.5% of the velocity perturbations were assigned at all grid points and the synthetic data were inverted. ——————————————————————

Line 143 (Fig.S4): I suggest to plot also the stations used to compute the tomographic images, in order to have a visual overlapping between the resolution test and actual station setup.

Response to reviewer's comments: Thank you for this comment. I have added the seismic station in Fig. S4. ———————————————————————
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Line 216: the HV6 anomaly is already clearly visible at 200 km depth layer. Why this anomaly is not considered during discussion although the checkerboard test shows a good resolution quality??

Response to reviewer's comments: Thank you for this comment. In this version. I have discussed this high-velocity anomaly (Hv6) as shown below: On the other hand, the tomographic image reveals the Hv6 high-velocity anomaly with a clear subducted slab-like feature, which might be a subducted slab of the Pacific Plate. Although He and Zheng (2018) identified a high-velocity anomaly at the same location, the anomaly does not have a clear subducted slab-like feature. ———————————————————————

Kind regards, Mario Anselmi

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