Responses to Referee #2

We thank the referee #2 for the insightful comments and constructive suggestions. We have addressed all their comments in the revised manuscript. Below are our responses to the referee's critical comments (*Italics*). The page and line numbers in our responses refer to those in the revised manuscript.

1- Why did the authors use the polynomial function for this purpose?

Authors: Thanks for the reviewer's question, in the previous preparations for the experiments, some other plane fitting functions had been tried by the 1stOpt (First Optimization) software and the results were similar with or a little worse than that of the polynomial function. Since the Hong Kong Satellite Positioning Reference Station Network (SatRef) is a flat GNSS network (Zhang et al., 2017), there is no large difference in tomography results between the polynomial function and other interpolation methods while the polynomial function has the easier and more convenient expression. So in this paper we use the polynomial function for this purpose.

Reference: Zhang Bao, Fan Qingbiao*, Yao Yibin, Xu Caijun and Li Xingxing. An Improved Tomography Approach Based on Adaptive Smoothing and Ground Meteorological Observations. Remote Sensing, 2017, 9, 886, DOI:10.3390/rs9090886.

2- Due to the important role of the voxel-based tomography technique in this method, the use of the term "function-based tomography" may lead to misinterpretation. For this reason, it is recommended that the title of the paper be changed.

Authors: Thanks for the reviewer's reminding, the term of "function-based tomography" has been changed into "improved tomography" throughout the manuscript. The title of the paper was changed into "An improved pixel-based water vapor tomography model" (Page 1, Lines 1-2).

3- Why the results have not been compared with the radiosonde observations?

Authors: Thanks for the reviewer's suggestion, we have added the water vapor comparison with radiosonde data section. The comparison results showed that the proposed tomography model was not as good as the traditional tomography model on RMSE and we analyzed the reasons. The main reasons could be due to systematic differences between the training source ECMWF data and the radiosonde data as well as the location of the radiosonde station being close to the HKSC GNSS station, leading to the voxels for the location of the radiosonde station having GNSS rays penetration, which is not suitable for the improved tomography model to show its good advantage in the scenario of voxels without GNSS rays penetration. However, the water vapor profiles of the improved model almost match that of the traditional model (Page 17, Figure 6), indicating that the improved model still has the advantage of the convenient and efficient expression (Page 1, Lines 29-30; Page 10, Lines 315-317; Page 16, Line 457 to Page 17, Line 490; Page 18, Lines 503-504).

4- Due to the importance of the issue, the authors should draw up and compare the results obtained from the two methods.

Authors: Thanks for the reviewer's reminding, the layered maps of the water vapor density

from the two models as you suggested have been compared and presented (Page 10, Line 332, Lines 338-339; Page 11, Figure 2).

5- References need to be revised. For example, (adavi and mashhadihossainali, 2015) is not a valid and appropriate reference. Also, there are no valid and new articles on tomography and its accuracy in the list of resources (except self citations).

Authors: Thanks for the reviewer's reminding, the paper of adavi and mashhadihossainali was deleted and changed into other appropriate papers relating to the virtual reference station approach. Besides, some valid and new articles on tomography and its accuracy were added as you suggested (Page 2, Line 54, Lines 67-74).