

Interactive comment on “A new voxel-based model for the determination of atmospheric-weighted-mean temperature in GPS atmospheric sounding” by C. He et al.

Anonymous Referee #3

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The submitted manuscript describes the establishment of a voxel-based global weighted mean temperature model, named GWMT–D, which is a new version of the GWMT series models. This model obviously improves the modelling performance of weighted mean temperature at higher altitudes compared to the old GWMT models. Such study may be of interested to the community using weighted mean temperature model.

Major comments

01. The primary problem of this manuscript lies in the description and writing. It is found that the methods and explanations in some parts of the manuscript are very difficult to understand. Some descriptions are inaccurate or illogical. The writing of the

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manuscript needs great improvement and it is recommended to do this with the help of a professional writer. Some examples are shown below.

Page 5, lines 5-6: “Due to the fact that the GGOS data set has been applied in the development GTm–III, the surface Tm from the GGOS 5 data set is also used in the performance assessment of three selected empirical Tm models.” Not logical.

Page 6, lines 8-10: “This paper takes this feature into account and a new modelling procedure is designed to capture the diurnal variation, i.e. Tm values at any other time are obtained by a spline interpolation method.” Not clear.

Page 6, lines 26-28: “Long-term Tm time series over the globe can be used for climatological analysis, but its temporal correlation may be too weak to be considered in the Tm modelling process. This suggests that short period of data may lead to an unreliable result.” Not logical.

Page 8, lines 18: “Particularly, the constant-value method performs poorly in both temporal and spatial domains.”

Page 9, lines 4: “terrain of the Antarctic is generally higher than the pressure level of 1000 hPa”

Page 10, lines 9-11: “Comparing with the GTm_N model, better performance of the GTm–III may result from the discrepancy between GGOS surface Tm data (ECWMF reanalysis data) used by GTm-III and NCEP reanalysis data used by GTm_N.” Not understand.

02. In the introduction, the GMWT series models are described in detail, but no introduction about GMWT-IV model is found here. However, in section 4 this model is compared with the new model GMWT-D.

03. Page 2, lines 20-23: Generally, the regression model is also a type of empirical models. Please give a more accurate definition of empirical model.

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04. Please explain why the four height levels, 0, 2, 5 and 9 km are chosen in the GWMT-D model.

05. Section 3 is hard to understand. Please rewrite this section and describe the procedure of creating GWMT-D model.

06. The manuscript claims that the study has improved the diurnal variation in the T_m model. However, it is not found any methods on the diurnal variation modelling in the section "3.1.1 Diurnal variation". In addition, the effect of including diurnal variation in the T_m model is also not shown in the manuscript.

07. Page 8, please explain Table 3.

08. Lack of detailed descriptions on the methods used to produce results shown in the Figures 9 and 10 in the manuscript. What is the vertical resolution of Figure 10?

09. Please add the number of radiosonde stations in each height interval to Table 5. However, I think there are no radiosonde stations at the altitudes above 5 km.

Minor comments:

01. Page 3, line 5: "e.g., NCEP-DOE Atmospheric Model Intercomparison 2 (NCEP2) data" ?

02. Page 3, line 27: "2. Data for the determination of T_m " "Data" is enough here.

03. Page 4, line 27: "(5) the highest humidity level is far lower than the height of the top troposphere obtained from an empirical model (200~350 hPa)" "far lower" is not accurate. Show the accurate height interval.

04. Page 5, line 2: "(i.e. the lower limit of the integral boundary in Eq. (3) is the surface of the site)". Delete it.

05. Page 7, line 23: "four reference times (i.e. from 0, 6, 12, 18, and 24 UTC) of the day" Delete '24'.

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06. Page 9, line 15: "modelling method" may be better.

07. Page 13, line 24: "The GTm-II model was identical to GWMT in theory but with different model coefficients" Not clear.

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