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Atmospheric Measurement Techniques Discussions

Interactive comment on "Tomographic retrieval algorithm of OH concentration profiles using Double Spatial Heterodyne Spectrometers" *by* Yuan An et al.

Anonymous Referee #2

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The authors present a description of the instrument and retrieval algorithm of Double Spatial Heterodyne Spectrometers for the monitor the OH concentration. A forward model is constructed to simulate the observed data of DSHS accurately. A new tomographic retrieval algorithm for obtaining the OH concentrations is also proposed to obtain the OH concentration. The distinctive features of this algorithm are the usage of a look up table method. The errors are also analyzed caused by the atmospheric mode, the instrument calibration error, the Doppler effect and interpolation algorithm. The manuscript demonstrates the potential for measurements of OH concentration by DSHS, but is lacking detail in some areas. Specific comments are provided below.

Abstract: The abstract only describes the method used in the paper. It should give more related results. Page 2, Line 48: The introduction part of the OH radical method should be more summarized, including principle and results. Page 7, line 210: The T2-1 and T2-2 position should be defined more clearly. Page 7, line 212: It should be the distance of satellite position fromT1 to T2-1 moment, and T1 to T2-2 moment. Page 7, line 214: Consider replacing "cannot reflect the actual OH distributions" with "make bigger difference". Page 9, Line 237: Consider making the flow chart more clear and nice looking? Same with other flow charts in the essay. Page 11, Line 297: The "Grating width" in the table 1 should have some unit. Page 11, Line 304: Figure 8 should be replaced by a higher definition picture. Page 17, Line 467: Gave a lots description of the LSUV retrieval algorithm, which was not used in the essay, and did not explain the reason why it was incredible in lower atmosphere. The tomographic retrieval algorithm is an improved version of LSUVïij§Or two independent algorithms? Could you analyse the advantages of the tomographic retrieval algorithm by combining the inversion results of LSUV? Page 18, Line 487: when using the lookup table, the accuracy of the tomographic observed database will affect the OH results? Have you considered proper amount of the data? And the parameter setting of the influencing factors? The accuracy of this database is not described in this paper. And is there any other method to prove the accuracy of the database? Page 20, Line 550: Consider giving more detailed description of the calculation of relative errors. Page 23 line 627: the method of cubic spline interpolation is used to obtain the OH concentration that can not use the lookup table. In essence, the interpolation result is not the actual measurement, and the error estimation of interpolation results in this paper may be inaccurate! Page 25, Line 673,677,679,680: How were these errors calculated? Page 27, line 745: When will the DSHS used in the satellite and obtain the actual data for the OH measurement? The only way to verify the feasibility and correctness of the method is the deeply analysis of the obtained data. The writing of the whole essay need to be improved.