Improving Simulations of Zeeman Absorption Spectrum for Hyperspectral Microwave Sounding Applications

General Comments:
The manuscript updates the Zeeman effect coefficients of Larsson (2019) in the 2024 RS-LBL model, which improves the accuracy of simulation at the bands near Zeeman splitting lines, and put forward a new channel configuration for near space temperature profiles. After comparing them with the channels of SSMIS through simulations, it is proved that a finer vertical resolution can be realized from the configuration, which will be served as a good reference for the future payload design and channel selection of near space microwave radiometers.

special comments:
1.The first sentence at the first paragraph at page 2 "*Infrared hyperspectral instruments have now reached maturity, and the radiance data have been proven to improve NWP forecast accuracy (Aires et al., 2015; Eresmaa et al., 2017; Mcnally et al., 2006). However, microwave sensors have significantly fewer detection channels compared to infrared instruments due to technological limitations (Boukabara and 40 Garrett, 2011)*" seems there is logically confusion in the comparison between infrared sensors and microwave sensors, where the authors try to argue the importance of microwave sensors. But, since the infrared sensors "have now reached maturity, and the radiance data have been proven to improve NWP forecast accuracy', why still need microwave sensor? The reasons seem not be clearly given.

2.Through the manuscript tries to explain the Zeeman effect of O2 on radiative transfer in the atmosphere, there seems no much special improvements or new contribution in Section 2 but summaries on the principle of Zeeman Splitting and progress in its absorption models. Furthermore, some references on oxygen absorption models are not fully covered, such as Liebe 1989,1992,and 1993.

3.There is no definition on '*product matrix P*' in line 153, and transmittance matrix Γ should be defined by a 4*4 matrix by considering the Zeeman effect, but 2*2 matrix only, in considering the radiation of four Stokes parameters due to Zeeman effect.
See reference: Wang K X, Wang Z Z, Wang W Y. Analysis of the remote sensing mechanism and influencing factors of microwave radiometers for the Earth's magnetic field. Chinese Journal of Geophysics, 2026, 69(2): 496-510.

4. About "*Microwave LBL Model Simulations*" at Section3, there is no introduction on the input parameters or profiles used as backgrounds.

5. There is no unit given for the parameters in formula (12) at line 295.

6.It is suggested that the authors give clearer introductions on how to set integration time for SSMIS and HMAS, whether trough the hardware design or averaging by the software, since there is not more time for integration time during a scan with the satellite flying.