

Atmos. Meas. Tech. Discuss., referee comment RC2
<https://doi.org/10.5194/amt-2021-344-RC2>, 2022
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Comment on amt-2021-344

Anonymous Referee #2

Referee comment on "Continuous temperature soundings at the stratosphere and lower mesosphere with a ground-based radiometer considering the Zeeman effect" by Witali Krochin et al., Atmos. Meas. Tech. Discuss.,
<https://doi.org/10.5194/amt-2021-344-RC2>, 2022

Continuous temperature soundings at the stratosphere and lower mesosphere with a ground-based radiometer considering the Zeeman effect

Microwave radiometry has matured to a reliable and robust technique for ground based measurements of the middle atmosphere (stratosphere and mesosphere) for a number of reasons:

- Radiometers operating at frequencies below 120 GHz can be used at almost any site on Earth
- The important gases CO, H₂O, O₂ and O₃ all have emission lines below 120 GHz
- Measurements can be done both day and night, even during cloudy conditions
- Low noise amplifiers below 120 GHz, which can be used as the first frontend stage, are commercially available
- The widely used, and freely available, inversion software ARTS has developed to a very powerful tool, not at least since Zeeman line splitting now is included

Despite this only a few ground-based microwave radiometers are continuously observing the middle atmosphere. Publications, as the proposed manuscript, are therefore very important to inspire researchers in the middle atmospheric field to use this technique.

My opinion is therefore that the manuscript shall be published, but I have a three comments that I ask the authors to consider before publication:

- The intrusion of Zeeman line splitting is an important part of the manuscript. As you mention Navas-Guzmán et al. (2017) compared TEMPERA observations with for example MLS. I wonder why you, in this investigation, did not compare with the same instruments to see the effect of including the Zeeman effect?
- You compare TEMPERA with the two reanalysis systems MERRA2 (Gelaro et al., 2017) and NAVGEM-HA (Eckermann et al., 2018), which both assimilate satellite data. I think it would be valuable to, except for comparisons with TEMPERA, also compare them to each other.
- Finally I think it would be interesting to run the inversion software twice, one with including the Zeeman effect and one without and compare these two runs with MERRA2 and NAVGEM-HA