

Response to Comments by Referee #1

Referee comments in boldface type

Author responses in italics

The author sincerely appreciates the referee's offer to review the manuscript, all the associated efforts, and helpful comments.

Anonymous Referee #1

Referee report on manuscript acp-2018-1047

General Comments

1. OH rotational spectra are widely used for the estimation of upper mesosphere temperatures. The author discusses the complexity of the vibrational-rotational structures. He demonstrates the validity of an exponential-gap rotational relaxation model and the bimodality of the OH state distribution. He suggests that more complicated structures beyond bimodality are possible. These are important and interesting results.
2. The author shows that it is important to take bimodality into account when deriving temperatures from the OH spectrum. Large errors can occur if bimodality is neglected. This is an important and intriguing result for atmospheric physics.
3. The author makes suggestions how to mitigate the problem. This again is interesting, but not easy to accomplish.
4. The paper is well written.
5. The paper is recommended for publication after minor changes have been made.

Specific Comments.

1. Page 4, Line 12: “: :OH radiative lifetime decreases as the vibrational level decrease: :” It should be the other way round! Please check!

The reviewer is correct. This inadvertent mistake had already been corrected in the version submitted to ACP for Discussion and no further action was taken.

Technical Corrections

1. Page 3, Line 24, and Fig.3: 294 K or 293 K? *Changed to the correct 293 ± 4 K*
2. Page 5, Line 5: “Thus it is reasonable: :” *Changed as suggested*
3. Page 6, Lines 11pp: Anlauf et al. goes after Adler-Golden *Corrected as suggested*
4. Page 7, Lines 4pp: Hickson et al. goes after Grygalashviyly *Corrected as suggested*