



## **Bimodality in Mesospheric OH Rotational Population Distributions and Implications for Temperature Measurements**

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Emission from the OH Meinel bands is routinely used to determine rotational temperatures that are considered proxies for the kinetic temperature near the mesopause region. Previous observations determined OH rotational temperatures that show a dependence on the vibrational level, with the temperature rising overall as the OH vibrational quantum number  $v$  increases. The source of this trend is not well understood and has generally been attributed to deviations from thermodynamic equilibrium.

This report shows the existence of bimodal OH rotational population distributions is an inherent feature of rotational relaxation in gases and can provide an explanation for the previously reported temperature trend. The use of only a few lines from rotational transitions involving low rotational quantum numbers to determine rotational temperatures does not account for the bimodality of the OH rotational population distributions and leads to systematic errors overestimating the OH rotational temperature. We will report selected examples, discuss the relevant implications, and consider strategies that could lead to more reliable OH rotational temperature determination [1].

[1] K. S. Kalogerakis, *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2018-1047> (2018).