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New Insights for Mesospheric OH Nightglow

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The hydroxyl radical has a key role in the chemistry and energetics of the Earth's middle atmosphere. A detailed knowledge of the relevant pathways for OH(high v) vibrational relaxation by atomic and molecular oxygen is required for understanding mesospheric OH and extracting reliable chemical heating rates from atmospheric observations. A relevant question that has previously generated some controversy concerns whether mesospheric OH(v) rotational population distributions are in equilibrium with the local kinetic temperature. Laboratory experiments provided evidence for fast, multi-quantum OH(high v) vibrational relaxation by O atoms [1-3]. Oxygen atoms are expected to significantly influence the intensity and internal state distribution extracted from the Meinel OH(v) emissions, as well as the analysis and interpretation of atmospheric observations [4]. Moreover, the effective rotational temperatures of mesospheric OH(v) appear to deviate from local thermodynamic equilibrium for all observed vibrational levels [5]. This report will discuss relevant atmospheric implications and new insights for mesospheric nightglow.

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