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Single vs multi-level quenching of the hydroxyl airglow

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The reaction in the upper mesosphere between atomic hydrogen and ozone results in hydroxyl (OH) that is produced in excited vibrational levels 6 through 9. The vibrationally excited OH radiates in a thin (∼8 km thick) layer near 87 km, giving rise to the strong near infrared airglow emission that has been used for remote sensing of the mesopause region. The interpretation of the emission relies on accurate knowledge of the population and quenching of the upper states, and open questions remain as to whether the quenching takes place through single- or multi-quantum deactivation. Here we will demonstrate how high quality spectral observations of OH (9,7) and (8,6) airglow emissions are available as background measurements during standard K-band astronomical observations from the Nordic Optical Telescope (18°W, 29°N). These emissions have been analysed to ascertain the quenching of the upper vibrational populations. Together with a steady-state model of these emissions, an estimate of the ratio of single to multi-quantum quenching efficiency and the impact on the populations of the lower vibrational levels will be presented.