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Solar influence on hydroxyl chemistry near the mesopause

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Observations of the hydroxyl (OH) Meinel (3,1) band nightglow emissions at Stockholm, Sweden (59.5N, 18.2 E) have been used to deduce the OH emission rate and neutral temperature near 87 km from 1991 through 2002. This period of observation covers the declining phase of solar-cycle 22, and solar minimum conditions through to the peak of solar cycle 23. The OH band radiance, which is the result of atomic-oxygen chemistry, as well as its rotational temperature have been correlated against solar indicators such as F10.7, E10.7, the sunspot number and the Ap and aa indices to examine the effects of solar forcing on the mesospheric odd-oxygen chemistry. Comparisons with a steady-state model indicate that the MSIS model underestimates the variation in atomic oxygen with solar flux, particularly below 87 km. In addition, the model shows that the solar-cycle variation in rotational temperature is suppressed for the lower lying OH vibrational levels. The observed radiance and temperature variations with solar cycle will be presented, as well as model results for different solar-activity levels.