

THE SCALE LENGTH OF OH AND CN IN COMET BENNETT (1970 II)

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Comet Bennett (1970II) was observed with an ultraviolet spectrometer on the OAO-2 spacecraft during April 1970. The instrument consisted of a plane grating, a parabolic mirror, a slit, and a photomultiplier tube. The exit slit provided a 2' x 8' rectangular field-of-view and a 23 Å bandpass. At this resolution emission features such as OH λ 3090 and CN λ 3883 were essentially monochromatic. Since the instrument had no entrance slit, movement of the grating produced a shift in the field of view, with 1 arc min of spatial offset corresponding to a 10 Å wavelength shift.

The strongest cometary UV emission feature was the (0,0) band of OH at 3090 Å. Figure 1 presents a comparison of six observed intensity profiles of OH with calculations based on Haser's (1957) parent-daughter-molecule model with purely radial outflow. The observed OH coma had an extent of $\sim 20'$ or a diameter of 9×10^5 km when the comet's heliocentric and geocentric distances were about 0.8 a.u. and 1 a.u., respectively. The scale length of the parent molecule of OH could not be determined, but a lower limit of 5×10^4 km was indicated.

The OH scale length, however, was, for the first time, determined to $2(+0.5 - 1.0) \times 10^5$ km at a cometary helio-

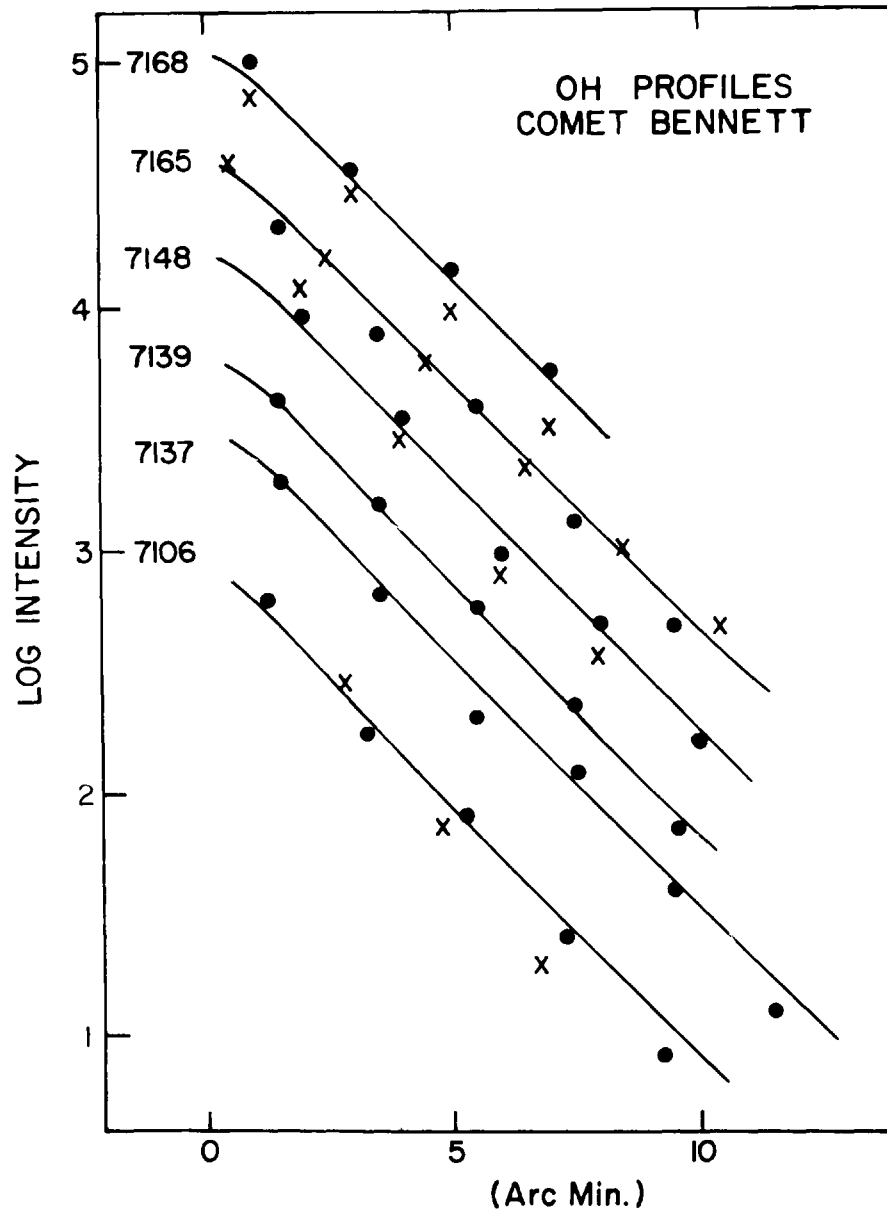


Figure 1 A comparison of model calculations with OH observations for six orbits in April 1970. The long wavelength wing is indicated by filled circles (●) while the short wavelength (sun-ward) wing is indicated with (X). The theoretical profiles (solid line) are for scale lengths of the parent molecule of 10^5 km and 2×10^5 km for the OH radical.

centric distance of 1 a.u. This value is smaller than expected. The photodissociation cross section of OH is too small to yield such a short scale length (Dalgarno 1974) Since an excitation into high rotational energy levels of OH is not observed, one would also expect the efficiency of predissociation to be small (Smith 1970) The results presented for the OH scale length need further theoretical explanation.

Similar observations were made of the (0-0) CN band at 3883 A which is less intense than the OH emission. Good agreement between the observed and calculated profiles was obtained using a CN scale length of 1.4×10^5 km (compare Delsemme and Moreau 1973).

The results are presented in more detail by Keller and Lillie (1974)

REFERENCES

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