OBJECTIVE PRISM SPECTROSCOPY OF THE TAIL OF COMET AUSTIN 1982 G

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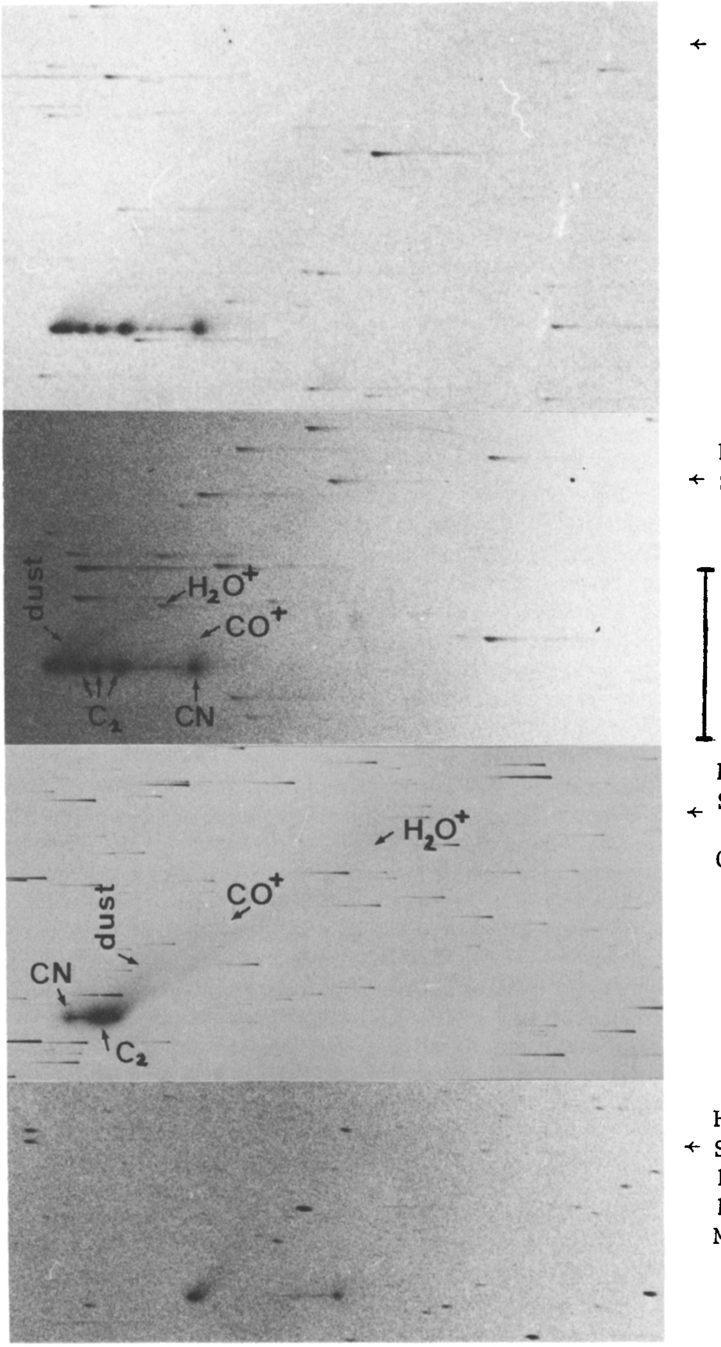
The main emissions of the cometary plasma tail are due to CO^+ (400/402 and 425/427 nm) and H_2O^+ (aroud 650 nm). Emissions of CO_2^+ at 367 nm have also been observed (Swings and Page 1950). These ions relate much more directly to the presumed mother molecules of the cometary nucleus (like H_2O, CO_2, CO) than most strong emissions of the neutral cometary coma (Huebner and Giguere, 1980, see also Jockers, 1982). Therefore it is important to determine column densities of cometary ions. So far only very few measurements of ion column densities are available (Wyckhoff and Wehinger, 1976a, b; Arpigny, 1965).

In principle, the determination of ion column densities should be best possible from objective prism spectra. Since the wavelengths of the emissions are widely separated, the low dispersion of a prism may be sufficient. The reduced dispersion of a prism in the red spectral region is even favourable because the red H_2O^+ emissions are more extended in wavelength than the blue CO^+ emissions. A slitless spectrograph will always record the ion tail even if it deviates from the projected anti-solar direction because of solar wind influence. The large field of a Schmidt telescope is also of advantage. If, during the exposure, the telescope is guided to follow the proper motion of the comet the spectra of the field stars will be widened and provide a means for an absolute calibration of the plate. Objective prism spectroscopy has been applied to comets before. As far as we know, however, no red sensitive emulsions were used so that the H_2O^+ emission was not recorded.

Objective prism spectra of Comet Austin 1982 g were obtained with the Schmidt telescopes of the Observatorium Hoher List (34 cm/138 cm) and of Konkoly Observatory (60 cm/180 cm). Reproductions of some of the plates are shown in Fig. 1. 103 a-E and 098-02 emulsions were used. A short dust tail and a narrow plasma tail are visible. To our surprise the plasma tail was strongest in the red spectral region (H_2O^+). Traces of CO^+, however, seem to be present on all plates. Reduction of the inclined spectra, which are close to plate background, turned out to be more difficult than expected so that we are not able to present ion

M. Capaccioli (ed.), Astronomy with Schmidt-Type Telescopes, 237–239.



Hoher List
Sept. 8, 1982
19.50–20.30 UT
103a-E

Hoher List
Sept. 9, 1982
19.03–20.03 UT
103a-E

Konkoly Observatory
Sept. 11, 1982
19.45–20.05
098-02

Hoher List
Sept. 15, 1982
19.13–20.13 UT
103a-E
Magenta-Filter

Fig. 1: Photographic reproductions of the objective prism spectra of Comet Austin 1982g. Note that on the Konkoly spectrum the dispersion is reversed.

column densities yet.

Two results which are apparent from Figure 1 may be worth mentioning in view of possible future observations.

1) For stellar applications Schmidt prisms usually are designed for a certain linear dispersion. For an extended object like a comet the angular dispersion is the figure of merit. Therefore Schmidt telescopes with a shorter focal length (and a larger refracting angle of the prism) are more useful. For large Schmidt telescopes the use of colour film (Lamy and Koutchmy, 1982) or separate exposures in a red or blue wavelength band defined by coloured glas filters and appropriate emulsions may be more useful. In this case, however, no widened spectra of background stars will be available for the calibration.

2) Since comets usually have small elongations from the sun the background sky is a serious problem. The spectrum of Sept. 15, obtained during a period of poor sky transparency, was taken through a magenta gelatine filter (T = 55 % at 425 nm, T = 84 % at 650 nm, T < 1 % between 470 and 605 nm) to reduce the contribution of the background sky. More experience with this filter is necessary.

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