1.6
Spectroscopy and Imaging of Comets P/Halley and P/Giacobini-Zinner

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We report observations of comets P/Halley and P/Giacobini-Zinner from the time of recovery of each object to the present. We have obtained narrow-band images centered on the 5140 A band of C_2, the 4845 A continuum, and the 4260 A CO^+ band, as well as broad-band red images dominated by the dust continuum. Our C_2 images of P/G-Z show it to be considerably more extended and symmetric here than in the red continuum. Broad-band images of P/Halley reveal the existance of a coma at a heliocentric distance of 4.5 AU. We have also performed long-slit spectroscopy of both objects with a CCD, as well as aperture spectroscopy in the blue with an image tube scanner (ITS). The CCD spectra of P/G-Z show that the ionic emission increased in strength relative to that of the neutrals as the comet approached the Sun. These spectra also show that the ionic emission is substantially more asymmetric than that of both the continuum and the neutrals. Long-slit spectra taken normal to the tail of P/G-Z at a distance of $1.0*10^4$ km from the nucleus on 19 July 1985 show the tail to be moderately broad in H_2O^+, having a full width at half maximum of 5600 km. Our ITS spectra show strong reflected H and K absorption in P/G-Z, indicating a large amount of dust in the central portion of the coma, at r>1.2 AU.

1.7
Pre-Perihelion Gas and Dust Production Rates in Comet P/Halley (1982i)

S. Wyckoff, P.A. Wehinger (Ariz. St. Univ.), P. Weissman (NASA/JPL) and M. Festou (Instit. d'Ap., Paris).

Spectra (3000-7000 Å) were obtained with the Multiple Mirror Telescope Reticon Spectrograph of comet P/Halley (1982i) over a range in heliocentric distance, r = 5 to 3 AU. The spectrum evolved from a slightly reddened solar reflectance spectrum to one with molecular emission features. The emission band of CN (3883 Å) was first detected in February 1985 (r = 4.8 AU, Δ = 4.5 AU). CN production rates were calculated using the vectorial model, and H_2O production rates estimated. Dust production rates as a function of heliocentric distances were derived from broad-band continuum fluxes. The estimates of H_2O production rates and the rate of change of the dust production rate are consistent with H_2O controlling sublimation in P/Halley.

1.8
Lyman-alpha measurements of P/Giacobini- Zinner

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Comet P/Giacobini-Zinner will be observed by the Pioneer-Venus Orbiter Ultraviolet Spectrometer on 11 September 1985, when the comet is 1.03 au from the Sun and 1.09 au from Venus. The Lyman-alpha coma will be scanned for between 8 and 12 hours, including the time of closest approach to the comet by the ICE spacecraft. Detection of cometary Lyman-alpha will permit an estimate of the water vapor evaporation rate. A 3-σ detection will be possible if this rate exceeds 3×10^{27} mol sec $^{-11}$. The data will be analyzed using the PTM coma model recently applied to similar measurements of P/Encke (M.R. Combi, A.I.F. Stewart and W.H. Smyth, submitted to Nature).

1.9
Images of the Gas Velocity Field in the Inner Coma of Comet Giacobinni-Zinner

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Images of the Greenstein effect in OH are presented. The projection along the line of sight of the sunward component of the velocity of the expanding gas is apparent in data taken in August, September, and October 1985, including the ICE spacecraft encounter. The Greenstein effect is due to the doppler shift of the solar spectrum. Gas flowing toward the sun from the nucleus is excited by a spectrum that is blue-shifted with respect to that exciting the gas flowing away from the sun. This effect has been treated by Schleicher and A'Hearn (Ap.J. 258, 864, 1982), who calculate the variation with sunward velocity of the band flux ratio OH (1-1) (at 3160 Å) to OH (0-0) (at 3085 Å). These results will be applied to CCD images of P/Giacobinni-Zinner, taken through filters which isolate these bands, with the continuum contribution removed by scaling and subtracting an image made in the nearby continuum (at 3650 Å). When the OH images, corrected for continuum contamination and atmospheric extinction, are aligned and ratioed, the resulting image is proportional to the sunward velocity of the gas projected along the lines of sight through the inner coma, and independent of the gas density.

1.10
Ground-Based Spectroscopy of Comet P/Giacobini-Zinner (1984e)

P. A. Wehinger, S. Wyckoff, S. Konno (Ariz. State Univ.), and M. Festou (Inst. d'Astrophys., Paris).

Spectra of P/Giacobini-Zinner obtained with the Kitt Peak National Observatory 2.1-m telescope and IIDS detector show strong emission features of OH, CN, and C_2. The spectra cover the range $\lambda\lambda$ = 3000-7000 A with a resolution of $\Delta\lambda$ = 15 A and heliocentric distances from 2.30 AU to 1.03 AU. Features identified with the H_2O^+ ion are found in spectra of the tail. Measurements of continuum and emission band fluxes have been used with the vectorial model to calculate production rates.

1.11
CCD Imaging and Spectroscopy of Comet Giacobini-Zinner

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Our CCD system was used during the period 1985 June September to obtain imaging and spectroscopy of Comet Giacobini-Zinner. The imaging concentrated on the narrow band IHW filters as well as several selected filters such as for the 1-0 CN band at 9180 Å and for the forbidden OI line at 6300 Å. In addition, broad band BVRI images were taken. Spectroscopy was carried out in the wavelength region 5200-10500 Å. On June 18, 1985 the comet showed emissions by 6300 OI, and the 1-0, 2-0 CN bands. By July 25, 1985, the comet had brightened ~ a factor of 10 in the V images and our spectra showed stronger CN and OI emissions, as well as emissions by the 2-1 C_2 band, other weaker CN bands, and possibly the beginning of NH_2 emission. It is hoped that more data will be available by the time of the meeting.
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1.12
Spectrophotometric Spatial Mapping of Comet P/Giacobini-Zinner

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Spatially resolved spectrophotometric observations of Comet P/Giacobini-Zinner have been obtained using the Steward Observatory 2.3-m telescope with blue photon counting reticon system. The spectral coverage included the range from 3000 Å to 6200 Å at 6 Å resolution. Observations during 1985 June indicated that the inner-most coma was dominated by dust. A dust tail extending to ~40 arcsec was also present. Molecular species observed included OH, NH, CN, C_3, and C_2. Preliminary values for the production rates indicated