N89-16685

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

Spatially Resolved Quantitative Sprectroscopy of Comets

PERFORMING ORGANIZATION

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DESCRIPTION *(a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)*

(a) Strategy: Because of their temporal and spatial variations, modern ground-based studies of comets within ~ 4 A.U. of the sun are observationally demanding tasks. Over the years, we have attempted resolved spectroscopy of comets covering a wide range of intrinsic luminosity. Recently my group has developed spectral and direct-imaging procedures to detect weak ion tails submerged into the comae of even fairly faint comets.

(b) Accomplishments: Although the last year was devoid of any really bright comet, re-analysis of older dust and gas production data with the benefit (hindsight) of the 1986 P/Halley apparition has been almost completed (with R.L. Newburn). The main changes are that the nucleus does make a significant contribution to continuum light, and that the gravity effect in the dust escape velocity is somewhat larger than previously assumed.

On the direct observational side, spectral studies of 1987's Comet Bradfield show it to be qualitatively carbon-rich, at least in the outer coma ratio of CO+ and CO_2+, compared to H_2O+ with respect to Halley at similar heliocentric distances.

(c) Anticipated Accomplishments: We are just beginning our observational study of comet P/Tempel-2 (with Wehinger, Wyckoff, and Belton at KPNO and our usual group at Lick Observatory). The [OI] λ6300 line has just been (weakly) detected (May 12, 1988), so water production has commenced (r = 1.89 A.U.), despite the "puny" appearance of the cometary coma on that date.

(d) Publications (1987/88):

1. Belton, M.J.S., Spinrad, H., Wehinger, P.A., Wyckoff, S., and Yeomans, D.K., 1987, Astron. & Ap. 187, 569, The Spectral Behavior of P/Halley at Large Heliocentric Distance in Light of the Giotto/Vega Results.

2. Hanner, M.S., Newburn, R.L., Spinrad, H., and Veeder, G.J., 1987, Astron. J. 94, 1081, Comet Sugano-Saigusa-Fujikawa (1983V) -- A Small, Puzzling Comet.

3. Spinrad, H., Ann. Revs. Astron. Astrophys. 1987, 25, 231, Comets and Their Composition.

4. Wyckoff, S., Tegler, S., Wehinger, P.A., Spinrad, H., and Belton, M.J.S., 1987, Ap.J. 325, 927, Abundances in Comet Halley at the Time of the Spacecraft Encounters.