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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE
CCD Camera System for Cometary Research

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) The objective is to upgrade the NASA/GSFC 36" telescope instrumentation, primarily with a new CCD camera system, to permit an effective monitoring program of cometary activity by means of narrowband imaging and spectroscopic techniques.
b) We have twice taken delivery of the CCD camera system from Princeton Scientific Instruments and twice returned it within six weeks for repair. During the times we had the camera system in the lab, we measured the instrumental performance of the TEK 512x512 CCD chip (e.g., readout noise, dark current, etc.) and developed the complete operational software for the camera system plus several useful observing and data reduction routines for use at the telescope. The CCD camera system is controlled by an IBM AT computer. The peripheral equipment and software to permit the efficient transfer of large amounts of data to the LASP's computers (VAXs) and subsequent timely reductions are also in place. The Io torus [S II] emission was monitored with a Fabry-Perot scanning spectrometer, in conjunction with the International Jupiter Watch.
c) The CCD camera system will be coupled to a narrowband interference filter imager and a long-slit spectrograph to provide regular and well-calibrated spatial and spectral observations of comets. The CCD instrumentation will be interface to the NASA/GSFC 36-inch telescope which is already equipped with a non-sidereal drive capable of tracking comets. The large dynamic range, low noise characteristics and high quantum efficiency of CCDs overcome the cometary observational difficulties of a large range of intensities and faint extended features. Photometric narrowband images in selected emission lines or bands (e.g., C_2, CN, C_3, [O I], H_2O^+) and the continuum, as well as long-slit spectroscopy will determine gas to dust column density ratios, abundances, production rates, and scale lengths as a function of heliocentric distances. Monitoring of cometary activity on both its pre- and post-perihelion orbital phases will provide information concerning the chemical homogenuity of the nucleus, place tighter constraints on chemical models of the coma, and improve our understanding of the solar wind/radiation interaction with coma and tail structures.
d)

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