N89-16657

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

Ground Based Infrared Astronomy

PERFORMING ORGANIZATION

Planetary Systems Branch
Laboratory for Extraterrestrial Physics
Goddard Space Flight Center
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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) Infrared spectroscopic instrumentation has been developed for ground-based measurements of astrophysical objects in the intermediate infrared. A conventional Michelson interferometer is limited for astronomical applications in the intermediate infrared by quantum noise fluctuations in the radiation from the source and/or background incident on the detector, and the multiplex advantage is no longer available. One feasible approach to recovering the multiplex advantage is post-dispersion. The infrared signal, after passing through telescope and interferometer, is dispersed by a low resolution grating spectrometer onto an array of detectors. The feasibility of the post-dispersion system has been demonstrated with observations of astrophysical objects in the 5 and 10 μm atmospheric "windows" from ground-based telescopes. Ground-based observations will be made during FY87/88 with the post-dispersion system at Kitt Peak using the FTS at the 4-meter telescope, and McMath telescope.

b) During FY87/88 the post-disperser was used at the Kitt Peak 4-meter telescope and McMath telescope with facility Fourier transform spectrometers. Jupiter, Saturn, Mars, and Venus were observed. On Jupiter, the resolution at 12 microns was 0.01 cm^{-1}, considerably higher than had been achieved previously. The specrum contains Jovian ethane and acetylene emission. Construction was begun on the large cryogenic grating spectrometer.

c) Proposals will be submitted for FY89 to observe Jupiter, Saturn, Mars and Venus with the 4-meter and McMath FTS using the Goddard pot-disperser. Manuscripts have been submitted and are being prepared describing the instrument and our observations.

d) Publications

"A Cryogenic Grating Postdisperser for Astronomical Observations using Fourier Transform Spectrometers", G. Wiedemann, D. Jennings, V. Kunde, G. Lamb, H. Moseley, and R. Hanel, submitted.

"Detection of 12 Microns MgI and OH Lines in Stellar Spectra", D. Jennings, D. Deming, G. Wiedemann, J. J. Keady, Ap. J., 310, L39.

"Detection of -13 Ethane in the Atmosphere of Jupiter", G. Bjoraker, D. Jennings, and G. Wiedemann, in preparation.