A Near-Infrared Spectral Survey of Planetary Nebulae

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We have completed a near-infrared spectral survey of more than 40 planetary nebulae (PN). The data were obtained using the KSPEC spectrometer on the University of Hawaii 2.2m telescope on Mauna Kea. KSPEC is a cross-dispersed spectrograph that provides simultaneous sampling of the 1.1 – 2.4 μm range at a resolution of approximately 700. We used a 1×7 arcsec slit and a slit-viewing camera with a second NICMOS3 detector operating in the K-band for positioning and tracking of the source. The survey sample consists of compact IR-bright PN with a range of ages and morphological classifications. For many PN in the survey, spectra of several positions, such as the central star and one or more positions in the nebula, were obtained. There are many spectral features of interest within this wavelength range, such as H I recombination lines, emission lines of He I, Fe I, O I, and [Fe II]; molecules such as H_2, CN, C_2, and CO; and continuum emission from the central star and hot dust in the nebula. A typical spectrum is shown in Figure 1. Emission from H_2 was detected for the first time in several PN, including NGC 40, NGC 7026, M 1-92, and Vy 2-2. The survey data will be used to compare the properties of the sample PN, including H_2 excitation mechanisms (shocks versus excitation by UV photons) and temperatures, and to correlate the properties with morphology class and age.

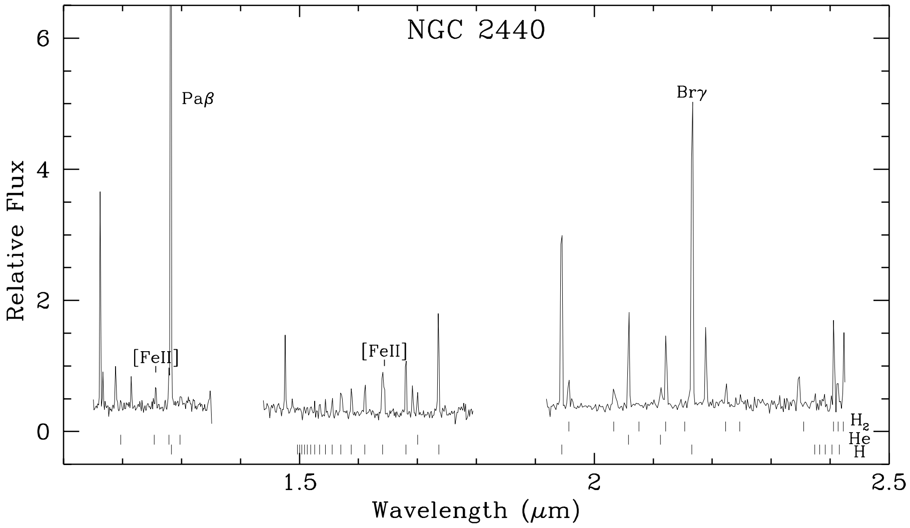

Figure 1. Spectrum of NGC 2440, typical of PN where strong H_2 and hydrogen recombination line emission are present.