Identification of Polycyclic Aromatic Hydrocarbons in Interstellar Clouds
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Introduction
The diffuse interstellar bands (DIBs) are a phenomenon found in astronomical absorption spectra in which the origin of the absorption lines is unknown. Among the postulated carriers for the DIBs are polycyclic aromatic hydrocarbons (PAHs), long chains or groupings of aromatic rings.¹ This hypothesis stems from the sharp increase in absorptivity around 2175 angstroms (Å), a wavelength at which many PAHs have a strong absorption line (Fig. 1). PAHs have been shown to have strong absorption in the visible wavelength region (4000-7000 Å) and their cations have been identified. Among the postulated carriers for the DIBs are polycyclic aromatic hydrocarbons (PAHs) and other PAHs in the interstellar medium.

Research Objectives:
1. To perform a correction for the strong absorption of water vapor in the near infrared
2. To verify the presence of absorption peaks at 9577 Å and 9632 Å corresponding to buckminsterfullerene²

Near Infrared Spectrum
The near infrared region of ground based astronomical spectra contain strong contamination from water vapor absorption (Fig. 2). Contamination from water vapor absorption may be minimized by collecting observation data when the air is relatively dry without impacting the strength of underlying stellar or interstellar features.

Initial Observations
The spectra for the program was obtained from 1999 to 2007 with the 3.5 m telescope and the Astrophysical Research Consortium echelle spectrograph (ARCES) at Apache Point Observatory. The ARCES employs an echelle grating, two cross-dispersing prisms, and a SITe CCD detector with a 2048 x 2048 pixels. Each ARCES spectrum provides complete spectral coverage from about 3700 to 10000 Å at a resolving power of R = 38,000.³ The typical signal-to-noise ratio at the wavelength of peak instrumental sensitivity was S/N > 1000 though lower in the 9500 Å region.

Telluric Correction
In order to remove the water vapor absorption lines with minimal impact on underlying DIBS, the task ‘telluric’ was utilized in the Image Reduction and Analysis Facility (IRAF) (Fig. 4).

Telluric contains two free parameters:
• Scale: what multiplicative factor is used to adjust the sample spectra
• Shift: the Doppler velocity used in order to match underlying stellar features

Earth’s Atmosphere Correction Using TELLURIC in IRAF
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Conclusion
For this project, we report a non-detection of the doublet previously identified. For future research, we recommend a non-detection of DIBs that may or may not be related to PAHs

References

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