Interstellar extinction curves at uncharted near-infrared wavelengths

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Abstract

Spectroscopic measurements of Milky Way dust extinction curves are often limited to UV and/or optical wavelength ranges. Nevertheless, the NIR (near-infrared) region hosts several broad extinction features: the 3.1 micron ice feature, the 3.4 micron HAC feature, and possibly the 1.5 micron iron silicate feature. However, these cannot be captured by broad-band photometry (for example from 2MASS). In this study, we extend the extinction curve measurements all the way to 5.5 micron, using new, high signal-to-noise spectra from the IRTF/SpeX instrument for a sample of diffuse sightlines. Fitting these refined curves enables us to derive the relationship between NIR extinction, V-band extinction A(V), and total-to-selective extinction R(V). In combination with IUE based UV and HST/STIS based optical extinction curves, we can investigate the R(V)-dependence from the UV through the NIR at spectroscopic resolution, which provides stronger constraints on the dust grain size distribution. In addition, we can inspect the structure of the NIR curve in great detail, to characterize known features, and possibly discover new ones, which yields essential clues on the nature of dust grains. Finally, this study will serve as a pilot to prepare for high-sensitivity, high-resolution NIR spectral observations with JWST's NIRSpec towards diffuse sightlines.

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