Infrared dust extinction law of the Milky Way with JWST NIRSpec

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Although infrared (IR) extinction is much weaker than optical extinction, accurate infrared extinction is essential for high-precision distance measurement and detection of the properties of dust grains. In contrast to the optical extinction law, the IR extinction law is not well understood and remains controversial. For example, whether the near-IR extinction curve of 0.9–3 μm can be approximately characterized by a general power-law $A_\lambda \propto \lambda^{-\alpha}$, and how the power-law index varies with sight lines or the optical extinction.

In this talk, we will present our recent work on the 0.6–5.3 μm interstellar dust extinction law based on the 993 prism/CLEAR spectra from the James Webb Space Telescope (JWST). We propose a pair method to obtain the reddening curves based only on JWST observed spectra and find that the infrared 1.0–5.3 μm reddening curves agree with the power law $A_\lambda \propto \lambda^{-\alpha}$ well. We determine an average value of $\alpha = 1.98 \pm 0.15$, which is consistent with the average value of the Galaxy. We find that α may be variable and independent of R_V. With the derived α, we convert the reddening curves into the extinction curves and establish the nonparameterized α-dependent extinction curves in the wavelength range of 0.6–5.3 μm. At $\lambda<1$μm, the derived extinction law is not well described by the parameterized power-law-type curve. Our nonparameterized α-dependent extinction curves are suitable for the extinction correction of JWST-based photometry and spectra measurements at 0.6–5.3 μm. With more results from different regions, it will help to study dust growth in dense environments.