The 3-D extinction law in the 2nd quadrant of the Galactic disk

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Abstract. We estimate the 3D extinction law in the optical–NIR bands for a line of sight in the 2nd quadrant of the Galactic disk. Two dust lanes are identified at ∼9 and ∼10.25 kpc in both A_V and R_V, indicating that the size of the dust grains in the spiral arms is larger than that in the inter-arm regions.
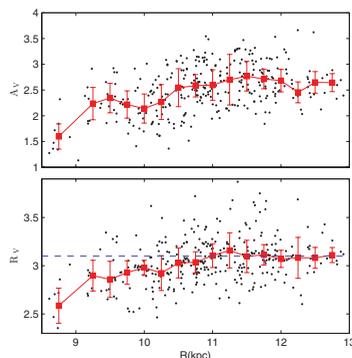
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1. Introduction

The interstellar extinction is related to the properties of the dust and varies with wavelength. The model of the extinction law can be parametrized with two parameter, A_V and R_V (Cardelli *et al.* (1989)). Both of the parameters are related to the distance as well as the direction of line of sight. Therefore, onlythe full 3D distribution can allow us to fully understand the extinction.

2. Data and results

We obtained 316 red clump star spectra observed from MMT/Hectospec at three 1-degree fields: $l = 129°$, 130°, and 131° at $b = 0°$. The distances of the sample stars are measured according to Liu *et al.* (2012). Com-

Figure 1. The estimated A_V (top) and R_V (bottom) as function of R (dots). The red rectangles show the median values and the 1-σ dispersions.

bining data from the SDSS and 2MASS catalogs, we estimate the reddening in 5 colors, i.e., $g - r$, $r - i$, $i - J$, $J - H$, and $H - K$, with accurate photometry. With these reddening values, we are able to estimate the extinction parameters, A_V and R_V, as function of Galactocentric radius R along this line of sight. Fig 1 shows the results. Two steeper rises are found at ∼9 and ∼10.25 kpc, through which 2 dust lanes cross, in both A_V and R_V. The correlation in R_V makes it evident that the dust grain size in the spiral arms is larger than that in the inter-arm regions.

References

Cardelli, J. A., Clayton, G. C., & Mathis, J. S. 1989, *ApJ*, 345, 245
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