Size Distribution of Interstellar Dust Constrained by Near-infrared Diffuse Galactic Light Observed with MIRIS

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Diffuse Galactic light (DGL) is dust-scattered light of interstellar radiation field. Therefore, the DGL observation provides some properties of interstellar dust, such as size distribution and albedo of grains. We observed three diffuse clouds in high Galactic latitude at 1.1 and 1.6 μm with Multi-purpose Infra-Red Imaging System (MIRIS)[1], a wide-field camera instrument onboard the Korean satellite STSAT-3. After data reduction, the DGL brightness is measured by correlating the near-infrared (IR) images with a far-IR 100 μm map of interstellar dust thermal emission. The result is consistent with previous studies[2] and shows the most accurate DGL measurement achieved to date thanks to the wide-field observation of MIRIS. We also find a linear correlation between optical and near-IR DGL in the MBM32 field, using the data obtained in the ground-based observation[3]. The excess is found in the optical wavelengths, suggesting the presence of the extended red emission reported in several earlier studies. To constrain the size distribution of interstellar dust, we adopt recent dust models with or without μm-sized very large grains and predict the DGL spectra, taking into account reddening effect of interstellar radiation field. The population of very large grains is suggested by the flat extinction curve observed in the mid-IR[4]. The result shows that observed color of the near-IR DGL is closer to the model spectra without very large grains[5]. This may imply that dust growth in the observed MBM32 field is not active owing to its low density of interstellar medium. This is also consistent with some theoretical studies of dust growth in interstellar medium.

[1]Han et al. 2014, PASP, 126, 853
[2]Arai et al. 2015, ApJ, 806, 69
[3]Ienaka et al. 2013, ApJ, 767, 80
[4]Wang et al. 2015, ApJ, 811, 38
[5]Weingartner & Draine 2001, ApJ, 548, 296