Title: Foreground Dust Properties toward the Cluster NGC 7380

Authors: Sadhana Singh, Jeewan C. Pandey, Thiem Hoang, Neelam Panwar, Biman J. Medhi, Vishal Joshi, Shashikiran Ganesh,

Abstract:

Using starlight polarization, we present the properties of foreground dust toward cluster NGC 7380 embedded in H II region Sh 2-142. Observations of starlight polarization are carried out in four filters using an imaging polarimeter equipped with a 104 cm ARIES telescope. Polarization vectors of stars are aligned along the Galactic magnetic field. Toward the east and southeast regions, the dust structure appears much denser than in other regions (inferred from extinction contours and a color composite image) and is also reflected in polarization distribution. We find that the polarization degree and extinction tend to increase with distance and indication for the presence of a dust layer at a distance of around 1.2 kpc. We have identified eight potential candidates exhibiting intrinsic polarization by employing three distinct criteria to distinguish between stars of intrinsic polarization and interstellar polarized stars. For interstellar polarized stars, we find that the maximum polarization degree increases with the color excess and has a strong scatter, with the mean value of 1.71% ± 0.57%. The peak wavelength spans 0.40–0.88 μm, with a mean value of 0.56 ± 0.07 μm, suggesting similar grain sizes in the region to those in the average diffuse interstellar medium. The polarization efficiency is also found to decrease with visual extinction as $P_{max}/A_V \propto A_V^{-0.61}$. Our observational results are found to be consistent with the predictions by the radiative torque alignment theory.