

Abstract

The photopolarimetric study of the stars background to star forming dark clouds (Bok globules) as a tool to investigate ongoing physical processes in the clouds is reported here. When the light from the background stars passes through the clouds, extinction and reddening are caused due to absorption or scattering by the dust in the clouds. As these clouds themselves don't radiate in the optical region, it is very important to study photopolarimetrically the stars background to these clouds to know interior of the clouds. Recently, many photometric and polarimetric studies have been made on the star forming clouds. It is generally expected that the increasing extinction along a line of sight corresponds to increasing polarization. But some of the studies show a lack of polarization efficiency with extinction. The cause of the lack of polarizing power for dust in some cold dark clouds is still debated.

Out of eight nearby clouds, CB3, CB25, CB39, CB52, CB54, CB62 and CB246, reported by Sen et al. (2000), which were observed polarimetrically, three clouds CB3, CB25, CB39 are observed photometrically in B,V,R filters, for the present work, using an optical CCD imager, from the 2M Himalayan Chandra telescope (HCT) at IAO (Hanle).

The present study concentrates upon the estimation of colour excess as a measure of extinction of background starlight. The colour-colour diagrams of the background stars for the three clouds, show that all the stars fit the main sequence with a few exceptions. An attempt has been made to look for any possible relationship between extinction and polarization of the stars background to the clouds. The measured

extinction seems to increase with increase in percentage polarization, for the cloud CB39 and to some extent for CB25. However the cloud CB3 does not follow this trend very well. Possible reasons for this are discussed.

Different chapters are organized as below:

Chapter 1 deals with a brief account of interstellar dust, interstellar clouds and star formation. The polarimetry and photometry in dark clouds are then discussed. Finally, the objective and the layout of the thesis are presented.

In chapter 2, different works on dark clouds, photometric and polarimetric study in dark clouds, by different authors are discussed.

The chapter 3 includes a brief discussion on CCD imaging, aperture photometry, observation and collection of data.

The chapter 4 begins with basic information on the image processing software IRAF, then the reduction and analysis of photometric data using IRAF, the methods followed and the calculations and results.

The chapter 5 deals with the errors, different types of errors, how errors from different sources propagate through the calculations to the final result.

The chapter 6 will deal with the discussions on observed extinction of background starlight of different field stars for each of the clouds under consideration and conclusions are drawn from the present study.