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Dust properties and magnetic field geometry towards LDN 1570

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Abstract. We have performed both optical linear polarimetric and photometric observations of an isolated dark globule LDN 1570 aim to study the dust polarizing and extinction properties and to map the magnetic field geometry so as to understand not only the importance of magnetic fields in formation and evolution of clouds but also the correlation of the inferred magnetic field structure with the cloud structure and its dynamics. Dust size indicators (R_V and λ_{max}) reveal for the presence of slightly bigger dust grains towards the cloud region. The inferred magnetic field geometry, which closely follows the cloud structure revealed by *Herschel* images, suggest that the cloud could have been formed due to converging material flows along the magnetic field lines.

Keywords. (ISM:) dust, extinction, ISM: magnetic fields, techniques: polarimetric, ISM:clouds, ISM: individual-LDN 1570

1. Results

LDN 1570 (Lynds, 1962) is same as Barnard 227 (Lynds, 1962) and CB44 (Clemens & Barvainis, 1998) which is a isolated small dark globule located at a distance of ∼400 pc (Stutz *et al.*, 2009). Small dark globules are the unique laboratories to study the early evolutionary stages that precede core collapse and subsequent star formation (Kane *et al.* 1995). The mean values of P_{max} and λ_{max} are found to be 3.27±1.02 per cent and 0.59±0.08 μm respectively, slightly higher than the value, 0.545 μm, corresponding to the general ISM. The value of R_V estimated using the λ_{max} is found to be 3.3±0.5. Using $(V-I)$, $(V-J)$, $(V-H)$, $(V-K)$ vs. $(B-V)$ two-colour diagrams, we evaluated the value of R_V as 3.64±0.01. The R_V values derived from both these methods show that the grain size in LDN 1570 is slightly bigger that those found in the diffuse ISM. The magnetic field geometry of LDN 1570 seems to follow the large scale structure seen in the 250 μm image produced by the *Herschel*. Towards the southern parts the field seems to be almost parallel to the Galactic parallel ($b = -0.62°$) whereas towards the northern parts the field lines are bend by ≈20° towards the Galactic plane ($b = 0°$). The filamentary structure seen towards the northern condensation are found to be aligned with the magnetic field lines. Based on the morphology of the magnetic field lines with respect to the cloud structure, we believe that LDN 1570 could have formed due to the converging flow of material along the field lines.

References

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