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Comparing the structure of three dark globules

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We present a comparative study of three dark globules CB52, CB107, and DC267.4-07.5. By means of an accurate photometry, near-IR two-colour diagrams were derived for the stellar backgrounds and used to determine the colour excesses of the reddened stars (Campeggio *et al.* 2004). By assuming a normal interstellar reddening law (Rieke & Lebofsky 1985), the visual extinction can be obtained as $A_V = 15.87E(H-K)$.

We sampled the three images with a spatial grid, computing, for each box, the mean extinction A_V and the relative dispersion σ_{A_V}. It is noteworthy that the extinction maps, obtained by means of this information, closely follow the shapes of the globules with values increasing from the boundary to the innermost dark regions. To analyze the structural properties of these globules we investigated the extinction dispersion σ_{A_V} as a function of A_V (Lada *et al.* 1994; Padoan *et al.* 1997), pointing out three different behaviours: parabolic (increasing up to a maximum and then decreasing), linear and fanlike for CB52, CB107, and DC267.4-07.5 respectively. For the globules DC267.4-07.5 and CB107, the scatter plots can be fitted with a linear function, while, for comparison purpose, we adopted for CB52 the tangent slope to the fitting parabola in the point A_V=2. To give a physical interpretation of these trends we also developed a code to simulate clouds. In this model a given volume of space is filled with a collection of small spheres (clumps) randomly distributed and characterized by different positions, central densities, and density profiles. Our simulations are completed by considering artificial stellar backgrounds, characterized by density, magnitude and colour distributions similar to those actually observed in the unreddened regions of the observed fields. We applied to these synthetic backgrounds the same procedures used for the analysis of the observations. Our results point out that such a kind of simulation can account for the different behaviours of the σ_{A_V} vs. A_V scatter plots observed in clouds with different internal structures (Maiolo *et al.* 2006). We also extended this analysis to a range of angular scales to study the non-homogeneity of these clouds for different spatial scales. We note that in each case the slope decreases with increasing angular resolution, pointing out that the globules, particularly CB107 and DC267.4-07.5, appear more structured toward the larger scales. Similar evidence was given by Lada *et al.* 1999 for the cloud IC 5146. In conclusion, our investigation suggests different internal structures for the studied clouds.

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