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Statistical comparison of clouds and star clusters

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The extent to which the projected distribution of stars in a cluster is due to a large-scale radial gradient, and the extent to which it is due to fractal sub-structure, can be quantified -- statistically -- using the measure ${\cal Q} = \bar{m}/\bar{s}$. Here $\bar{m}$ is the normalized mean edge length of its minimum spanning tree (i.e. the shortest network of edges connecting all stars in the cluster) and $\bar{s}$ is the correlation length (i.e. the normalized mean separation between all pairs of stars).
We show how ${\cal Q}$ can be indirectly applied to grey-scale images by decomposing the image into a distribution of points from which $\bar{m}$ and $\bar{s}$ can be calculated. This provides a powerful technique for comparing the distribution of dense gas in a molecular cloud with the distribution of the stars that condense out of it. We illustrate the application of this technique by comparing ${\cal Q}$ values from simulated clouds and star clusters.

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