Universality of interstellar filaments power spectra: A link to the origin of CMF

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Abstract

Recent *Herschel* observations have demonstrated the importance of studying interstellar filaments for the better understanding of star formation. It is now almost clear that majority of the dense cores are formed along the thermally supercritical filaments due to gravitational instabilities. However, the virtue of being supercritical is not enough for the formation of cores unless there is a non-linear interaction among the initial perturbation modes. In the absence of these longitudinal modes, self-gravitating filaments collapse radially without any fragmentation. Interestingly, the statistical properties of these perturbation modes are directly linked to the statistics of core masses. Analytically it has been shown that a line-mass fluctuation with a characteristic power spectrum slope of -1.5 can generate a mass spectrum similar to the Salpeter towards the high mass end. Using the *Herschel* Gould Belt-key project dust emission data for the nearby molecular clouds we have found that the line-mass fluctuation along the axial direction has a quasi-universal 1-D power spectrum slope of -1.6. This is the first observational characterization of the density fluctuations along the filaments providing an alternative mechanism of explaining the origin of CMF.