The Stability of Low Surface Brightness Disks Based on Multi-Wavelength Modeling

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To investigate the structure and composition of the dusty interstellar medium (ISM) of low surface brightness (LSB) disk galaxies, we have used multiwavelength photometry to construct spectral energy distributions for three low-mass, edge-on LSB galaxies. We use Monte Carlo radiation transfer codes that include the effects of transiently heated small grains and polycyclic aromatic hydrocarbon molecules to model and interpret the data. We find that unlike the high surface brightness galaxies previously modeled, the dust disks appear to have scale heights equal to or exceeding their stellar scale heights. This result supports the findings of previous studies that low mass disk galaxies have dust scale heights comparable to their stellar scale heights and suggests that the cold ISM of low mass, LSB disk galaxies may be stable against fragmentation and gravitational collapse. This may help to explain the lack of observed dust lanes in edge-on LSB galaxies and their low current star formation rates.

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