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Title

Gaps in the cloud cover? Comparing extinction measures in spiral disks

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Abstract

Dust in galaxies can be mapped either by the FIR/submillimeter emission, the optical or infrared reddening of starlight, or the extinction of a known background source. We compare two dust extinction measurements for a set of 15 sections in 13 nearby galaxies to determine the scale of the dusty interstellar medium (ISM) responsible for disk opacity: one using stellar reddening and the other a known background source. In our earlier papers, we presented extinction measurements of 29 galaxies, based on calibrated counts of distant background objects identified though foreground disks in Hubble Space Telescope WFPC2 images. For the 13 galaxies that overlap with the Spitzer Infrared Nearby Galaxies Survey, we now compare these results with

those obtained from an I - L color map. Our goal is to determine whether or not a detected distant galaxy indicates a gap in the dusty ISM, and hence to better understand the nature and geometry of the disk extinction. We find that distant galaxies are predominantly in low-extinction sections marked by the color maps, indicating that their number depends both on the cloud cover of Spitzer-resolved dust structures, mostly the spiral arms, and a diffuse, unresolved underlying disk. We note that our infrared color map $[E(I - L)]$ underestimates the overall dust presence in these disks severely because it implicitly assumes the presence of a dust screen in front of the stellar distribution.

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