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An Empirical Determination of the Dust Mass Absorption Coefficient, κd, and its Variation Within Nearby Galaxies

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With the advent of large far-infrared and submillimetre facilities such as Herschel, Planck, JCMT, and especially ALMA, dust now provides an indispensable way to study the evolution of galaxies. In particular, our ability to observe large areas of the submillimetre sky quickly (along with the advantageous effects of negative-k-correction and lensing) mean that dust observations are increasingly used as a proxy to study star-formation rates, gas masses, and chemical evolution - which are impractical to observe directly for such substantial numbers of galaxies.

However, our ability to exploit dust observations in this way is predicated on a simple assumption - that we can actually use observations of dust emission to infer dust masses. But the dust mass absorption coefficient, κd, is uncertain to (at best!) an order of magnitude. Worse still, this forces us to treat κd as being constant both between galaxies, and within them - which of course cannot be true in reality. Pinning down κd, and how it varies, is therefore vital.

I will present a simple empirical method for determining the value of κd in galaxies, which exploits the fact that the dust-to-metals ratio in galaxies exhibits minimal variation in high- and intermediate-metallicity systems. This method puts new empirical constraints on global values of κd, providing an important counterpoint to theoretical and laboratory models.

I will also present the first ever resolved maps of κd, obtained by applying the method in a pixel-by-pixel manner to well-resolved nearby galaxies. These maps provide strong observational evidence for variation of κd within galaxies.

Consider for a poster?

Yes

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Session Classification: Dust as a tracer in the Milky Way and local galaxies

Track Classification: Dust as a tool