Resolved variations in the dust properties of Andromeda

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Abstract

Over the past decade, studies of dust in the Andromeda galaxy have shown variations in its observational properties, including radial variations in the dust emissivity index. Understanding the astrophysical reasons behind these radial variations may give clues about the chemical composition of dust grains, their physical structure, and the evolution of dust. Within the Local Group, there is evidence for variations in the dust emissivity index in the Milky Way depending on whether regions are dominated by atomic or molecular gas; and in the Triangulum galaxy, correlations have been found between the dust emissivity index and star-forming regions. This sets the scene for exploring how this property behaves in Andromeda's dense molecular gas regions, considered to be sites of future star formation. The dust and gas in Andromeda have been mapped using CARMA CO observations and Herschel dust measurements and trace molecular gas at 30 pc spatial scales. Our approach capitalises on these high-resolution data to search for any significant connections between GMCs and variations in the dust emissivity index. Our results indicate systematic changes in the dust emissivity index with respect to radius, reaffirming the results of previous studies. However, we notice little difference between the average dust emissivity index inside GMCs compared to outside GMCs, indicative of very weak to no correlation between GMC regions and the variations in the dust emissivity index. We produce GMC catalogues in two ways, with the added aim of seeing whether any CO-dark gas exists within Andromeda.

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