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Dust emission in millimeter wavelengths: Cooling of the interstellar medium in NGC6946

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The interstellar dust plays an important role in the formation of molecular gas and its emission helps distinct the heating and cooling of the interstellar medium. Dust dominates the observed emission in galaxies over a wide spectral range reaching from the mid-IR to mm wavelengths. The spatial distribution of the mm-wave dust emission from galaxies is largely unexplored while we know that most of the gas and dust resides in relatively cold (10-20K) regions that are discernable from the warm dust emission near star-forming regions only with sufficient spatial resolution in face-on galaxies. The NIKA2 Guaranteed Time Project IMEGIN (Interpreting the Millimetre Emission of Galaxies with IRAM and NIKA2) has recently mapped the mm emission in a sample of nearby galaxies at high angular resolutions. As a pilot study, we present the observations of the face-on galaxy NGC6946. Subtracting the contributions from the free-free, synchrotron, and CO line emission, we map the distribution of the pure dust emission at 1.15 and 2mm. A relatively tight correlation is found between the CO and cool dust emission in star-forming regions. Separating the arm/interarm regions, we find a dominant emission from interarms indicating the significant role of the general interstellar radiation field in heating the cool dust. Finally, we present maps of the dust mass, temperature, and emissivity index using the Bayesian MCMC modeling of the spectral energy distribution in NGC6946.

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