DETERMINING THE SYSTEMATIC ERRORS IN FITS OF DUST THERMAL EMISSION: THE ROLE OF LABORATORY DATA IN UPCOMING MODELS

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Interstellar dust plays an important role the study of interstellar medium, especially since the development of far-infrared and submillimeter instruments in the last decades (e.g. IRAS, Herschel, *Planck*, ALMA) has allowed wide surveys of dust thermal emission. Using a dust emission model these observations can be converted to maps of quantities such as the dust column density and temperature, or to constrain dust masses in molecular clouds and galaxies.

Dust emission is commonly modeled as a blackbody with temperature T multiplied by an opacity κ that varies with wavelength as a power law: $\kappa \propto \lambda^{-\beta}$, usually with $\beta \sim 2$. However, we are learning from both astronomical observations and laboratory tests on dust analogues that T–β models are too simplistic. Two facts in particular emerge:

1) For most candidate dust materials the opacity $\kappa(\lambda)$ does not follow a power law: its slope decreases beyond a certain wavelength (typically around 400–700 μm);
2) The optical properties of materials often depend on temperature as well; for instance opacity often increases with T.

Our group is working on optical data on several candidate dust materials, collected by multiple laboratories, to parametrize the materials' opacities as functions of λ and T. This parametrization will be the first step in building a more physically realistic and flexible dust model. By fitting observations of molecular clouds and nearby galaxies, and by constructing synthetic observations to fit with conventional methods, the new model will allow to find potential systematics in T–β fit results. The model could also be applied to galaxies at high redshift, where recent dust mass estimates are posing a challenge to dust formation models, and understanding systematics on such measurements is essential.