All-sky dust modeling using PLANCK and IRAS observations

Gonzalo Aniano (CNRS – Institut d'Astrophysique Spatiale), M.-A. Miville Deschenes (CNRS – Institut d'Astrophysique Spatiale), F. Boulanger (CNRS – Institut d'Astrophysique Spatiale) and B. T. Draine (Princeton University)

We present all-sky, high-resolution, model of the far infrared (IR) emission of the interstellar dust as measured by PLANCK and IRAS. We employ the Draine & Li (2007) [DL07] dust model to characterize: (1) dust visual extinction Av, (2) dust mass surface density, (3) the starlight intensity heating the dust, (4) total infrared (IR) luminosity emitted by the dust, and (5) IR luminosity originating in regions with high starlight intensity. The present work extends to the full Milky Way dust modeling done on nearby galaxies with Herschel and Spitzer data.
The DL07 model reproduces the observed Spectral Energy Distribution (SED) in the 60-850 μm range satisfactorily in most of the sky, with small deviations in the galactic disk near the galactic center. However, the DL07 optical reddening estimates over predict independent estimates from stellar and QSO measurements by factors of 3 and 2 respectively. The dependences of the deviations of the DL07 estimates are analyzed and parametrized, leading to a “renormalized” DL07 model with correct ratio of optical reddening per unit of IR emission. This renormalization shed light into the constrains that need to be satisfied by the next generation of dust models. The H gas column density inferred from the DL07 dust mass density also over-predict current ground-based observations by factors 1.3 to 3.0, and the renormalization procedure brings both estimates into agreement.
The state-of-the-art dust parameter maps, and new constrains are made publicly available.