Seminarium Astrofizyczne

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A New Spectral Energy Distribution Model of Dust Emission Consistent with Chemical Evolution

The spectral energy distribution (SED) of galaxies provides fundamental information on the related physical processes. However, the SED is significantly affected by dust in its interstellar medium. Dust is mainly produced by asymptotic giant branch stars and Type II supernovae. In addition, the dust mass increases through the metal accretion, and the grain size changes by the collisions between the grains. The contribution of each process and the extinction depend on the size distribution. Therefore, the SED model should treat the evolution of the dust mass and size distribution. In spite of the importance of dust evolution, many previous SED models have not considered the evolution of the total mass and size distribution in a physically consistent manner. In this work, we constructed a new radiative transfer SED model, based on our dust evolution model consistent with the chemical evolution. To reduce the computational cost, we adopted the mega-grain and the one-dimensional plane parallel galaxy approximation. As a fiducial case, we calculated Milky Way-like galaxy SEDs at various ages under the closed-box model. We found that a galaxy at the age of 100 Myr does not produce small grains such as polycyclic aromatic hydrocarbons. After 1 Gyr, we observed a drastic increase of infrared emission and attenuation caused by a rapid increase of dust mass. This phenomenon can be treated appropriately for the first time by our new model. This model can be used for the SED fitting to a galaxy at any stage of evolution.

Serdecznie zapraszam,
Agnieszka Majczyna