3D RADIATIVE TRANSFER FOR YOUNG STELLAR OBJECTS

Jürgen Steinacker

Astrophysical Institute and University Observatory Jena, 07743 Jena, Schillergässschen 2

The general problem of performing 3D continuum radiative transfer in dust layers and accretion disks around young stellar objects is briefly reviewed. With emphasis on the technical aspects of the solution algorithm, we present direction grid nodes equally distributed on the unit sphere, obtained by applying a Metropolis algorithm. The influence of numerical diffusion on the solution using first-order finite differencing is discussed and a solution appropriate for 3D radiative transfer is given. A generator for grids used to solve the 3D radiative transfer equation with the finite differencing method is given. The grid is adaptive and optimized to minimize the first order discretization error. We show that for the calculated grid, the optical depth throughout every grid cell is below a given threshold and allows global error control for solutions of radiative transfer problems on the grid. The proposed grid generation algorithm is easy to implement and allows pre-calculation of the grids. Moreover, the grids can be stored in integer arrays making a fast solution of the radiative transfer equation possible. We suggest to use individual grids for each frequency to use the global error control of the grid generation method. It is shown that the use of one single grid for all frequencies can lead to large discretization errors. A first comparison to Monte-Carlo code results for a simple rotational symmetric accretion disk configuration is shown.