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Radiative heating of circumstellar disks

A. Feiler[1], J.P. Ruge[1], T.F. Illenseer[1], S. Wolf[1], W.J. Duschl[1,2]

[1] *Institut für Theoretische Physik und Astrophysik, Christian-Albrechts-Universität zu Kiel, Germany*

[2] *Steward Observatory, The Universitiy of Arizona, Tuscson, AZ, USA*

Stellar irradiation plays a crucial role in the evolution of circumstellar disks. For this purpose we developed a model to parameterize the radiative heating of an optically thick disk in the hydrodynamics code Fosite. It is based on the seminal work of Kenyon & Hartmann (1987) but uses new methods to calculate the photospheric height, the illuminated surface of the disk and the oblique radiative transfer proposed by Watanabe & Lin (2008). Our choice of dust absorption properties makes the model sensitive to the chemical composition and the size distribution of the dust grains. Part of the incoming radiation is scattered out of the disk and cannot contribute to the heating which is also included in the model. The possibility of self shadowing is taken into account. We use the new model to investigate the formation and evolution of thermal waves in irradiated protoplanetary disks in the context of a full hydrodynamic description of disk evolution.