Parallel Computing of Radiative Transfer in Relativistic Jets Using Monte Carlo Method

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Abstract

We have developed a parallelized multi-dimensional Monte Carlo code for simulating radiative transfer in a relativistic jet from collapsing massive progenitor of long-duration gamma-ray bursts (GRBs). Although a large number of sample photons and long-term tracking in a scattering medium are required for accurate prediction of light curves and emission spectra with less statistical errors, they need huge computational loads. The developed code achieved a high parallel efficiency which helps us to obtain solutions in a practical computational time. We have conducted radiative transfer simulation with hydrodynamical data of the relativistic jet in which Thomson scattering dominates compared to absorption. The obtained light curve and emission spectra depend on the jet structure, and a power-law of the light curve will be discussed in the context of GRBs.