Modeling the iron line in GRB afterglows

M. Böttcher (Rice University)

The time and angle dependent yield of line and continuum emission from a dense, metal enriched torus around a cosmological gamma-ray burst (GRB) source is simulated, taking into account photoionization, collisional ionization, recombination, and electron heating and cooling due to various processes. The importance of the hydrodynamical interaction of the GRB blast wave with the torus as well as the fact that the photon spectrum illuminating the torus material may strongly deviate from the observed GRB radiation, are stressed. A model calculation to reproduce the Fe Kα line emission observed in the X-ray afterglow of GRB 970508 is attempted, but the results indicate that even with $> 0.1\,M_\odot$ of iron concentrated in a highly metal-enriched region of $R \lesssim 10^{-3}$ pc, as estimated by other authors, it is unlikely that the observed iron line luminosity is produced in this scenario.