A THEORETICAL MODEL OF AN OFF-AXIS GRB JET

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Broad-lined Ic supernovae (SNe) have been commonly linked with long duration gamma-ray bursts (lGRBs). In the particular case of such a SN, SN 2020bvc, the radiation was isotropic with an X-ray flux. Both facts lend themselves to be studied under the formalism of an afterglow produced by an off-axis jet which expands laterally and becomes on-axis, which our model makes possible. We have researched the evolution of the afterglow of an off-axis top-hat jet when it interacts with a stratified circumburst medium ($n(r) \propto r^{-k}$). We have developed a model for the synchrotron radiation due to such an interaction before and after the jet enters our line of sight. With basis on external forward shocks, we have analyzed the behavior of the afterglow in the relativistic phase (before the jet breaks) and in the lateral expansion phase. We have obtained synchrotron light curves in the fast- and slow-cooling regimes in both timescales. The model has been successfully applied to the observed X-ray emission from SN 2020bvc with a stratification parameter $k = 1.5$.

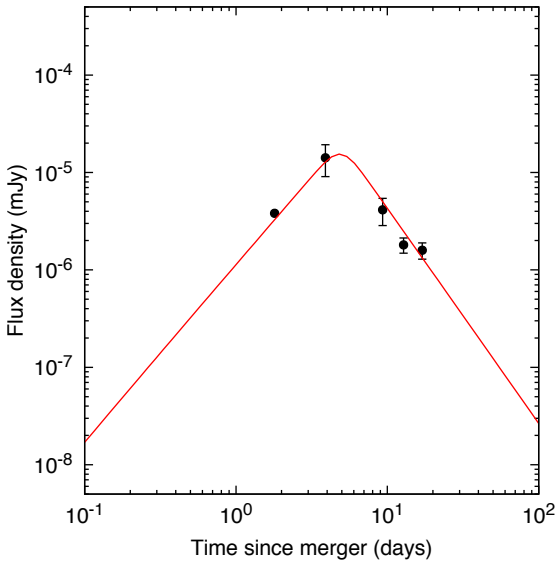

Figure 1: The X-ray data points of SN 2020bvc with the best-fit curve obtained with our model for a stratification parameter of $k = 1.5$.