The Supercritical Pile model for GRBs

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We present the spectral and temporal radiative signatures expected within the “Supercritical Pile" model of Gamma Ray Bursts (GRBs). This model is motivated by the need for a process that provides the dissipation necessary in GRBs and presents a well defined scheme for converting the energy stored in the relativistic protons of the Relativistic Blast Waves (RBW) associated with GRBs into radiation; at the same time it leads to spectra which exhibit a peak in the νF_ν distribution of the burst at an energy E_p $\sim$ 1 MeV in the observer’s frame, in agreement with observation and largely independent of the Lorentz factor Γ of the associated relativistic outflow. Furthermore, this scheme does not require (but does not preclude) acceleration of particles at the shock other than that provided by the isotropization of the flow bulk kinetic energy on the RBW frame. In the present paper we show a detailed evolution of the spectra as the RBW expands into a constant density environment and discuss ways of connecting the prompt emission with the afterglow within the framework of this model.