EXAMINATION OF THE EFFECTS OF FIREBALL RADIATION ON MATERIAL OF THE EJECTA CURTAIN. T. J. Wdowiak[1], K. M. Arnoult[1], and B. G. R. Coltress[1,2], [1]Astro and Solar System Physics Program, Department of Physics, University of Alabama at Birmingham, Birmingham, AL 35294-1700 (wdowiak@phy.uab.edu), [2]Ramsay Alternative School, Birmingham, AL 35205.

Although the radiation emitted by the ascending fireball would be intercepted by material of the ejecta curtain, examination of the consequences of this occurring seems to have escaped the attention of those who study impacts. For the terrestrial situation, the effects could include dessication of ejecta while above the atmosphere, annealing of shock-induced features of crystals such as quartz, which are considered to be indicators of an impact event, and perhaps even tektite formation through fusion of ejecta material in ballistic flight above the atmosphere. The luminosity history of the fireball, on the basis of preliminary calculations, appears to be the most significant factor in evaluating the role of radiation in the impact event.

If radiation heating of ejecta is to be significant, it would be expected that the process would be relatively insensitive to variation of parameters, and even simple models for the luminosity history should have utility in the assessment of radiant heating. It is also obvious that the duration of the period of high luminosity of the fireball will have the greatest effect.

Prior to the Shoemaker-Levy 9 Comet impact with Jupiter, Zahnle and MacLow [1] attempted to predict the fireball luminosity history for a bolide impacting a thick hydrogen atmosphere. The situation for a terrestrial impact would be a different one because high opacity sources would not only arise from the impactor, but also from the more abundant target rock. In addition, there is a likelihood that condensation of solids would slow the expansion of the fireball [2].

We have generated a family of fireball luminosity histories and used them to estimate the temperatures of in-flight test particles at the inner surface of the ejecta curtain. The results have been applied to the questions of annealing of shock induced distortions in grains and fusion of clumps into tektites. The results of these calculations will be presented. In addition, an apparatus for radiant heating in a vacuum of test samples, including tektite material, has been constructed. The apparatus has the capability of an irradiance of 10,000 suns, which is a level of interest, as indicated by our preliminary calculations. The results of experiments carried out with the apparatus will be discussed.

[1] K. Zahnle and M. MacLow, Icarus 108, 1-17 (1994).

[2] H. J. Melosh and E. Pierazzo, Lunar and Planetary Science 28, 935-936 (1997).