

# Description of SStoRM v3

Joshua Lande and Dr. Ronald Turner

December 10, 2005

## 1 Introduction

SStorm stands for the Solar STorm Radiation Model. SStoRM lets you create and analyze solar particle events (SPEs). Version 3 of SStoRM is different from version 1 because it can handle the simulation of solar particle events with Gaussian shock enhanced peaks. It is probably a good idea to understand how version 1 works before you start playing around with version 3. Most of the features common to both version 1 and version 3 are only explained in the manual of version 1. So feel free to refer back to it.

## 2 Create the SPE

The SPEs that this program creates include an event and a shock enhanced peak. The event and the shock enhanced peak both have an energy spectrum and a time evolution. You must specify the energy spectrum and the time evolution of both as well as the time delay before the shock enhanced peak. Once you do this, SStoRM knows everything that it needs and can do the simulations.

### 2.1 The “Energy Spectrum” Tab

To create your SPE, you must first select the energy spectrum, or fluence, for both the first and second event. Selecting the fluence of your event without the shock enhanced peak and selecting the energy spectrum of the shock enhanced peak is exactly the same as in the previous versions of SStoRM. The one difference is that you cannot select the K scaling factor in this version of the program. You must instead specify the total event integral fluence and the integral fluence of just the shock enhanced peak. The integral fluence of the event without the peak can then be calculated as the difference between them.

### 2.2 The “Time Evolution” Tab

Once you are happy with the fluence of your SPE, you can then define the flux, or time evolution, of your event. Specifying the time evolution of the event without the peak

is similar to that in version 1, but specifying the time evolution of the shock enhanced peak is different. The shock enhanced peak's time evolution is instead defined using the Gaussian curve:

$$Flux = Ce^{\frac{(t-delay)^2}{B^2}}.$$

Here,  $B$  must be specified. It represents the width of the shock enhanced peak. You must also specify the time delay between the beginning of the event and the middle of the shock enhanced peak. This delay allows for the shock enhanced peak to happen after the event has begun to die down. The scaling factor of the shock enhanced peak is calculated in an identical manner to that of a regular event in version 1, noting only that there is a different time evolution curve to integrate.

## **3 Analyze your SPE**

### **3.1 The “Estimated Dose” Tab**

The “Estimated Dose” tab works exactly the same as in the first version of SStoRM except that it calculates total radiation dose that an astronaut would receive from the event with an additional shock enhanced peak.

### **3.2 The “Exercise” Tab**

The “Exercise” tab works exactly the same as in the first version of SStoRM. SStoRM knows to take into account that the astronaut must also withstand a shock enhanced peak.