

# RESEARCH LOG - WEEK 7

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## 1. SIMULATING LIGHT CURVES

The Post-Reconnection Evolution of a Flux-Tube code returned in earnest this week as multiple runs of the program - each using different input parameters (reflecting uncertainty in the observed values) - were completed. In order to compare these PREFT runs with the observed data, it was decided that in the first instance, light curves will be generated from each run. Since, the light curves can be produced in 7 different wavelengths from the AIA data, wavelength specific light curves must also be generated for each PREFT run. The code runs in such a manner that the evolution of numerous small cells of plasma are modelled throughout time. Important properties of each cell that are recorded at each iteration include the temperature, pressure and density of the cell. Whilst these properties can vary greatly along the length of the flux tube being considered, within the cell itself, these values are assumed to be uniform at any given time step. A temperature response function can then be used in conjunction with the number density and volume of a cell to deduce the intensity of a particular wavelength of light that is produced by a single cell. Summing over the number of cells in the flux tube will provide the total intensity of a particular wavelength emitted by the idealised flux tube at any given moment. The temperature response function is of course dependent on the wavelength being analysed and so 7 different such response functions are used in this exercise.

$$I_{171} = \sum_i n_i^2 \cdot V_i \cdot G_{171}(T_i)$$

The above formula highlights how the intensity for 171Å was calculated at one particular instant where  $n_i$ ,  $V_i$  and  $T_i$  are the number density, volume and temperature associated with the  $i^{th}$  cell. Here,  $G_{171}$  is the temperature response function associated with 171Å. For ease of viewing, the magnitude of the intensity at each wavelength was normalised by dividing by the peak intensity and then all wavelengths were plotted on one graph. An example of this from one PREFT run (final loop length - 70Mm, magnetic field strength - 25G, reconnection angle - 120°) is shown in Figure 1 below.

An initial analysis of the time delays between each peak was then undertaken and a comparison of these results with the observed delays will be completed next week.

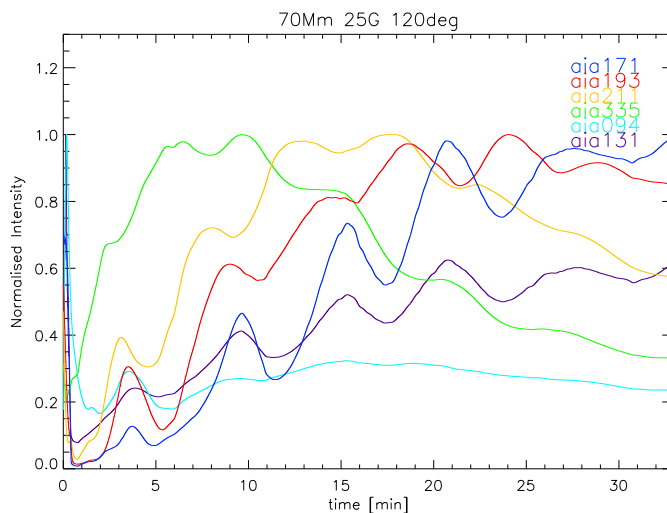


FIGURE 1. It is clear that the peak intensities for each wavelength occur at different times which demonstrates the cooling process being simulated during the PREFT run. The peaks for 131Å and 94Å occur at  $t \approx 0$  which suggests the PREFT run does not reach the characteristic temperatures for these two wavelengths (Note the subsequent rise in 131Å intensity is likely to be related to the lower of the two characteristic temperatures associated with this wavelength). Peaks in these wavelengths close to  $t=0$  were common features in many of the runs completed.

In addition, various movies of the flare as observed in different wavelengths were generated for inclusion in the final presentation in a couple of weeks time.

## 2. LECTURES

This week saw just a single lecture delivered by Professor Dana Longcope. The presentation was on the subject of the Physics GRE and the type of questions that can be expected on the test. Whilst this author is not seriously considering applying to graduate school in the United States, the use of Physics formulae that had long ago been buried in a dank and dusty corner of one's mind was certainly enjoyable. Strategies for answering the style of questions were considered and various methods for eliminating incorrect answers were also discussed. An opportunity to attempt several GRE problems was then provided before the solutions were given.