

# RESEARCH LOG - WEEK 6

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## 1. PEAK EMISSION DELAY CALCULATIONS

After using the PREFT code for the first time last week, it was deemed necessary to return to the flare observations to calculate the observed delays in peak emission for each wavelength relative to the onset of the flare. Several procedures were written to calculate the value of the peak emission in each loop and then the same was evaluated for each pixel within the loop (excluding pixels corresponding to the loop footpoints in the chromosphere). It was then noted that each wavelength has multiple peaks that correspond to emission by different ions and consequently represent the solar plasma at different characteristic temperatures. Therefore for each wavelength only the first peak (corresponding to the highest characteristic temperature) was to be considered and so only the largest peak within an acceptable time range was identified. The time at which this peak emission occurred at different wavelengths was then calculated for each loop and again for each pixel within a particular loop. The delays between flare onset and peak emission at different wavelengths were then trivial to calculate. Figures 1-3 highlight the results of this analysis for one particular loop.

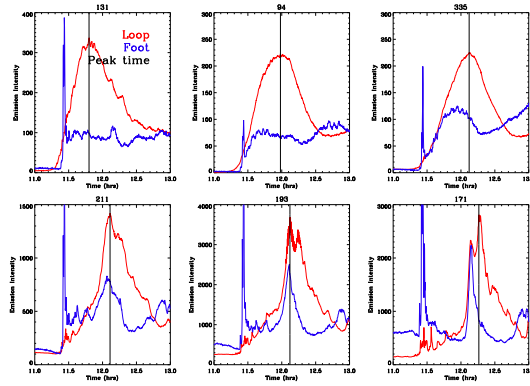


FIGURE 1. Emission intensity of a loop as viewed in different wavelengths during the flare. The vertical black line highlights the time calculated for the peak emission intensity. In this case the peaks for all wavelengths are obvious, although in other cases, smaller local peaks were identified as only the highest characteristic temperatures are to be considered.

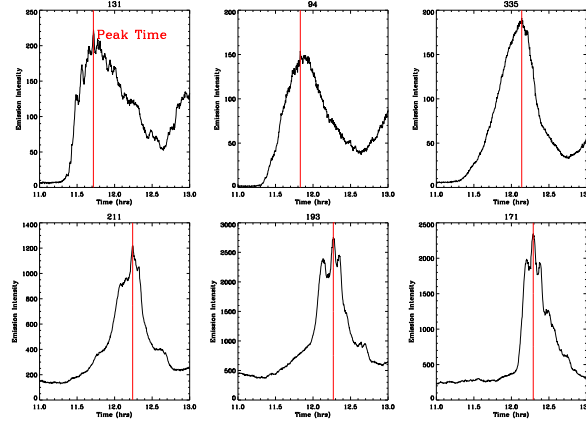


FIGURE 2. Emission intensity of a pixel within the Fig. 1 loop as observed in different wavelengths during the flare event. Again, the peak identified is highlighted with the vertical line.

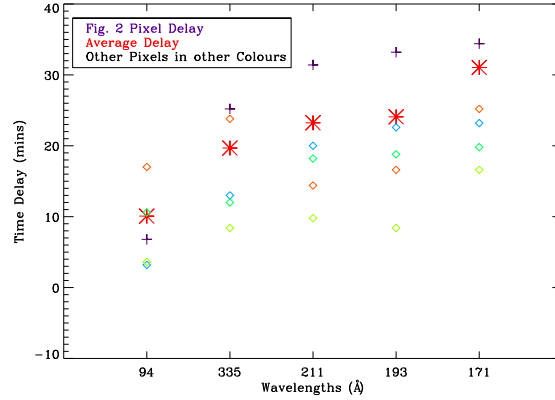


FIGURE 3. Time delay between the onset of flaring and peak emission intensity at different wavelengths for each pixel in a particular loop. This figure corresponds to the loop shown in Fig. 1. The pixel shown in Fig. 2 is highlighted and the average delay taken from all pixels in the loop is also shown.

Generally, the delays observed in peak emission for each wavelength follows an expected trend with wavelengths corresponding to higher temperatures peaking earlier. Other wavelengths then peak later as the solar plasma cools to temperatures associated with these wavelengths.

## 2. LECTURES AND SEMINARS

This week saw a continuation of the talks given by British speakers with the delivery of Professor Priest's second pair of lectures on Magnetohydrodynamics. The process of reconnection and its consequences in the sun were considered. Reconnection in a 2-D plane was explained to be relatively well understood whereas the corresponding process in three dimensions was shown to be far more complex. Various numerical simulations of magnetic reconnection in 3 dimensions were explored and the concepts of magnetic separatrices and null points were introduced. Furthermore, two seminars were given during the week. Dr Anthony Yeates, a lecturer from Durham University spoke on the subject of magnetic helicity and how it is gauge dependent but in some sense relates to the winding number with respect to a specific reference frame. The second seminar, given by Graham Kerr, a graduate student from The University of Glasgow discussed the phenomena of white light flares and the physical processes that may result in an observed brightening in the visible spectrum.