Determining coronal bright point size via cross-correlation using multi-wavelength images from AIA/*SDO*

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ABSTRACT

Subject headings: Sun: corona-Sun: bright points-

1. Introduction

Bright points are located in the junctions between supergranules in the solar photosphere. These are thought to be a result of magnetic flux tubes moving to these junctions after rising to the surface and being jostled about by advection (source: class notes?). Though they only cover about 1.6 % of the visible surface (Srivastava & Dwivedi (2010)), bright points (together with sunspots) contribute over 90% of the total magnetic flux (Howard & Stenflo (1972)).

Over the course of the solar cycle, they can contribute significantly to the global intensity variation of the sun, particularly in the ultraviolet regime (Riethmüller et al. (2014)). UV flux from bright points can be studied using their coronal counterparts.

These bright points can be seen in the upper layers of the solar atmosphere in the form of coronal bright points. The cross-sectional area of these BPs is known to increase in height as the density decreases and temperature increases (source).

2. Data

This analysis was carried out on data from AIA/*SDO* (Lemen et al. (2012)). A grayscale image of the full disk at the start of the time series () is shown in figure A single coronal bright point was located and analyzed in each passband, of which there were seven total. Each of these wavelengths corresponds to emission from a different ion, hence a different temperature/height above the solar photosphere. An image of the bright point in each of the wavelengths is shown in figure also at the beginning of the time series.

The relevant values for each passband are given in table 1.

Wavelength [Å]	Temperature [K]	Height [km]
94	10^6	11
131	10^6	11
171	10^6	11
193	10^6	11
211	10^6	11
304	10^6	11
335	10^6	11
1600	10^6	11
1700	10^6	11
4500	10^6	11

Table 1: stuff

3. Analysis

The intensity of each BP as a function of radius gives a rough visual estimate of the size of the BP. Here the estimate was taken a step further, using the cross-correlation of the BP pixels through the entire time series.

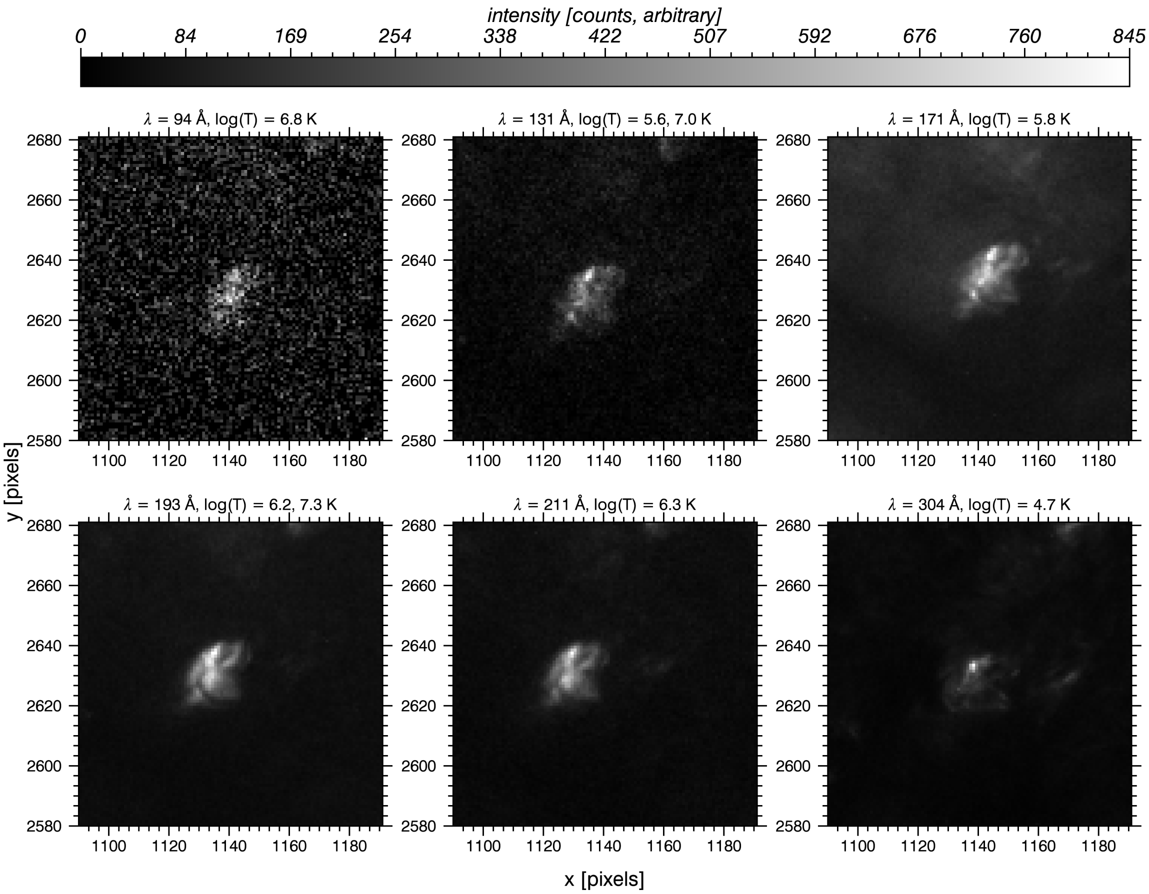

Fig. 1.— Images of the BP in six different AIA wavelengths.

4. Results

5. Conclusion

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Srivastava, A. K., & Dwivedi, B. N. 2010, MNRAS, 405, 2317

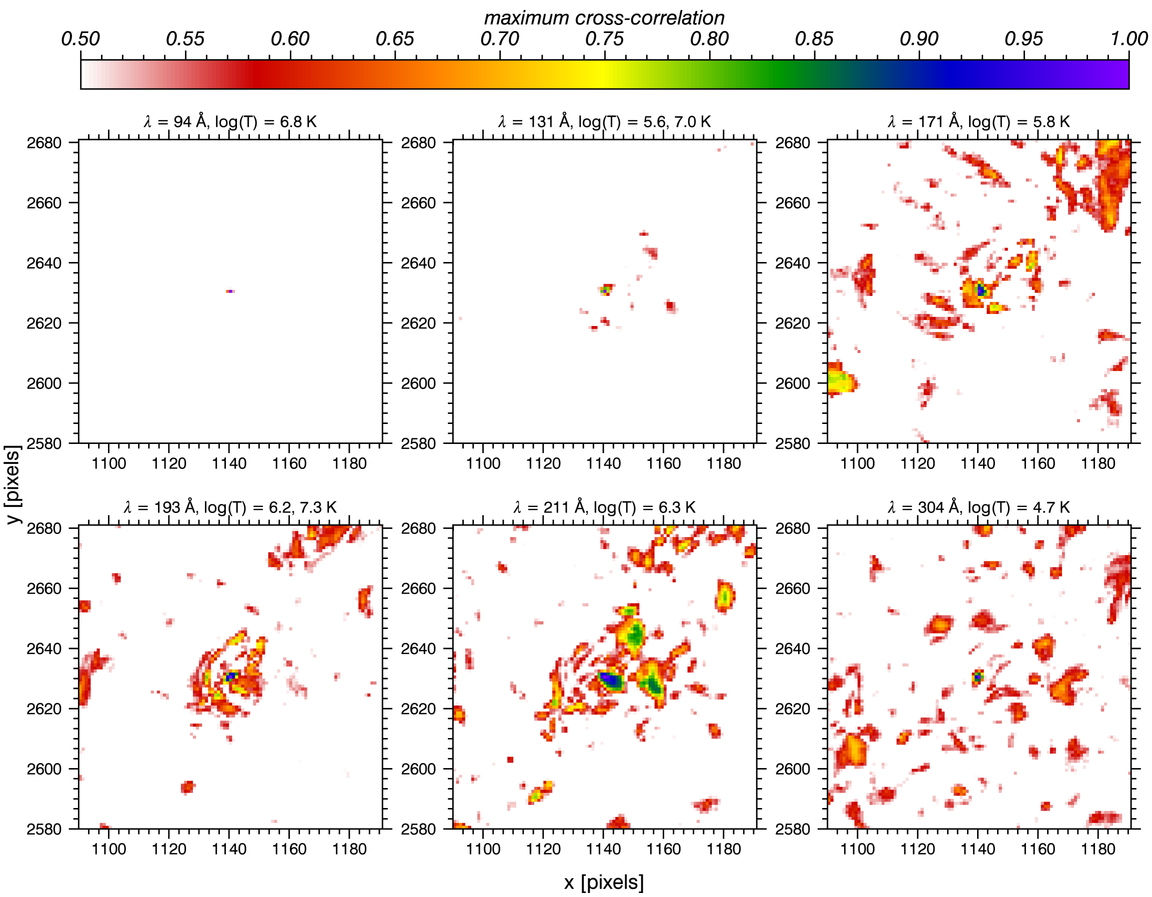

Fig. 2.— Cross-correlation

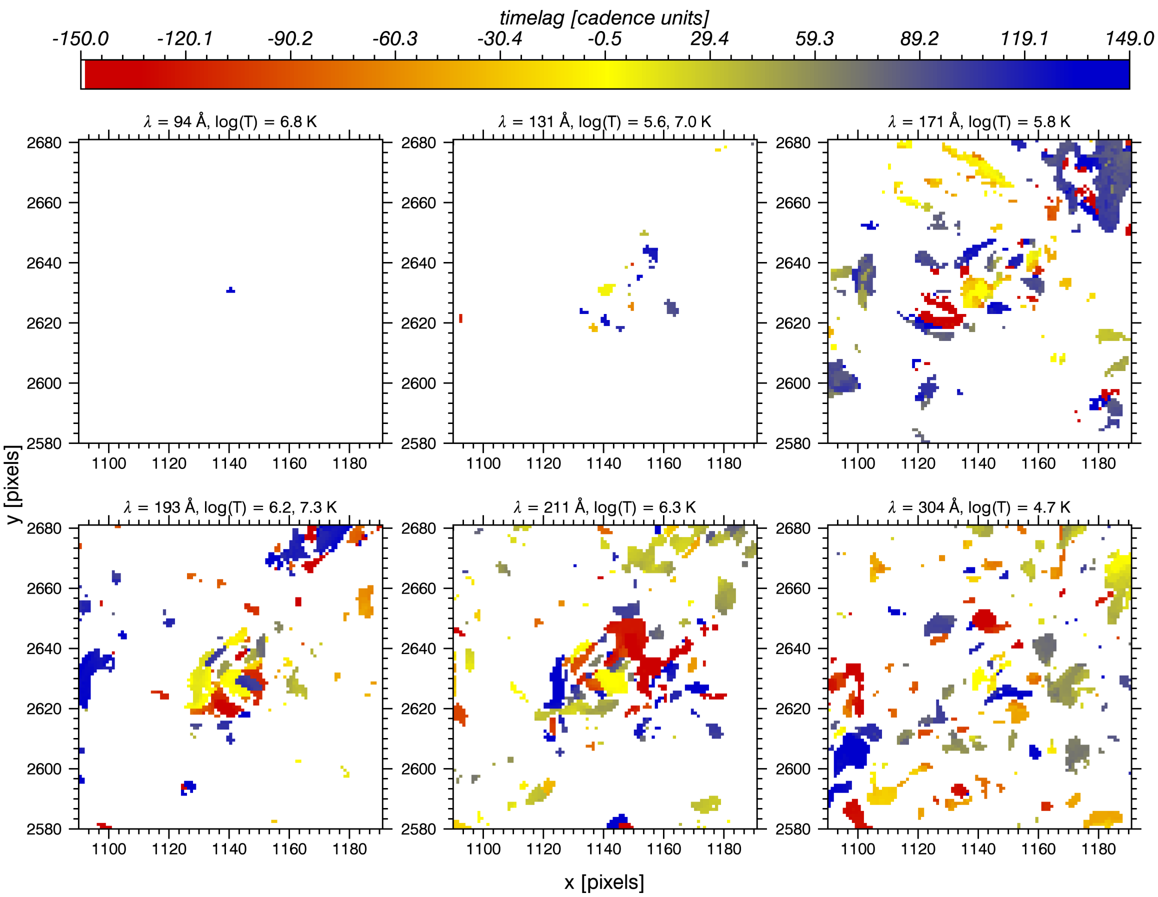

Fig. 3.— Timelag

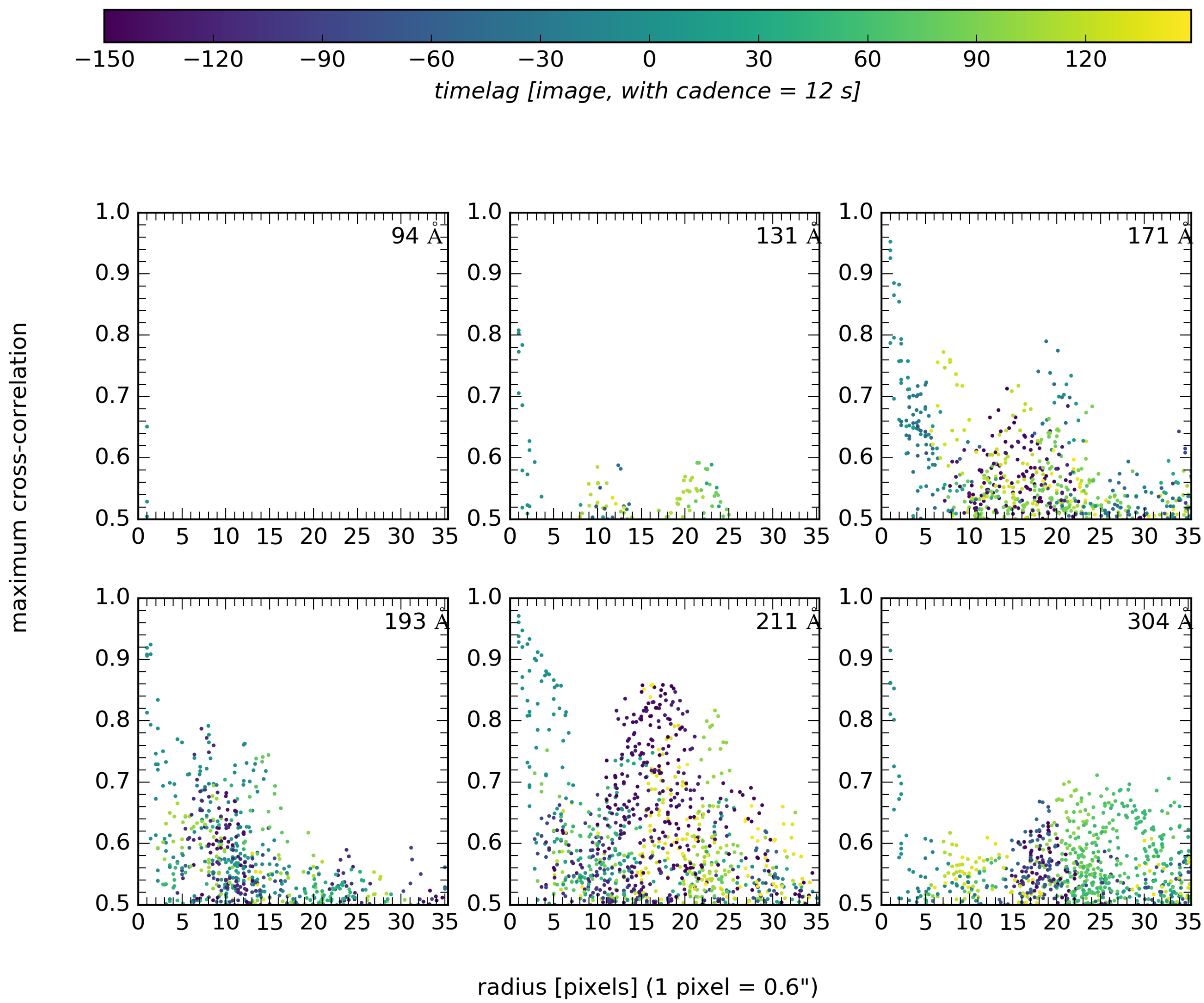

Fig. 4.— The highest cross-correlation value of each pixel is plotted against its distance from the center pixel. The color indicates the timelag at which the highest cross-correlation occurred.

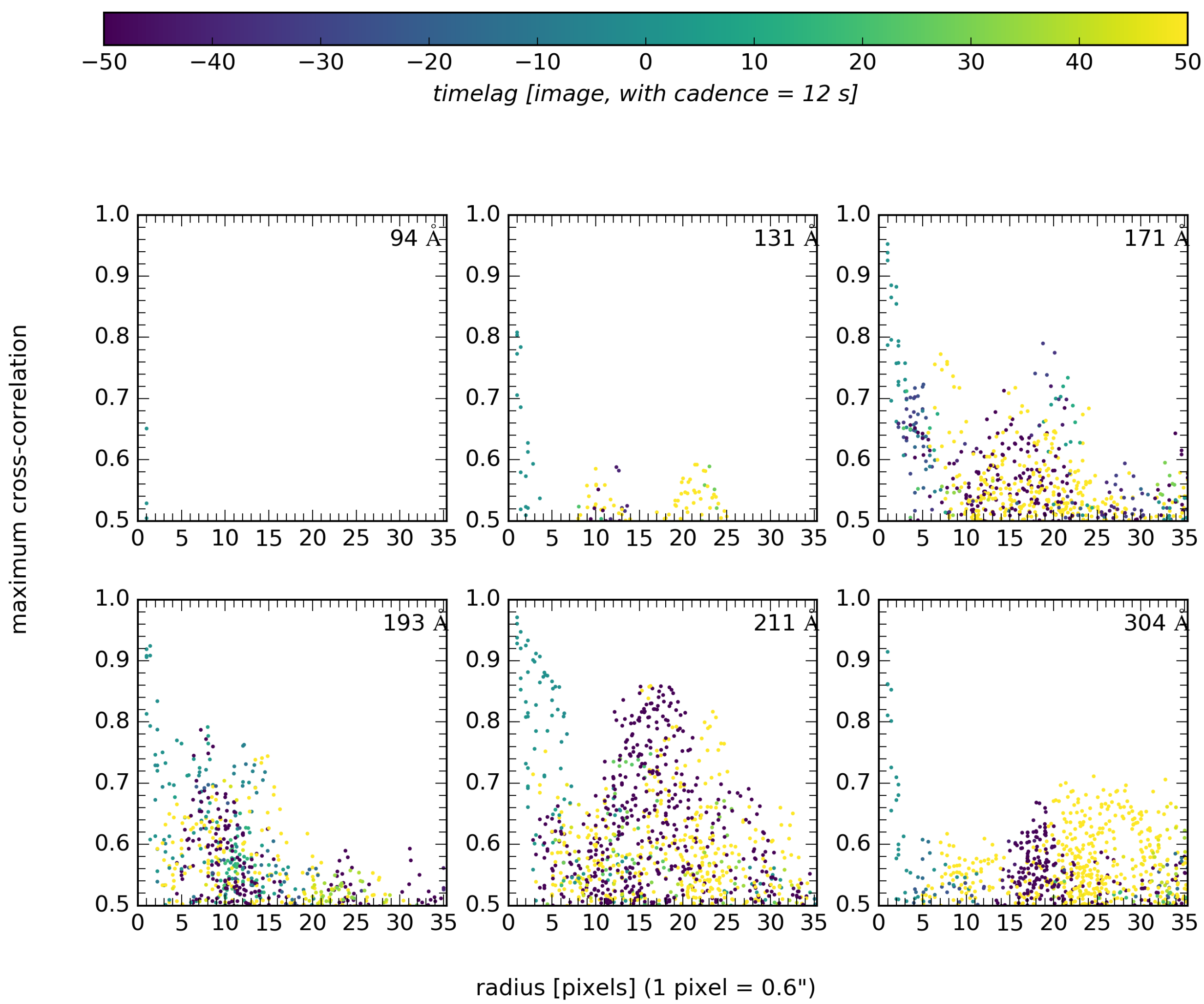

Fig. 5.— Same as figure 4, but with two thirds of the timelag cut out.