

TIME VARIATIONS IN CORONAL ACTIVE REGIONS

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Summary. The AS&E X-ray telescope experiment on Skylab has obtained images of the solar X-ray corona with a variety of time resolutions ranging from $2\frac{1}{2}$ s to the regular 12 ± 2 h synoptic observation rate. The form and brightness of coronal active region structures are seen to vary on time scales ranging from seconds, for flare associated changes, to several solar rotations for long term evolution of the regions. The extrapolation of photospheric magnetic fields into the corona, using the potential field approximation, results in a good morphological agreement between the form of the computed coronal field lines and the structure of many of the active regions observed. Thus, in general, the coronal active region structures follow potential field lines and the long term evolutionary changes can be explained on the basis of the spreading of the fields. Short term changes in active region structure frequently take the form of selective brightening or dimming of pre-existing loops due to changes in the pressure of the emitting coronal plasma. In these cases, variations in the non-potential component of the coronal fields supporting and containing the plasma are implied.

The examples shown included the behavior of the X-ray active regions associated with McMath-Hulbert Ca plages 12387 and 12511. McMath 12387 was a magnetically complex, inverted polarity region with complicated X-ray structure. The emergence of new magnetic flux and a class M2 X-ray flare were accompanied by a change in the temperature from less than 2×10^6 to more than 3×10^6 K of some (but not all) of the extensive loop structures of this region without significant change in the form of the structures. McMath 12511 was a two day old simple bipolar region with two compact X-ray emitting loops crossing the neutral line. A subflare in this region was preceded by the gradual brightening of one of these loops. The flare itself consisted of an increase in the surface brightness of this loop of a factor of 20 in less than 2 min and a return to the preflare level in about 3 min. The form of the loop was unchanged through the event.