

Statistical analysis of the Speckle applying the "Hinode" / XRT

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" When a charge-coupled device (CCD) image is taken, white noise will appear identically main CCD image. For example, the trajectory of noise is watched like scar, small spot and snowstorm, which is called as spike, unwanted signal, and so on. In this study, noise is called " Speckle " . The speckle is due to the particle nature of photon when CCD is hit by Solar Energetic Particle(SEP) or cosmic ray.

SEPs have high energy of 10 keV - 10 GeV, which are generated by solar flare, coronal mass ejection(CME). This reason is that SEP plays an important role in space weather. When SEPs with high energy of GeV order will come to earth magnetosphere, low earth orbit (LEO) satellite would be damaged the potential of single events like SEPs effect.

For this reason, this study analyzed Hinode / X-Ray Telescope (XRT) images and detected speckles. Analysis period is from January 2011 to July 2013. As a result speckles were periodic fluctuations and significantly increased, when on 00:04 UT March 7 2012, X5.4 Flare occurred.

Number of detected speckles had a time zone is 3 or 4 times as high as before the occurrence of the Flare. In addition periodic fluctuations are synchronized with orbital period. Moreover information of the satellite orbit indicates speckles increase over the High Latitude Zone (HLZ). Although this is suggested SEPs flow in HLZ, there is a region with high geomagnetic latitude, so speckles are caused by charged particles of non-SEPs.

This study reports on detailed consequence. Besides it looks at the correlations between decrease or increase in speckles and information of the satellite orbit or solar activity.

Keywords: Space Weather, SEP, Flare, CME, Hinode/X-Ray Telescope(XRT)