Classification of mini-dimmings associated with extreme ultraviolet eruptions by using graph theory

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Abstract
Coronal dimmings in both micro and macro scales, can be observed by extreme ultraviolet images, recorded from Solar Dynamics Observatory or Atmospheric Imaging Assembly (SDO/AIA). Mini-dimmings are sometimes associated with wave-like brightening, called coronal mass ejections. Here, the sun full disk images with 171 Å wavelength, cadence of 2.5, and 0.6 arcsec cell size, were taken on 3 March 2012, then the obtained data were analyzed. Using Zernike Moment and Support Vector Machine (SVM), mini dimmings are detected. 538 active region events, 680 coronal hole events and 723 quiet sun events have been recognized using algorithm. The position, time duration and spatial expansion of these events were computed. The eruptive dimmings have a more spatial development than thermal dimmings after eruptions. This is evident in their graph characteristics length. Then, using graph theory, eruptive and thermal mini-dimmings were classified, with 13% error, for 200 dimmings. 68 dimmings were classified as thermal, and 132 as eruptive. To do this, evolution of graph characteristic length were used.

Keywords: sun, mini - dimmings, coronal mass ejections, Zernike moments, support vector machine

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