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DEVELOPMENT OF SOLAR FLARE PREDICTION TECHNIQUE BASED ON IMAGE PROCESSING OF REAL-TIME SOLAR MAGNETOGRAM DATA

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Many flare prediction techniques currently used are based on the statistics of white light sunspot observations in the past. It is generally known that bigger and more complex sunspots tend to produce larger flares in higher possibility. Recent solar satellite observations have enabled the real-time steady observations of magnetogram, i.e. direct observations of magnetic field in the sunspots, and also gave us a chance to predict flares by measuring the amount of stored energy in the sunspot and capturing the appearance of trigger features around there. Now we are developing a new method to predict flares based on the data of the magnetogram images taken by HMI telescope on board SDO satellite of NASA, by coupling with the image processing techniques. At first, from the magnetogram data, we detect the sunspot region, where the flare occurrence is highly expected. Secondly, we calculate the characteristic values: physical parameters, like the sunspot area, the magnetic field strength and the share angle of the horizontal magnetic field along the polarity inversion line, and image parameters characterizing the sunspots, like colors and shapes. We have been preparing a series of database of these physical and image characteristic values, from which we statistically investigate the status of the sunspot just before the flare occurrence and try to find what are most important values for flare prediction. Finally, this system will be developed to the one for the real-time operation, which automatically detects the active region, measures the characteristic values, and estimates the amount of stored energy and the risk of flare occurrence.