Forecast of the Solar Flare Magnitude from the Photospheric Magnetic Field Properties

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The solar flare is a transient phenomenone, and have great influence on the solar-earth environment. It is important to forecast that when, where and how large flare occurs.In this study, we compared solar flare magnitudes and photospheric magnetic properties quantitatively for the purpose to forecast that how large flare occurs.

We adopted the linear fitting method to the photospheric magnetic properties and the solar flare magnitudes, and evaluated a simultaneous tolerance interval.

Data samples are 22 flares and 14 active regions. The solar flare magnitude is got from the GOES satellite 1-8 angstrom data. Maximum flare is X17 (1.7 x 10ˆ-3 W/cmˆ2), and minimum flare is A5 (5.0 x 10ˆ-8 W/cmˆ2). The photospheric magnetic properties are got

from the Solar Flare Telescope (Mitaka, Japan) vector magnetograms and the SoHO/MDI magnetograms. The photospheric magnetic properties are magnetic flux, magnetic field strength, current density and others. We adopt the linear fitting method to the magnetic properties and the flare magnitude. With this linear fitting equation a probability and a confidence level are set, a simultaneous tolerance interval is got. If we use the magnetic field strengths and the flare region area as magnetic parameters, a simultaneous tolerance interval is about factor 1.8 with 0.90 probability and 0.90 confidence level, and about factor 13.8 with 0.95 probability and 0.95 confidence level.

These photospheric magnetic properties are got from flare brightening regions. However, it is difficult to forecast where a next flare occurs. So we also use the magnetic properties got from the strong shear regions and entire active regions. In this presentation, we explain these parameters and results in detail.