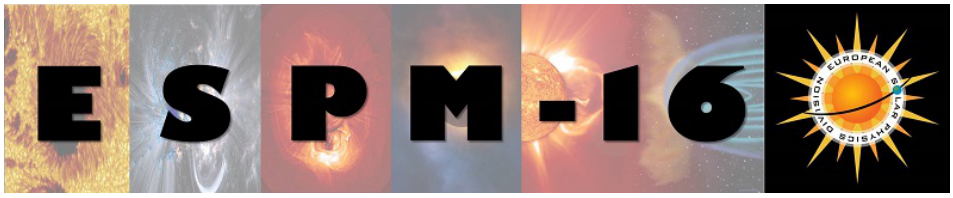

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On the possibility of probing the flare productivity of an active region in the early stage of emergence

Wednesday 8 September 2021 14:39 (13 minutes)

Prediction of the future flare productivity of an active region (AR) when it is in the early-emergence stage is a longstanding problem. The aim of this study is to probe two parameters of the photospheric magnetic field, both derived during the emergence phase of an AR, and to compare them with the flare productivity of a well developed AR. The parameters are: (i) the index of the magnetic power spectrum (the slope of the spectrum) at the stage of emergence, and (ii) the flux emergence rate. Analysis of 243 emerging ARs showed that the magnetic power index increases from values typical of quiet-Sun regions to those typical of mature ARs within a day, while the emergence proceeds for several days; frequently, after the increase, the value of the power index oscillates around some mean value with the fluctuations being several times smaller than the growth of the power index during the emergence onset. For a subset of 34 flare-productive ARs we found no correlation between the power spectrum index at the stage of emergence and the flare index derived from the entire interval of the AR's presence on the disc. At the same time, the flux emergence rate correlates well with the flare index (Pearson's correlation coefficient is 0.74). We conclude that a high flux emergence rate is a necessary condition for an AR to produce strong flares in the future; thus the flux emergence rate can be used to probe the future flare productivity of an AR.

Student poster?

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