Abstract

This investigation uses the entire set of synoptic line-of-site magnetograms from the SOHO Michelson Doppler Image (MDI) to calculate multiple characteristics of the magnetic field in active regions. These measures are calculated for the disk passage of 1075 NOAA active regions spanning Solar Cycle 23 from 1996 - 2009 in an attempt to determine the ability of line-of-sight magnetograms to be used as a predictor of coronal mass ejections (CMEs) and solar flares. Previous studies of this nature have been restricted to a relatively small sample size.

This expansive study is accomplished by using an IDL code that automatically searches the MDI database for data related to any NOAA AR, identifies the primary neutral line on remapped data [Bokenkamp, 2007], applies a constant-alpha force-free field model [Allsandrakis, 1981], and calculates several measures of nonpotentiality [Falconer, 2008]. Superposed epoch plots were produced for these measures surrounding various “Key times” (see Analysis). These plots were used to seek out any pre- or post-flare signatures with the advantage of the capability to resolve weak signals.

Individual AR example: 8910

The only selection criterion imposed in this study is that the AR must be within 30 degrees of disk center to minimize projection errors. See right for description of parameters. The temporal location of an M2.6 flare is marked by a vertical bar (physical location indicated by point of lightning bolt at top of poster). The plots to the right show that the parameters have a strong response to the flare. But is this a typical response? Superposed Epoch (SPE) analysis can help answer this question.

Conclusions

While a flare response is evident in the above SPE plots, they lack the type of strong signal response required for accurate space weather forecasting. Further study will include the time variation of total flux (dTOT). Vector magnetograms provide the opportunity to calculate many more parameters (more flare indicative), parameters, SDO will be an excellent source for such data.

References: