



www.SolarMonitor.org

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What is Solar Monitor?

The main purpose of **Solar Monitor** is to provide near real-time information on solar activity. It is accessible to a wide variety of users, ranging from solar physicists to amateur astronomers. It has an easy-to-use layout with many features including active region information, flare forecasting and full solar disk images. Our project focused on improving and maintaining the site. Our tasks included repopulating flare history links (see Active Region Table), replacing AIA 4500 Å with better resolution HMI Continuum images and layout improvements.

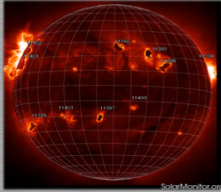


Figure 1 - XRT Full Disk Image

Real Time Full Disk Images

On a periodic basis, **Solar Monitor** downloads data from a variety of astronomical instruments, including data taken at optical, EUV and X-Ray wavelengths. This data is then processed and full disk images are created to display on the site (See Fig. 1).

One of the main features of these images are the **NOAA Active Regions** which are overlaid on the images using Solar Monitor techniques. These regions are assigned on a daily basis and allow for quick and easy identification of sunspot location, area and other properties.

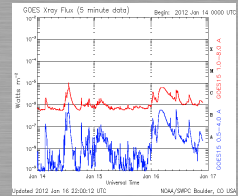


Figure 2 - GOES Plot of X-Ray Flux

Flare Forecast

Solar Monitor offers its own Flare Prediction System, using a combination of TCD's Poisson-based model¹ and NOAA's Space Weather Prediction Center (SWPC) data.

Active Regions are given, along with their percentage probability of producing C-, M- or X-Class events in the following 24 hour period. These percentage probabilities are based on the number of flares produced by regions, classified using the McIntosh Classification Scheme², during the 21st and 22nd solar cycle.

This data was used to calculate the average number of events expected (μ) in a given time interval. Thus an equation for calculating flare probability (P_{μ}) in a 24 hour period can be given as follows:

$$P_{\mu}(N \geq 1) = 1 - \exp(-\mu)$$

The screenshot shows the Solar Monitor website interface for August 13, 2013. It features a navigation bar with 'Date Search', 'NOAA Search', and 'Rotation' options. Below the navigation are several solar images from different instruments: GONG Mag, HMI 6173A, GHN Ha, AIA 171A, AIA 193A, and XRT. A 'Flare Forecast' section is visible on the left, and 'GOES ACE SDO/EVE Events' and 'IDL Access' are on the right. A 'LATEST' section at the bottom highlights 'Most Active Region - NOAA 11817 - 1 M-class and 1 C-class flare'.

Time Series Data

GOES: This provides access to in-situ measurements of X-Ray and high-energy particle fluxes. The data is given as time-series plots (See Fig.2)

ACE: Access to Solar Wind property measurements. Plots of both plasma and magnetic field are available here.

SDO/EVE: Latest data from the EUV Variability Experiment is provided here. Plots include both 3 Day and 6 hour light curves.

Events: Links to latest solar events information such as SolarSoft and SWPC.

IDL Access

Solar Monitor data is available via SolarSoft using IDL. Enabling users to download, plot, print out or make movies from any of the available data.

Mobile Version

The website has been modified for use on smartphones or tablets.

This version can be simply accessed by scanning the QR code below:



Today's Active Region Table

This table contains the properties of each active region. These properties are extracted from the Solar Region Summary for the current date and the previous date.

The Group Number is a unique number assigned to each new active region by the National Oceanic and Atmospheric Administration (NOAA). The group number is also a hyperlink and by clicking on the link you will be brought to a new page, which contains close up images of the active region (Fig. 3).

The Location is the position of the active region at the end of that date. The positions are given in both the heliographic (latitude and longitude and heliocentric (arc seconds from the center of the Sun) coordinates.

The Hale Class is a classification system for sunspots based upon their complex magnetic structure.

The McIntosh Class² is a classification system which is based on the sunspots over all characteristics. These characteristics include polarity, size, complexity and elongation on the solar disk.

The Sunspot Area is the overall area of the sunspot group in millionths of the Sun's visible hemisphere.

The Number of Spots is the number of sunspots larger than 10 Millionths of the Sun's visible disk that form the active region.

The Flares History provides information on the type, magnitude, start time and the number of the flares that have occurred in an active region. By clicking on one of the flares, you are brought to a new page which contains more information about the flare.

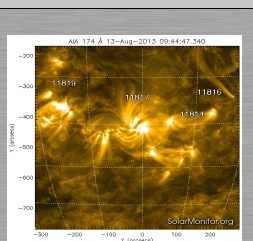


Figure 3 - A magnified image of NOAA region 11817



- Gallagher, P. T., Moon, Y.-J., Wang, H., Solar Physics, 209, 171, (2002).
- McIntosh, P., 1990, Solar Physics, 125, 251