ABSTRACT

NOAA’s Space Weather Prediction Center and NOAA’s National Geophysical Data Center are enthused to be able to provide on-line access to additional historical space weather records. The one that will be most familiar to customers, the Report of Solar and Geophysical Activity (RSGA), also known as the daily forecast, is now available back to June 20, 1966. From 1966 through 1987, these are scanned in pdf files that unfortunately are not text searchable. The forecasts since 1988 are on-line as ascii text files, which are text searchable. The forecasts are available at http://www.swpc.noaa.gov. When reviewing the solar and geophysical activity, it is sometimes helpful to have a view of all of the data and the patterns inherent in the data. They show features such as neutral lines, coronal hole boundaries, active regions, plage, filaments and prominences. Also included is specific information about the coronal hole polarity, active region numbers, flare probabilities for each region and the proton event probabilities for each region. The neutral line drawings are available at http://www.ngdc.noaa.gov.

In this paper, we describe the elements in a typical forecast and neutral line drawing, show some historical examples of both, and show how they can be accessed. Now, you can see how well SWPC forecasted your favorite, or not so favorite space weather storms. For those younger than a certain age, you can find the forecast for the day you were born. I’ll be as good as any horoscope. Unfortunately, the record is incomplete, so it can be difficult to keep track of paper records for 45 years.

DAILY SYNOPtic DRAWING (aka NEUTRAL LINE DRAWING)

The SWPC Solar Synoptic Analysis is done each day to provide the forecaster with a “snapshot” of the solar environment. The word “synoptic” means to “see together.” The purpose of this reporting is to organize the facts on the coronal holes as a common point – time. SWPC’s synoptic analysis can be compared to the NWL terrestrial weather map which shows the positions of high and low pressure systems, locations of fronts, and other weather parameters.

Active Regions (Sunspot Drawings)

Active regions of the sun are localized areas on the Sun with intense magnetic fields. The strongest magnetic fields provide energy for solar flares and coronal mass ejections (CMEs). Thus, monitoring of active regions is critical to accurate forecasting of space weather activity. Active regions are assigned their official numbers by SWPC. The Synoptic Drawing from August 15, 1981 shows many active regions with NOAA numbers from 3256 to 3275. Underneath the annotation of the NOAA Active Region number are shown the probabilities of C, M and X class flares for the next 24 hours and if non-zero, the proton probability is also shown (e.g. 3257 and 3266).

Coronal holes (X-Ray and He 10830)

Coronal holes are unipolar magnetic regions that are the source of high speed solar winds. Coronal holes appear dark on the sun. They are regions without magnetic field lines and lack strong magnetic field densities. Traditionally, coronal holes have been identified from the X-ray observations which can be made from ground based observatories. The coronal holes are important to space weather because the high speed winds can generate coronal mass ejections (CMEs) in the solar wind and the high speed wind itself drives magnetosheath activity. The most common source of geomagnetic storms are coronal holes, though these are usually only very weak storms. The boundaries of coronal holes are shown on the synoptic drawings with curved lines and in the quiet sun filament/prominences will lie along the neutral line. Neutral lines appear as dashed lines on the synoptic drawings and the forecaster indicates the direction of the magnetic field on either side of the neutral line with + (positive) and – (negative) signs.

Neutral Lines (Magnetogam)

Any time the magnetism field on the Sun organizes itself into large structures of one magnetic polarity or the other, there must be a “neutral line” at the boundary of the magnetic polarity. In active regions, neutral lines are associated with the separation of the magnetic field lines in the loop and in the quiet sun filament/prominences will lie along the neutral line. Neutral lines appear as dashed lines on the synoptic drawings and the forecaster indicates the direction of the magnetic field on either side of the neutral line with + (positive) and – (negative) signs.

Plage and Filaments/Prominences (H-alpha)

Plage: Most of an active region’s area is usually occupied by plage and whereas sunspots appear dark, plage shows up as bright. It is due to plage that the Sun is brightest at solar minimum. Areas of plage are the most strongly magnetic fields, but the fields are less highly organized as it is in sunspots. In the synoptic drawings, plage is shaded in with a red pencil. It is typical to have regions of plage with no sunspots. These are not considered to be active regions and do not get an official number, as plage regions usually don’t produce any solar flares.

Filaments/Prominences: Filaments (on disk) and prominences (at the limb) are meta-stable regions of high density suspended in the low density corona. These are considered meta-stable because they can erupt becoming a coronal mass ejection but sometimes they just fade away. When they erupt they then become a geomagnetic storm thread. These eruptions are usually slow and don’t often drive very large storms. The filaments and prominences are drawn as outlines with magnetic field lines showing the area of the filament/prominence. Some of the most dramatic images of the Sun have been taking with prominences mid-eruption.

SPACE WEATHER FORECAST (REPORTS OF SOLAR GEOPHYSICAL ACTIVITY)

Forecasts of space weather activity have been in routine operation for 90 years per day since the 1960’s. Currently, it is issued once per day at 2200 UT, with an analysis and summary of activity from 2100 UT on the previous day up to 2100 UT on the current day. It includes forecasts of solar and geophysical activity for the next 3 days. When issued more than once per day, the additional forecasts would often contain information which had changed since the previous forecast.

All the Neutral Line Drawings are available from NGDC at: http://www.ngdc.noaa.gov/ndc/aurora/ftp.html?10830/I&.base=I&1160.9
Then choose Boulder as the Observatory

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