Using This Flip Chart

When a solar flare or CME erupts from the Sun, a radio signal is emitted that reaches Earth in a little over 8 minutes! By following the steps in this flip chart you will soon be able to answer the big question, **“Have signals been recorded today due to a flare or CME that could affect Earth?”**

In the flipchart you will find **INSTRUCTION CARDS** followed by **INF0RMATION CARDS**.

- **INSTRUCTION CARDS** contain every step necessary to obtain, analyze and record all required online data.

- **INFORMATION CARDS** contain a variety of sample images and helpful tips when interpreting and analyzing the data.

Don’t forget to keep your **Data Collection Sheets** nearby in order to collect all of the information you will need to complete your Space Weather News Report!

Space Weather Data
sunearthday.nasa.gov/swac/data.php

Using This Flip Chart

COLOR CODING

We have divided all of the Space Weather Action Center resources into four 'color-coded' categories: Sunspot Regions (orange), Storm Signals (green), Magnetosphere (blue) and Aurora (purple). The same color code scheme is used in the flipchart, the data collection sheets and on the Live Data and Tutorials webpage. You can always know which section you're in with one quick glance!

SPACE WEATHER DATA

All of the data links required to make your space weather observations are located on this single webpage. Beside each of the '**live data**' links you will also find '**tutorial**' links containing easy to read tutorials that that will help you when interpreting the data. You can always find your place by returning to this page!

THE SPACE WEATHER MEDIA VIEWER

The Space Weather Media Viewer is one of the main observation tools that you will be using. Once the Viewer is open, we recommend that you simply keep it open in a separate browser tab or window for faster data access when needed.

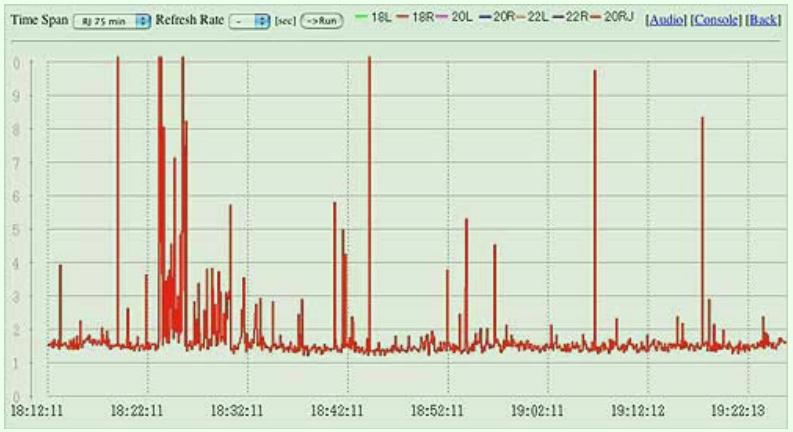
Space Weather Data
sunearthday.nasa.gov/swac/data.php

University of Florida Radio Observatory

1. Open '**Space Weather Data**' and click on " **University of Florida Radio Observatory "** (live data). The "Internet Jupiter Radio Observatory" website will open.
2. Click on the word [**Run**] in the third line. You will see a graph with several multi-colored lines showing data from several different antennas.
3. Adjust the graph so that it only shows data coming from the ground-based radio receivers in Florida. This can be done by using the 'drop down' lists in the upper left hand side of the webpage:
   - From the "**Time Span**" list, select '**RJ 15**'
   - From the '**Refresh Rate**' list, select '**30**' seconds. (You can select faster or slower refresh rates if desired.)
   - Click '**Run**'
4. You should now see a single red graph. This is the Radio JOVE receiver in Florida. (NOTE: If you see a *straight red line*, the data is currently unavailable . Simply move on to the next section, "GOES X-ray Flux (5 minute data)"
5. Refer to your '**Storm Signals Data Collection**' sheet to answer questions **(a)** through **(d).**
6. Close the current window and return to '**Space Weather Data**' .

University of Florida Radio Observatory

ANALYSIS TIPS:



Sharp spikes in the graph are usually due to man-made signals or lightning strikes.

The graph of a solar storm would show a gradual rise and fall in the signal over several seconds to several minutes and would look somewhat like a shark's fin.

ABOUT THE DATA:

When a solar flare or coronal mass ejection erupts, hot, charged particles are accelerated away from the Sun. When this happens, a radio signal is emitted that reaches Earth in a little over 8 minutes providing the first signal that a solar storm is headed our way. However, the particles from that same storm usually take up to 3 days to reach Earth.

Solar flares and Coronal Mass Ejections (CMEs) emit a broad range of light. Most of this light is invisible to us. To detect solar storms we will use radio waves, x--rays, and ultraviolet light. Radio waves are especially useful because they can be measured by instruments on the Earth and in interplanetary space.

Space Weather Data
sunearthday.nasa.gov/swac/data.php

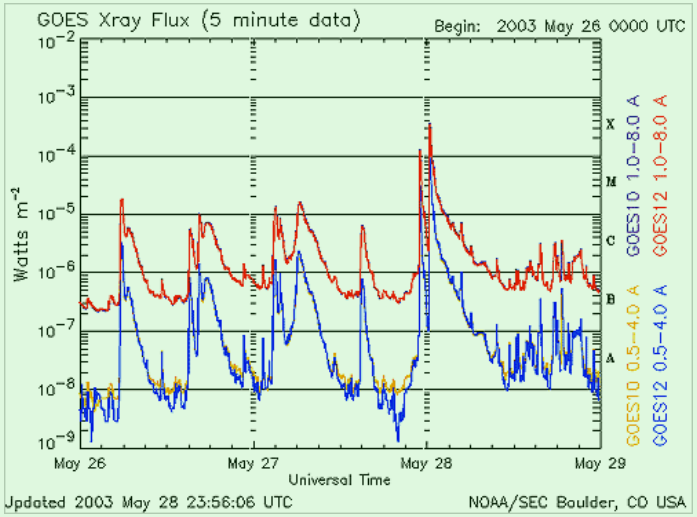
GOES X-ray Flux (5 minute data)

1. Open '**Space Weather Data**' and select '**GOES X-ray Flux (5 minute data)**' (live data). Observe the red line on the graph. This line indicates the level of solar activity that will affect Earth.
2. Using the solar x-ray activity scale (A,B,C,M, and X) along the right side of the graph, determine the power of the solar storm.
   - Levels A and B indicate that *Aurora* sightings are only possible in higher latitudes.
   - Level C indicates that *Aurora* sightings are possible further south.
   - Levels M and X indicate that *Aurora* sightings are possible as far south as Texas!
3. Refer to your '**Storm Signals Data Collection**' sheet to answer questions **(e)**, **(f),** and the (**Comprehension Question**).
4. Close the current window and return to '**Space Weather Data**'.

GOES X-ray Flux (5 minute data)

ABOUT THE DATA:

X-rays are continually emitted from the Sun. However, detecting significant increases in the intensity of those x-rays can provide an early warning of a solar storm. Scientists have developed a simple rating system for this solar x-ray activity.

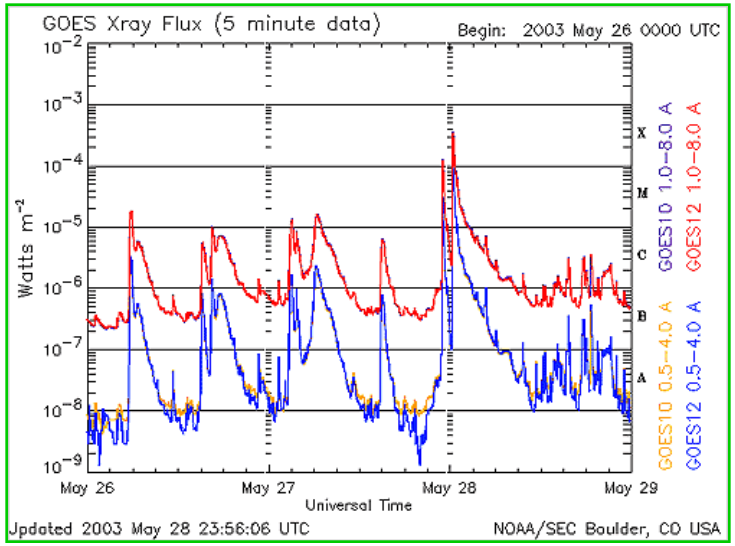


The solar x--ray activity scale along the right side (A,B,C,M, and X), determines the intensity of the solar storm. A is the lowest level, B is 10 times more powerful than A, C is 10 times more powerful than B, M is 10 times more powerful than C, and X is 10 times stronger than M. So this makes an X event 10,000 times stronger than A. In addition, each level can be further divided from 1.0 to 9.9. This means you could have a C2.3 event, or a B7.9 or an M6.5.

Even though X is the highest level, the numbers don't stop at X9.9. In October 28, 2003 there was an X17.2 flare followed several days later by one that was approximately X28. It was actually so strong it was hard to measure. These flares were the biggest ever measured.

Space Weather Data
sunearthday.nasa.gov/swac/data.php

GOES X-ray Flux (5 minute data)



ANALYSIS TIP:
Two GOES satellites record solar x-ray emission, GOES 10 and GOES 12. The red plot from GOES 12 is the one we want to use.

REMEMBER:
This is a 3-day plot. It usually takes 3 days for solar storms to reach Earth.

ABOUT THE DATA:
It is important to find out if these flares were on the side of the Sun facing us. Flares from the side of the Sun facing us are more likely to disturb Earth's magnetosphere than flares that erupt from the edges. You can use images 1-6 on the Sun-Earth Viewer to evaluate the location of the emissions from the Sun.

Space Weather Data
sunearthday.nasa.gov/swac/data.php