SNS • SORCE News Source

Monthly Newsletter

November 2003

(Public news item placed on the SORCE website)

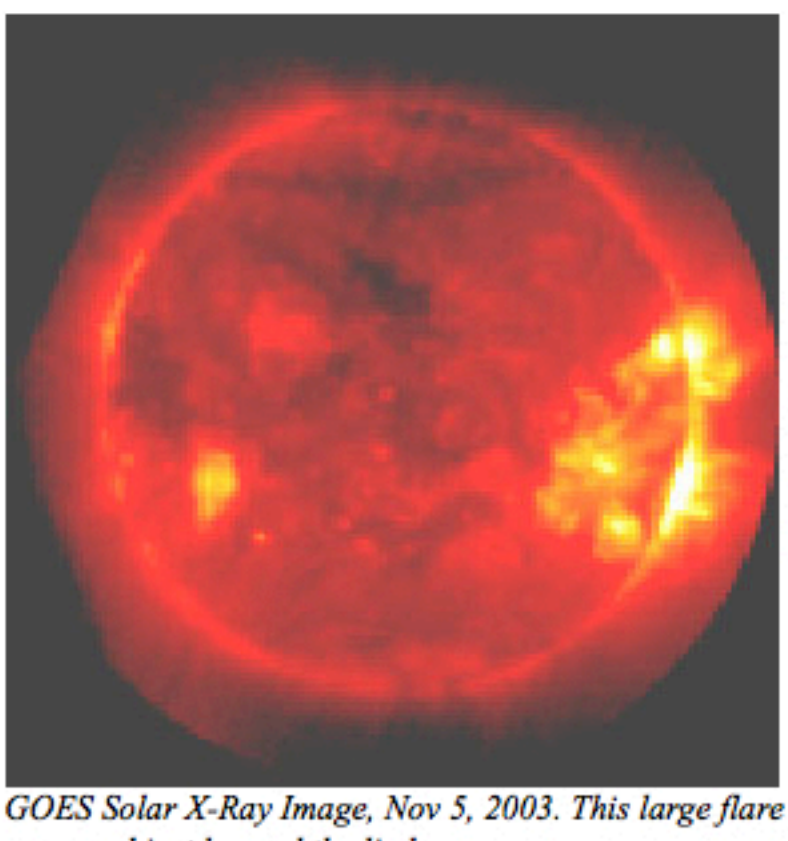
## SORCE Observes Recent Dramatic Flare Activity –

By Gary Rottman

During the last week of October and the first week of November the Sun surprised scientists with exceptionally high levels of activity. The Sun has been carefully observed with ever improving techniques since Galileo first pointed a telescope at it in the early 1600s. The latest enhancements to our observational capability are represented by the four new instruments on NASA's Solar Radiation and Climate Experiment, launched this past January. It is indeed fortuitous that SORCE is available to record the present "fireworks" on the Sun.

From historical observations we know that the Sun moves through a cycle of activity approximately every eleven years, changing from quiet to very active conditions and then returning to its quiet state. The nature of this activity includes the appearance of both bright regions, referred to as plage or faculae, together with very dark sunspots. Both of these phenomena are a manifestation of the Sun's magnetic field erupting from the interior and disturbing the bright surface layer of the Sun. The Sun was very active in 2001 to 2002, and it was generally felt that the Sun was well on its way back to its dormant state. Scientists were therefore quite surprised recently when new and intense magnetic activity appeared on the Sun. Indeed it is remarkable that several of the largest sunspots ever recorded appeared and moved across the solar disk during the week of October 26th.

When the Sun is active it is not unusual for intense flares and coronal mass ejections to occur. These transient phenomena carry large amounts of energy from the Sun to the Earth, and often cause havoc within our environment. The energy comes in two forms of radiation — light or electromagnetic energy that travels at the speed of light and traverses the distance from the Sun to the Earth in roughly eight minutes, and particles, primarily electrons and protons that cover the distance in roughly one day. When this transient energy reaches the Earth it interacts in quite different ways. The particles are charged and must follow the magnetic and electric fields of the Earth with a few penetrating to lower levels of our atmosphere, and causing aurora, but only in polar regions. These particles are so energetic that they easily



*GOES Solar X-Ray Image, Nov 5, 2003. This large flare appeared just beyond the limb.*

pass through spacecraft shielding and often damage sensitive electronics causing satellite failures. In addition, the particles and fields energize the very outer regions of our atmosphere and cause radio communication interruptions. The intense electric fields generated by the particles can also couple energy to power grids at the Earth's surface causing disruption and power outages.

The light radiation from the flare is also very intense, but only in very energetic X-rays (XPS) and far ultraviolet (SOLSTICE), and not in the visible light that reaches the surface of the Earth (TIM). This flare radiation is entirely absorbed in the upper layers of our atmosphere where it also ionizes the atmosphere to interfere with radio communication. Moreover, the intense radiation heats the atmosphere and causes it to expand. The expansion increases the atmospheric density at all altitudes, which in turn slows satellites causing them to fall prematurely.

The SORCE instruments have done a spectacular job capturing these recent flare incidents with great precision. These detailed measurements will be extremely useful to the solar physics community. For the TIM instrument, it is the first time that a TSI measuring instrument has ever seen a flare. SOLSTICE observed factors of two to ten increase in the ultraviolet while XPS recorded non-stop flare activity over many days. The



SNS • SORCE News Source

Monthly Newsletter

November 2003

SORCE scientists are thrilled to be fulfilling a dream, where instrument measurements are exceeding expectations and the Sun is cooperating by providing a most serendipitous display of unpredictable power.

To learn more about how the SORCE instruments are measuring the recent solar activity, visit the SORCE website home page – http://lasp.colorado.edu/sorce/.

## SORCE Science Meeting December 4-6, Sonoma, California –

The science program for the upcoming SORCE Meeting – Physical Processes Linking Solar Radiation and Solar Variability with Global Climate Change – is set. The meeting will be devoted to our understanding of the physical processes that connect the Sun's radiation and its variability to our terrestrial environment, including the processes involved with climate and ozone response to solar radiative forcing and the mechanisms that cause solar activity and radiation variations.
With over 60 abstracts submitted, the agenda will consist of both invited and contributed oral presentations and posters. The detailed agenda and abstracts are available on the SORCE Meeting website –
http://lasp.colorado.edu/sorce/sonoma_science_meeting_agenda.html

The meeting will begin in the morning, December 4, with three keynote overview presentations:

J. Eddy – Current status of Sun-climate connections and possible processes

V. Ramaswamy – Current status of the Sun's role in global change

J. Hall – Current status of Solar-stellar relationships

Scientific sessions and speakers over the two and half days include:

- *Solar Radiation – Status of Current SORCE Measurements*
  Gary Rottman, Greg Kopp, Jerry Harder, Bill McClintock, Tom Woods
- *Solar Radiation – Long-Term Records and Reconstructions*
  Claus Fröhlich, Steven Dewitte, Bob Lee, Richard Willson, and Sami Solanki
- Long-Term Solar Variations
  Philip Goode, Mausumi Dikpati, Yi-Ming Wang, Leif Svalgaard
- Climate Change Processes Involving Solar Radiation in the Troposphere
  Steven Platnick, Norm Loeb, Jerry Meehl, Sultan Hameed, Gerard Bond, Caspar Ammann, Kent Moore, Joan Feynman, Robert Cess, Ed Cook
- Global Change Processes Involving Solar Radiation in the Stratosphere
  Richard Stolarski, Murry Salby, David Rind, Robert Hudson, Marv Geller, Al Powell, Lon Hood, Alexander Ruzmaikin
- Future Directions in Sun-Climate Research
  Gerard Thuillier, Marv Geller, Stan Solomon, Tom Bogdan

The featured speaker at the meeting dinner on Thursday evening, Dec. 4, will be Dr. John Eddy. He will be speaking on "Tales of the Sun and Climate".

Poster presentations will be set up for viewing all day Thursday and Friday, with a special focus to be given late afternoon both days. The Bay Area Environmental Research Institute (BAER) is sponsoring a special poster reception on Friday. Poster abstracts are currently available on the SORCE Meeting website.

The scientific organizing committee members are Judith Lean from NRL, Peter Pilewskie from NASA Ames Research Center, and Doug Rabin from GSFC. They have put together an exciting agenda and everyone anticipates a very interesting meeting.

If you are interested in attending this SORCE Science Meeting, there is still space available. For information go to the meeting website for details – Dec03ScienceMeeting.html

## Upcoming Meetings / Talks –

SORCE scientists plan to present papers or attend the following 2003 meetings:

- SORCE Science Meeting, Dec. 4-6, Sonoma, California
- AGU Fall Meeting, Dec. 8-12, San Francisco, California

To submit information to this newsletter, please contact:
vanessa.george@ lasp.colorado.edu