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Sun Darkens Electronics

Space Physicists and Atmospheric Scientists Can Now Predict Disruptions Caused by the Sun's Coronal Mass Ejections

March 1, 2006 — Solar activity can wreak havoc in communications systems -- particularly during coronal mass ejections, when plumes of electrically charged particles hit earth's atmosphere. Scientists can now track the plumes down to the single affected cities, helping to predict disruptions.

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WESTFORD, Mass.--The sun guides our daily routine and impacts us in ways you may not even notice. In fact, the sun can play havoc with our communications systems. Now, a new discovery may help predict when and where this will happen and help keep your cell phone static free.

TVs, radios, cell phones -- modern-day conveniences most of us can't live without, but solar activity could jeopardize our way of life. During coronal mass ejections, electrically charged particles from the sun collide with earth's atmosphere.

John Foster, a space physicist at the Massachusetts Institute of Technology's Haystack Observatory in Westford, Mass., says, "This material flies through inner-stellar space and impacts the Earth like a solar hammer hitting the Earth's magnetic field." This solar hammer can cause communication disruptions on the ground and a plume of electrically charged particles high in the earth's atmosphere.

Now, atmospheric scientists at MIT may have discovered a way to predict space weather disruptions by identifying these plumes over the United States.

"What we are seeing is a pattern in where these plumes are forming," says Anthea Coster, an atmospheric research scientist at MIT Haystack Observatory.

Scientists hope to detect these patterns with the ISIS instrument. ISIS picks up radio signals and measures plume movement. Then, a supercomputer processes this data, which will alert scientists where the plumes occur, pinpointing down to the state -- even city -- that will be affected.

Foster says, "Predicting these would be a great benefit to any systems users, people who really rely on communications or navigation systems. Military operations, for one, would very much like to know what the space weather conditions would be like tomorrow."

Scientists say in the near future ISIS instruments will be distributed throughout the United States.

BACKGROUND: Bursts of matter from the sun, called coronal mass ejections (CMEs), have long been known to affect cell phone reception, TV and radio signals, and how much radiation exposure we receive while flying in the upper atmosphere. Now, researchers have detected plumes that tell them where the radiation from the ejection is concentrated and what places will be influenced the most by the CME.

CME OR SOLAR FLARE?: People sometimes confuse CMEs with solar flares, but they are different phenomena. Solar flares are explosions on the sun that occur when energy build up around sunspots, becoming so hot -- millions of degrees Fahrenheit -- that they produce a burst of electromagnetic radiation across the entire electromagnetic spectrum, from radio waves to x-rays and gamma rays. CMEs were once thought to be the result of solar flares, but while they sometimes accompany solar flares, there is no direct relation between the two. They occur when a large

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satellites and electronic equipment. Solar flares, on the other hand, affect radio communications. is ... > [read more](#)

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WHAT ARE PLASMAS: A plasma is essentially electrically charged (ionized) gas, consisting of free-moving electrons and ions (atoms that have lost electrons). Applying a surge of energy -- with a laser, for example -- knocks electrons off gas atoms, turning them into ions and creating a plasma. Unless this energy is sustained, however, plasmas will recombine back into a neutral gas. On earth, we are familiar with the ordinary states of matter: solids, liquids and gases. But in the universe at large, plasma is by far the most common form. Plasma in the stars and the space between them makes up 99 percent of the visible universe.

The [American Geophysical Union](#) contributed to the information contained in the TV portion of this report.

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