

## Solar Bursts May Threaten Global Positioning System, U.S. Agency Says

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WASHINGTON (AP) — The Global Positioning System, increasingly vital technology for activities including navigating cars and airplanes, bank financial transfers and more, may be threatened by powerful radio bursts from the sun, a panel of scientists warned Wednesday.

“Our increasingly technologically dependent society is becoming increasingly vulnerable to space weather,” David L. Johnson, director of the National Weather Service, said at a briefing.

GPS receivers have become widely used in recent years, using satellite signals to navigate airplanes, ships and automobiles, and in the use of cell phones, mining, surveying and many commercial applications.

Indeed, banks use the system to synchronize money transfers, “so space weather can affect all of us, right down to our wallet,” said Anthea J. Coster, an atmospheric scientist at the Haystack Observatory of the Massachusetts Institute of Technology.

The cause for their concern, Johnson said, was an unexpected solar radio burst on Dec. 6 that affected virtually every GPS receiver on the lighted half of Earth. Some receivers had a reduction in accuracy while others lost the ability to determine position, he said.

Solar activity rises and falls in 11-year cycles with the next peak expected in 2011.

If that increasing level of activity produces more such radio bursts the GPS system could be seriously affected, the researchers said.

And protecting the system is no simple task, added Paul M. Kintner Jr., a professor of electrical engineering at Cornell University, who monitored the December event.

There are two possible ways to shield the system, he said, both very expensive. Either alter all GPS antennas to screen out solar signals or replace all the GPS satellites with ones that broadcast a stronger signal.

That is why it is essential to learn more about the sun's behavior quickly in an effort to find ways to predict such events, the researchers said.

In addition to the GPS system, the December solar flare affected satellites and induced unexpected currents in the electrical grid, Johnson said.

“The effects were more profound than we expected and more widespread than we expected,” added Kintner.

Dale E. Gary, chairman of the physics department of the New Jersey Institute of Technology, said the burst produced 10 times more radio noise than any burst previously recorded.

The difference between that burst and normal solar radio emissions “was like the difference between the noise level of a normal conversation and the noise level in the front row of a rock concert,” he said.

“This is a wake-up call” to improve technology, commented Anthony J. Mannucci, group supervisor at NASA's Jet Propulsion Laboratory.

Patricia H. Doherty, co-director of the Institute for Scientific Research at Boston College, said the burst affected but did not shut down the Federal Aviation Administration's Wide Area Augmentation System, which uses GPS signals to help in navigation.

Most WAAS ground stations maintained contact with enough satellites to continue working, although their accuracy was somewhat affected, she said.

The stations have to maintain contact with at least four satellites to work, but they usually monitor at least 10 to increase their accuracy, she said. Most were able to meet the minimum, she said.

The briefing came at a Space Weather Enterprise Forum convened by the National Oceanic and Atmospheric Administration to discuss the effects of solar activity. Because of its increasing importance, Johnson said, the Weather Service's Space Environment Center was converted from a mainly research center in 2005 to an operational center reporting on solar activity and its impacts.