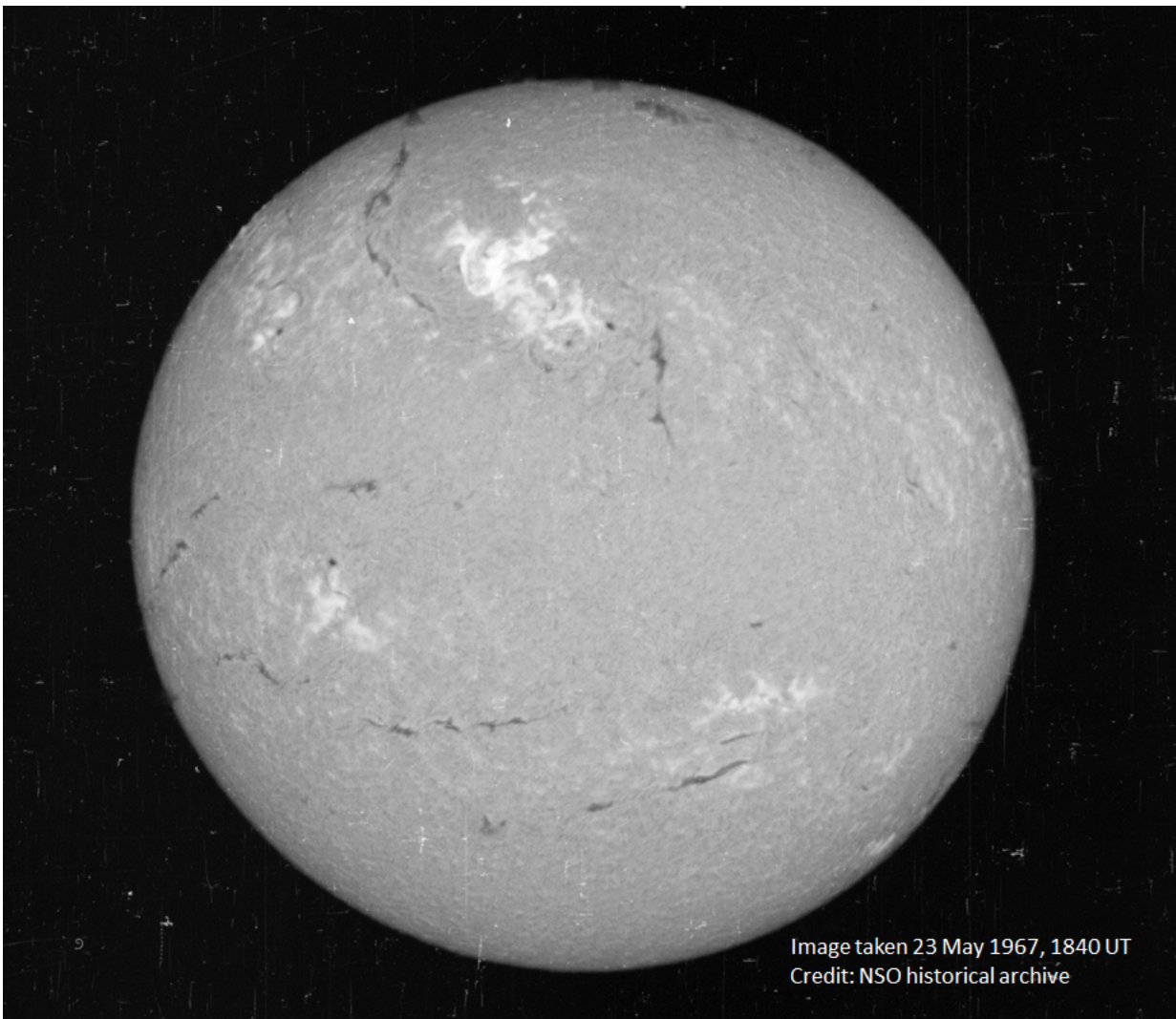


1967 solar storm nearly took US to brink of war

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A view of the sun on May 23, 1967, in a narrow visible wavelength of light called Hydrogen-alpha. The bright region in the top center region of brightness shows the area where the large flare occurred. Credit: National Solar

Observatory historical archive.

A solar storm that jammed radar and radio communications at the height of the Cold War could have led to a disastrous military conflict if not for the U.S. Air Force's budding efforts to monitor the sun's activity, a new study finds.

On May 23, 1967, the Air Force prepared aircraft for war, thinking the nation's surveillance radars in polar regions were being jammed by the Soviet Union. Just in time, military space weather forecasters conveyed information about the solar storm's potential to disrupt radar and radio communications. The planes remained on the ground and the U.S. avoided a potential nuclear weapon exchange with the Soviet Union, according to the new research.

Retired U.S. Air Force officers involved in forecasting and analyzing the storm collectively describe the event publicly for the first time in a new paper accepted for publication in *Space Weather*, a journal of the American Geophysical Union.

The storm's potential impact on society was largely unknown until these individuals came together to share their stories, said Delores Knipp, a space physicist at the University of Colorado in Boulder and lead author of the new study. Knipp will give a presentation about the event on August 10, 2016 at the High Altitude Observatory at the National Center for Atmospheric Research in Boulder, Colorado.

The storm is a classic example of how geoscience and space research are essential to U.S. national security, she said.

"Had it not been for the fact that we had invested very early on in solar

and [geomagnetic storm](#) observations and forecasting, the impact [of the storm] likely would have been much greater," Knipp said. "This was a lesson learned in how important it is to be prepared."

Keeping an eye on the sun

The U.S. military began monitoring solar activity and space weather - disturbances in Earth's magnetic field and upper atmosphere - in the late 1950s. In the 1960s, a new branch of the Air Force's Air Weather Service (AWS) monitored the sun routinely for solar flares - brief intense eruptions of radiation from the sun's atmosphere. Solar flares often lead to electromagnetic disturbances on Earth, known as geomagnetic storms, that can disrupt radio communications and power line transmissions.

The AWS employed a network of observers at various locations in the U.S. and abroad who provided regular input to solar forecasters at the North American Aerospace Defense Command (NORAD), a U.S. and Canadian organization that defends and controls airspace above North America. By 1967, several observatories were sending daily information directly to NORAD solar forecasters.

On May 18, 1967, an unusually large group of sunspots with intense magnetic fields appeared in one region of the sun. By May 23, observers and forecasters saw the sun was active and likely to produce a major flare. Observatories in New Mexico and Colorado saw a flare visible to the naked eye while a solar radio observatory in Massachusetts reported the sun was emitting unprecedented levels of radio waves.

A significant worldwide geomagnetic storm was forecast to occur within 36-48 hours, according to a bulletin from NORAD's Solar Forecast Center in Colorado Springs, Colorado on May 23.

Radar 'jamming'

As the solar flare event unfolded on May 23, radars at all three Ballistic Missile Early Warning System (BMEWS) sites in the far Northern Hemisphere were disrupted. These radars, designed to detect incoming Soviet missiles, appeared to be jammed. Any attack on these stations - including jamming their radar capabilities - was considered an act of war.

Retired Colonel Arnold L. Snyder, a solar forecaster at NORAD's Solar Forecast Center, was on duty that day. The tropospheric weather forecaster told him the NORAD Command Post had asked about any solar activity that might be occurring.

"I specifically recall responding with excitement, 'Yes, half the sun has blown away,' and then related the event details in a calmer, more quantitative way," Snyder said.

Along with the information from the Solar Forecast Center, NORAD learned the three BMEWS sites were in sunlight and could receive radio emissions coming from the sun. These facts suggested the radars were being 'jammed' by the sun, not the Soviet Union, Snyder said. As solar radio emissions waned, the 'jamming' also waned, further suggesting the sun was to blame, he said.

During most of the 1960s, the Air Force flew continuous alert aircraft laden with nuclear-weapons. But commanders, thinking the BMEWS radars were being jammed by the Russians and unaware of the solar storm underway, put additional forces in a "ready to launch" status, according to the study.

"This is a grave situation," Knipp said. "But here's where the story turns: things were going horribly wrong, and then something goes

commendably right."

The Air Force did not launch additional aircraft, and the study authors believe information from the Solar Forecasting Center made it to commanders in time to stop the military action, including a potential deployment of nuclear weapons. Knipp, quoting public documents, noted that information about the solar storm was most likely relayed to the highest levels of government - possibly even President Johnson.

The geomagnetic storm, which began about 40 hours after the solar flare and radio bursts, went on to disrupt U.S. radio communications in almost every conceivable way for almost a week, according to the new study. It was so strong that the Northern Lights, usually only seen in or near the Arctic Circle, were visible as far south as New Mexico.

Societal impact

According to Snyder and the study authors, it was the military's correct diagnosis of the [solar storm](#) that prevented the event from becoming a disaster. Ultimately, the storm led the military to recognize space weather as an operational concern and build a stronger space weather forecasting system, he said.

The public is likely unaware that natural disasters could potentially trick contemporary military forces into thinking they are under attack, said Morris Cohen, an electrical engineer and radio scientist at Georgia Institute of Technology in Atlanta who was not involved in the new study.

"I thought it was fascinating from a historical perspective," he said of the new study.

The May 1967 storm brought about change as a near miss rather than a

full-blown catastrophe, according to Cohen.

"Oftentimes, the way things work is something catastrophic happens and then we say, 'We should do something so it doesn't happen again,'" he said. "But in this case there was just enough preparation done just in time to avert a disastrous result."

More information: D. J. Knipp et al, The May 1967 Great Storm and Radio Disruption Event: Extreme Space Weather and Extraordinary Responses, *Space Weather* (2016). [DOI: 10.1002/2016SW001423](https://doi.org/10.1002/2016SW001423)

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