

Goddard Tech 12

Each month the Strategic Partnerships Office will tell the story of a renowned innovator at NASA's Goddard Space Flight Center and show how their technological breakthroughs are brought from the labs to our lives. NASA is turning the U.S. power grid into a large instrument designed to measure space weather using geophysical imaging and, after a successful test program, is partnering with more power companies to increase coverage.

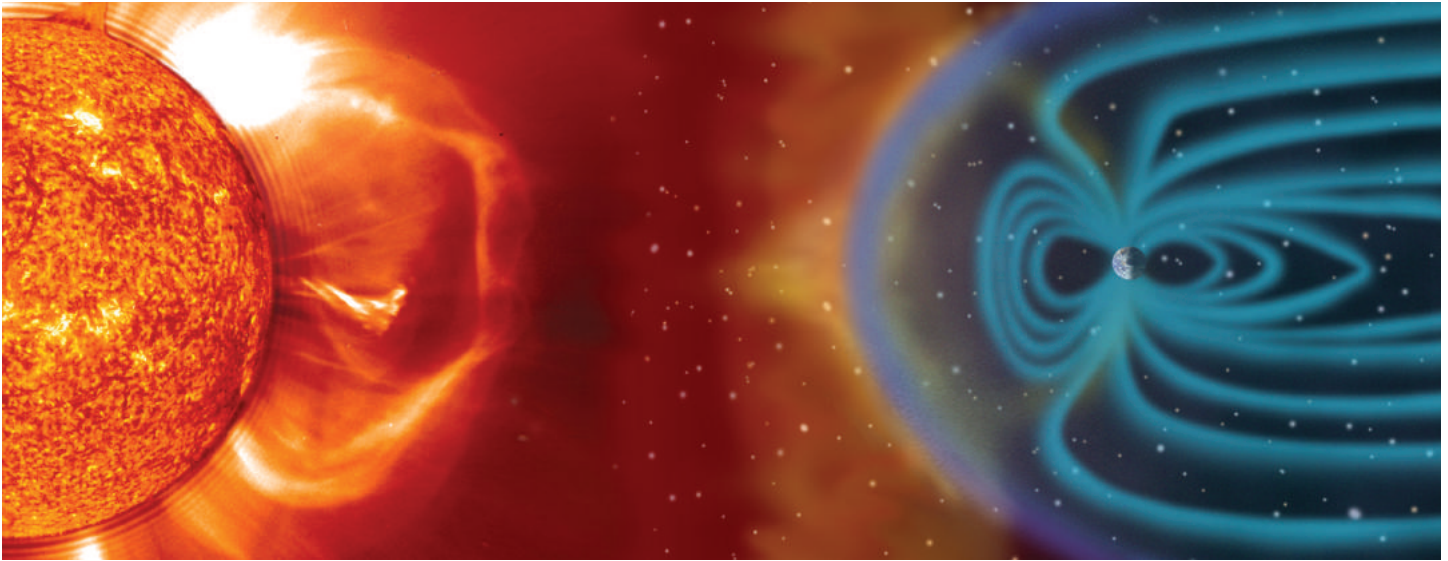


Illustration of the sun's impact on Earth's magnetic field. Credit: NASA SDO

The Technology

Geophysical Imaging

Scientist Antti Pulkkinen is in the midst of a project that will turn the nation's power lines into instruments capable of measuring space weather phenomena. The team is interested in measuring geomagnetically induced currents, which cause deadly solar winds. Even though the space between planets in our solar system seems fairly empty, the sun generates powerful magnetic fields that rise above the surface in giant loops. When these loops clash, super-hot, highly charged particles are sent out into space, creating intense solar winds.

These geomagnetic storms have caused widespread blackouts, the largest taking place on March 13, 1989 in Quebec, Canada. The millions of people that lived in the province found themselves in the dark for 12 straight hours. Airports closed, elevators stalled, and the metro was shut down. This is a dramatic example – storms of this magnitude are rather rare, but small storms do affect the world's power grids. According to the U.S. Geological Survey, had the blackout occurred in the Northeastern United States instead of Quebec, the economic impact could have exceeded \$10 billion. This number doesn't even include the risk to public safety.

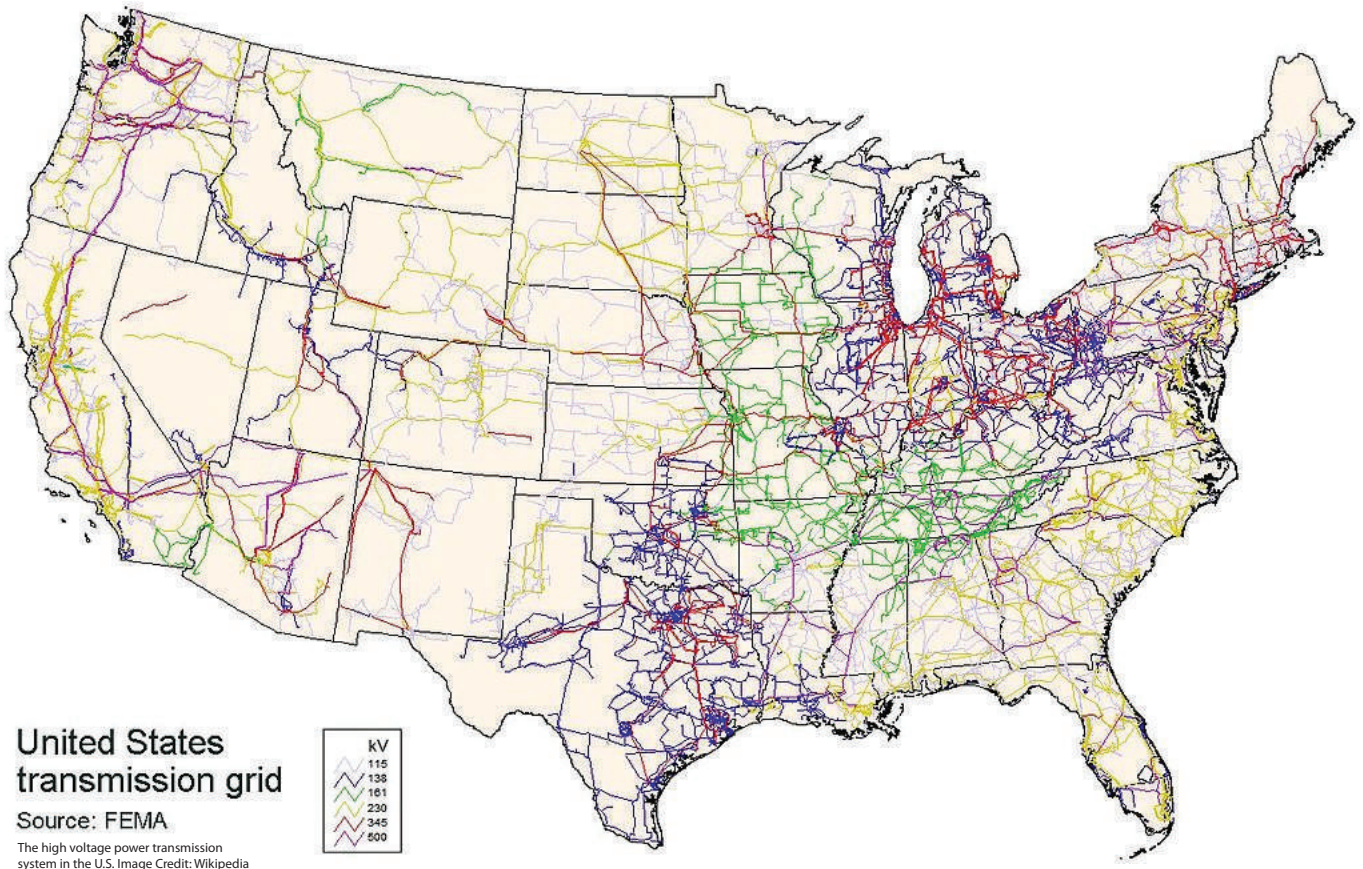
The Partnership

Alabama Power - Birmingham, AL

Dominion Virginia Power - Richmond, VA

Southern Company - Atlanta, GA

To better understand the impact space weather has on the U.S. power grid, the three companies above have allowed NASA's team to install scientific substations beneath their high-power transmission lines. The data gained from these substations will allow predictions of when space weather will affect power grids and how the problem can be mitigated. With the aim to make the equipment for the measuring these currents as inexpensive and versatile as possible, NASA hopes to achieve nationwide coverage.



The Innovator

Antti Pulkkinen

After growing up in Finland and attending the University of Helsinki, Pulkkinen came to Goddard to do his post-doctoral research work in physics in 2003. Since then, he has stayed in the United States. After his post-doctoral research, Pulkkinen worked with the University of Maryland Baltimore College and was part of the Catholic University of America's Physics Department before returning to Goddard's civil service workforce.

Well known for his work in measuring geomagnetically induced currents, he is leading the effort to turn the nation's power grid into a scientific instrument.

