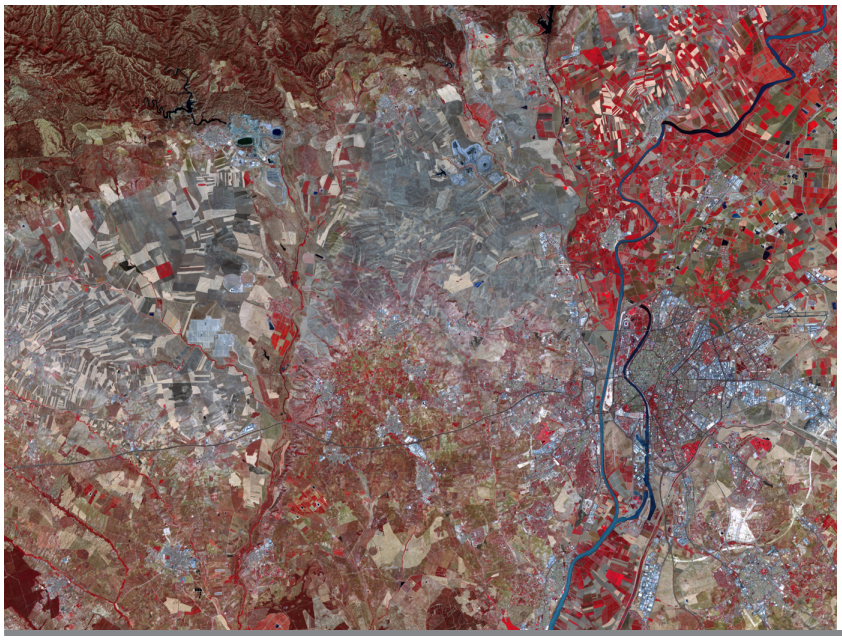

National Aeronautics and Space Administration

TECHNOLOGY SOLUTION

Electrical and Electronics

Using the Power Grid for Geophysical Imaging

Turns the U.S. power grid into an extremely large space science instrument

NASA Goddard Space Flight Center (with the support of the U.S. electric transmission industry) has developed a system that provides real-time data about geomagnetically induced currents (GIC) that flow in power grids during space weather storms. These currents can be a hazard for reliable transmission of electricity. In addition to monitoring GIC for hazard mitigation, this technology also enables the grid to serve as an antenna to study space weather phenomena.

The system extracts from the grid information about continental-scale geoelectric fields and ionospheric/magnetospheric electric currents. These are used to build unprecedented spatiotemporal pictures of near-space physical phenomena.

Power system operators can use the real-time data for situational awareness about GICs. This information can guide mitigation actions power companies may take.

BENEFITS

- Uses the existing grid to perform large-scale measurements
- Low-cost autonomous design of the magnetometer stations

THE TECHNOLOGY

This technology utilizes the U.S. high-voltage power transmission grid system as an extremely large antenna to extract unprecedented spatiotemporal space physical and geological information from distributed GIC observations. GICs are measured using differential a magnetometer technique involving one fluxgate magnetometer under the transmission line and another reference magnetometer station nearby. The reference station allows subtraction of the natural field from the line measurement, leaving only the GIC-related Biot-Savart field. This allows inversion of the GIC amplitude. The magnetometer stations are designed to operate autonomously. They are low-cost, enabling large scale application with a large number of measurement locations.

APPLICATIONS

The technology has several potential applications:

- Scientific study of space weather
- Monitoring of the electrical grid for potentially damaging GIC events

PUBLICATIONS

Patent No: 10175273

Turning the power grid into an extremely large space science instrument (http://science.gsfc.nasa.gov/sci/content/uploadFiles/highlight_files/670_SWxGrid_1page-ScienceHighlight.pdf)

technology.nasa.gov

More Information

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