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Attachment(s):
(1) "item on e-CALLISTO network", 295 KB pdf, 2 pages.

: Re:
: e-CALLISTO network
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Dear ISWI Participant:

I attach item on the e-CALLISTO network. Please have a look at
it when you have the chance.

Respectfully yours,
: George Maeda
: The Editor
: ISWI Newsletter

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News

Global solar observatory flares into life

Home-built e-CALLISTO network provides real-time data on Sun's radio emissions.

Nicola Nosengo

It may have begun as the hobby of a Swiss lab technician but, ten years on, the e-CALLISTO network of spectrometers now encircles the globe, recording solar radio emissions around the clock. The nineteenth instrument in the ground-based, low-cost system was set up in Anchorage, Alaska, last week — completing a chain of stations around the globe.

The CALLISTO (Compound Astronomical Low-cost Low-frequency Instrument for Spectroscopy in Transportable Observatory) spectrometers, designed and built by electronics engineer Christian Monstein of the Institute for Astronomy of the Swiss Federal Institute of Technology Zurich (ETH Zurich), record the intensity of electromagnetic radiation at radio frequencies, between 45 and 870 megahertz. The instruments can be connected to almost any kind of antenna, and send their data to an ordinary computer.

Monstein, an amateur radio astronomer, began working on the CALLISTO prototype in 2002, when digital radio tuners became available on the consumer market. "For the first prototype I adapted the tuner of my own television set," he recalls. "I used to call it PMS, 'poor man's spectrometer'."

The CALLISTO antenna at Trinity College Dublin's Rosse Solar-Terrestrial Observatory in Birr Castle Demesne.

Dr. Peter T. Gallagher, Trinity College Dublin

In 2003, working in his spare time and using just €200 (US$270) worth of equipment, he assembled the first observatory. Despite its low cost, researchers think the system will provide useful data through studying the Sun's activity.

Early warning

Arnold Benz, an astrophysicist at ETH Zurich, quickly realized that the instrument was particularly useful for studying the large explosions in the Sun's atmosphere known as solar flares. The radio emissions from these events are important for understanding the dynamics of the solar corona. Solar flares are also often associated with coronal mass ejections, huge fluxes of charged particles from the Sun that are a hazard to orbiting satellites and can disrupt mobile phone and television signals.

A network of radio telescopes providing information on radio bursts is run by the US Air Force's Radio Solar Telescope Network. "But the coverage is not complete, and the data are not available in real time for researchers," says Nat Gopalswamy, an astrophysicist who studies solar flares at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

Benz and Monstein thought that the cheap and easily transportable CALLISTO spectrometers could fill this gap. During the International Heliophysical Year in 2007, they received funding from the United

Nations, NASA and the Swiss National Science Foundation, and began distributing CALLISTO instruments around the world, trying to cover as many longitudes as possible. "We were doing science and politics at the same time," says Benz. "We wanted 24-hour coverage, but we also wanted to take radio astronomy to countries that could not afford it."

Over the past four years, CALLISTOs have been installed as far afield as Egypt, Siberia, Costa Rica and Mongolia. Some of the instruments have been set up by official astronomy institutes; others, by volunteer engineers or radio astronomers. Monstein travelled to most of the stations as they were set up, to assist with installation and training. "The instrument takes about six hours to build, but some training is needed to make sure it is used properly and gives good data," he explains.

Open 24 hours

The last blank spot was the eastern Pacific. The nineteenth and newest station was set up last weekend by Whitham Reeve, a telecommunications engineer in Anchorage. The new station recorded its first solar flare on Tuesday, and the network can now scan the Sun 24 hours a day — at least during the Northern Hemisphere's summer as there are still gaps in the coverage of the Southern Hemisphere. "This is important because solar flares often last longer than one day, and we are now able to observe whole events," says Benz.

Benz and Monstein hope to add a few more stations that could provide cover if other stations stop working, with Kazakhstan and Peru the next candidates.

The data from each instrument are stored in a shared database and made available in real time through the project's website. A few papers based on e-CALLISTO data have already been published.

Because radio signals travel faster than particles, the completed e-CALLISTO can also work as an early-warning system for radio bursts, alerting space mission control centres to upcoming disturbances caused by coronal mass ejections from the Sun. "This will become very important in a couple of years," says Benz. "The Sun is relatively quiet now, but by 2013 it will reach a new peak in its 11-year activity cycle."

The network's data have also caught the attention of scientists who observe the Sun in other wavelengths. "I look forward to comparing CALLISTO data with mine in X-rays and γ-rays," says Brian Dennis, a mission scientist who works on NASA's Reuven Ramaty High-Energy Solar Spectroscopic Imager (RHESSI) satellite, which studies solar flares.

Comments

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