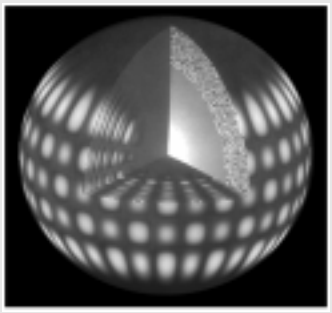

G O N G

GLOBAL OSCILLATION NETWORK GROUP

John Leibacher

The Global Oscillation Network Group (GONG) Project is a community-based activity to operate a six-site helioseismic observing network, perform the basic data reduction and provide the data and software tools to the community, and coordinate analysis of the rich data set that is resulting. GONG data are available to any qualified investigator whose proposal has been accepted. Information on the status of the project, the scientific investigations, as well as access to the data, is available on our WWW site (*http://www.gong.noao.edu*).

With the Sun continuing to develop the most spectacular magnetic active regions of the solar cycle, the GONG team is working feverishly to put the finishing touches on the new, high-resolution GONG+ camera system and to get it deployed around the world by the end of the year. With a bit of luck and lots of hard work, we should be installing the new system on Tenerife during the GONG 2000/ SOHO 10 meeting hosted there by the Instituto de Astrofísica de Canarias in October.

Operations

The GONG network of telescopes continued operating well during the second quarter of 2000. In anticipation of the GONG+ upgrade visits, no preventive maintenance trips occurred during this quarter, restricting all instrument downtime to equipment failure and weather-related events. The Udaipur site suffered most of the downtime as a result of the failure of both the primary and backup air conditioning units. The site was shut down for approximately one week before repairs were made and the site was brought back on line. Several days of additional downtime were incurred due to failures of the backup power systems. Because the internal batteries in the uninterruptable power supply (UPS) have failed, the UPS can no longer pick up the electrical load. Utility power dropouts bring the instrument down, and it will not return to normal operation until someone can restart the system after power is restored. There has also been an instance where the backup diesel generator failed to transfer power to the instrument.

Downtime, which is ultimately weather related but results in the failure of the turret to unstow, has been occurring at the El Teide and CTIO sites. These sites have nights during which precipitation falls and freezes, causing ice to form around the moving parts of the turret. When the time arrives to acquire the Sun, the motors need so much current to move the iced-up turret that a breaker on the power supplies trips, or on rarer occasions, fuses in the drive circuit blow. The instrument remains down until someone can get to the site to reset or replace the hardware. At least two days of downtime have accumulated at both of these sites. Fortunately, these events often occur in conjunction with poor weather conditions, so that most of the images lost would likely be unacceptable for data analysis.

continued

The Mauna Loa and El Teide sites experienced power-supply voltages that had drifted too far from their nominal -5.2V value. Site personnel replaced them, adding about three hours of downtime at each site. The same supply was replaced last year at Big Bear, and we expect it to be nearing the end of its lifetime at the remaining three sites. Good news, however, is that these power supplies will be eliminated with the GONG+ upgrade. We hope that no additional failures occur in the meantime.

Other short periods of lost images occurred during the replacement of a bank of Exabyte drives at Big Bear (~20 min.) and a system reboot at Learmonth (~83 min). The Exabyte drives have given us less trouble this quarter than in any previous quarter. Nevertheless, these devices will be replaced with the larger capacity DLT7000 drives during the GONG+ upgrade.

Data Management and Analysis

During the past quarter, the Data Management Acquisition Center (DMAC) produced month-long (36-day) velocity, time series, and power spectra for GONG months 45, 46, and 47 (ending 991223), with respective fill factors of 0.85, 0.84, and 0.88. Tables of mode frequencies which were computed from the power spectra using the three-month-long time series centered at GONG months 44 and 45.

The main development activity currently underway in the DMAC is related to the development and testing of the GONG+ camera and data system upgrade.

Data Algorithm Developments (and Some Science)

Peakfitting has progressed up through month 46, and analysis of the results continues to show the evolving dynamics in the solar interior as the cycle progresses. Analysis of the even splitting coefficients is now providing a look at the sound speed as a function of depth, latitude, and time. Preliminary analysis suggests that the temporally evolving component of the sound speed is purely a surface phenomenon, with no significant depth structure. This is somewhat surprising since it is thought that active region magnetic fields extended below the surface. Also surprising is the time-averaged sound speed perturbation, which appears to be relatively negative near the equator and positive at mid-latitudes. This pattern is inconsistent with the idea that meridional flows are thermally driven.

The current numerical interpolator used in the remapping step, central to both global and local helioseismology, is a cubic convolution. While this has been adequate for GONG Classic, it is not accurate enough at the higher spatial frequencies present in GONG+ data, thus we have implemented a sinc-function interpolator. Tests show that this interpolator can be applied twice without introducing artifacts into ring diagrams. The new algorithm greatly simplifies the organization of a local helioseismology pipeline using merged images. The current sinc interpolator algorithm is unacceptably slow, but we expect that it will be relatively easy to increase the speed of the code.

GONG+ Camera Development

The DNA video data acquisition system design has been rigorously tested and found to be acceptable for our design purposes. The fixes provided by DNA Enterprises appear to have been effective, and we are now proceeding with certification of the components for deployment. A temperature regulation problem with the SMD cameras has also been corrected, which will permit them to operate indefinitely in the environment of the GONG shelters without loss of temperature control.

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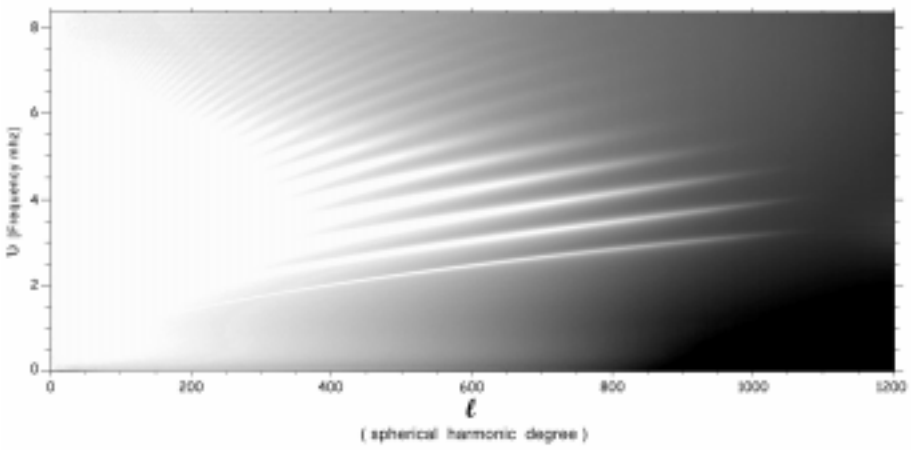

A two-dimensional power spectrum from the GONG+ prototype shows good sensitivity beyond ℓ = 1000, with the absence of spatial aliases at high ℓ. Classic GONG was limited to the left-hand quarter of this figure (ℓ < 250).

Our current investigation of a problem related to the camera serial communications has prompted the implementation of a much more robust error detecting camera interface capability than that provided by the vendor. Although we are still working on a complete solution, the software error-checking upgrade should permit us to proceed with component certification and deployment.

In preparation for the deployment, the project will stage two reviews to demonstrate that the system works to specification, that it is reliable, that the data are of high quality and meet expectation, and that the DMAC is ready to capture and process the data. It has been a long road, but we are now on track for a system deployment this Fall.

How to Contact GONG

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