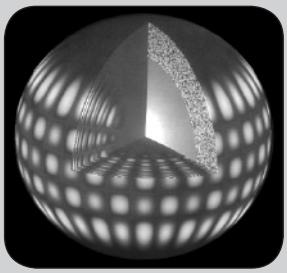

GONG

Global Oscillation Network Group

GONG

John Leibacher

The Global Oscillation Network Group (GONG) Project is a community-based activity to operate a six-site helioseismic observing network, to do the basic data reduction and provide the data and software tools to the community, and to 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, are available on our WWW server whose URL is http://www.gong.noao.edu.

October marked the fifth birthday of GONG's full network operations. The network continues to produce excellent data and maintain a high duty cycle through the full data processing pipeline. The GONG+ prototype testing continues, but the end is finally in sight. Following an upcoming Deployment Readiness Review, the first GONG+ system should be shipped to Big Bear in March. In addition to installing and verifying the functionality of the new system, we must be able to demonstrate that we can continue the low- to medium-ℓ p-mode program, and assess the two-site (Tucson/Big Bear) comparison and merging of the GONG+ high-resolution data. We should begin deployment to the other five sites in April, completing the effort by the end of July.

Operations

The GONG network continues to operate well despite the appearance of some annoying problems. The delay in the GONG+ deployment has caused a delay in preventive maintenance. The lack of periodic maintenance has resulted in downtime caused by the inability of the UPS to support the instrument during even brief power outages. Worse still, it appears that a low battery condition at the Learmonth site was actually inducing power glitches even when there was no clear drop in the utility power. Replacement batteries were obtained and installed by the site staff at Udaipur. Total system downtime because of failures and repair was about 54 hours. Replacement batteries had already been sent to Learmonth and were awaiting the arrival of a PM team, but when the problems appeared, the site staff undertook the task of the installation. Approximately 39 hours of downtime resulted at Learmonth. We want to acknowledge the efforts of the staffs of both these sites for dealing with and resolving these problems.

Troubles with the half-wave plate rotator appeared in the El Teide instrument, causing a loss of synchronization of the timing system. Initial attempts to fix it looked promising for a time, but the problem would recur about four days after the system was disabled. After several weeks of this intermittent problem, an electronics change was made which caused the system to remain in the unsynced state, and to complicate matters, the video signal was lost. As the year came to a close, both El Teide and Tucson personnel were busy attacking these problems, which we are all pleased to have behind us now. At least five days of downtime resulted in November and December.

Because the new GONG+ computer has not yet been installed, we were quite aware that we would face a problem as the year changed to 2001. Preparations were made well in advance, and as the UT clock approached midnight, the appropriate changes were made and the transition went smoothly. The exception was the Udaipur site, which could not be reached via the Internet. Instructions that would allow them to handle the problem remotely were faxed and soon implemented. Nevertheless, about

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GONG continued

1.5 hours of downtime resulted at several of the network sites and more is expected, as tapes covering this time are yet to arrive.

Exabyte problems continued to occur around the network, causing about 46 hours downtime. As usual, downtime is meant to include the total time of the malfunction, whether or not it overlapped with poor weather, or the instrument was in the stow mode, or another site was providing good data. Therefore, the number of hours of lost images should be considerably less than the above value.

Weather too has been a factor this time of year. Big Bear has stowed the instrument due to severe weather for close to 12 days, and El Teide has suffered several days of weather-related downtime.

Data Management and Analysis

During the past quarter, the DMAC produced month-long (36-day) velocity, time series, and power spectra for GONG months 50 and 51 (ending 15 May 2000), with respective fill factors of 0.83 and 0.84, and tables of mode frequencies, which were computed from the power spectra using the three-month-long time series centered at GONG months 48, 49, and 50.

In addition to routine data reduction, the DMAC is actively involved in upgrading systems and applications for the reduction of GONG+ data and has routinely begun processing data acquired by the Tucson engineering test site through site day ℓ - ν power spectra.

During the previous quarter, and in anticipation of the arrival of GONG+ data, the DMAC completed a long overdue upgrade and replacement of four of the pipeline workstations and is in the process of planning the first round of GONG++ hardware.

Data Algorithm Developments

The new version of Peakfind developed by David Landy now incorporates two asymmetric line profile models. The asymmetry parameter measured using one of these models (Nigam-Kosovichev) is in good agreement with previous observations. The frequencies obtained using the asymmetric fit are now being studied and inverted to assess the impact on our conclusions about the solar interior.

Rudi Komm has implemented a new (to helioseismology) time series analysis package. Originally developed in

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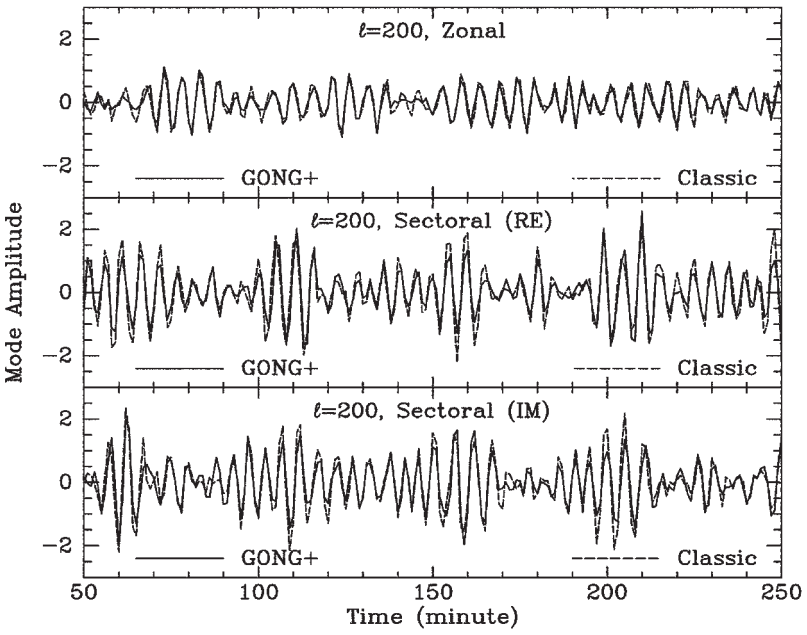

A set of detailed comparisons betweenGONG+, GONG Classic, and MDI images. The agreement is quite good, producing correlation coefficients around 0.9 for ℓ below 600 (GONG+ versus MDI). The figure shows excellent agreement between GONG+ and GONG Classic at ℓ of 200. This correlation strongly suggests that GONG+ and GONG Classic data can be successfully merged, which should improve the duty cycle during the transition to the new cameras.

GONG continued

oceanography, this method first seeks to determine a set of so-called empirical modes, which are derived from spline fits to the maxima and minima of a time series. These empirical modes are then subjected to a Hilbert transform, and the temporally varying amplitude and frequency are determined. The method has the potential of providing new insights into the excitation and damping of the oscillations. However, two technical details must be addressed before this can be done—the method must be extended to cope with gapped time series and with a complex-valued function.

Rachel Howe is developing a multi-dimensional regression analysis of helioseismic frequencies and several different activity indicators. Her results so far indicate that the relationship between the frequencies and the activity measures cannot be completely described by a linear relationship, but requires higher (and probably multiple) powers of frequency.

GONG+ Camera Development

A flaw in the SCSI interface of the GONG+ Data Collection System became evident during the final checkout at the Tucson engineering site, necessitating a suspension of our deployment schedule. At random times during the writing of accumulated data to the DLT tape drive, the system would crash and require operator intervention to restore normal operation. Fortunately, tape writing occurs after local sunset and permits us to implement 'work-arounds' that result in quick recovery and little to no loss of helioseismic data. Although this is disappointing, we are gratified that this problem revealed itself during testing rather than after deployment. We have initiated a series of tests to characterize the problem, determine the cause, and devise a remedy. Results so far suggest an obscure bug in the SCSI drivers, which are responsible for communications with the DLT tape drives.

As for the serial communications problem that we encountered last summer, we have developed error detection and recovery routines that enable a return to normal function with a minimal loss of data and little human interaction. If forced by constraints of time to proceed with deployment without fully correcting the cause of the problem, this 'armor-plating' will allow the commencement of GONG+ operations with little or no inconvenience to our site hosts.

The deployment components have been packed in crates and await transportation. After a four-week reliability run at the Tucson facility and a subsequent Readiness Review, our deployment teams will install the first system at the Big Bear site. The full network is scheduled for completion in July.

Personnel Changes

Susan Davidson, who has been with GONG for over six years, and NOAO for nearly 25 years, retired at the beginning of February. She will be missed throughout the GONG community, and we wish her the very best for the future. Roberta Toussaint, who has been with GONG for nearly a decade, has moved over to the SOLIS Project where she will be close by. We look forward to her continued association with GONG, including participation in the GONG+ deployment.

On the plus side of the ledger, we are delighted to welcome Guillermo Montijo back into the fold. Guillermo was a key player in the production and deployment of GONG Classic, and it is great to have him and his skills back on the team.

How to Contact GONG

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