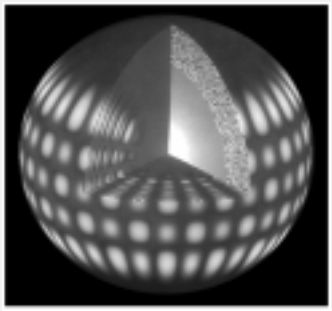

# G O N G

## GLOBAL OSCILLATION NETWORK GROUP

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The Global Oscillation Network Group (GONG) Project is a community-based activity to operate a six-site helioseismic observing network, to perform 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, is available on the Web at *www.gong.noao.edu*.

October marked the fourth birthday of GONG's full network operations, which continue to produce excellent data as solar activity grows. We've had several months recently with over 90% duty cycle out of the full data processing pipeline; interesting—and real!—variations in flows below the surface are manifesting themselves. The GONG+ camera system development continues; in spite of the inevitable teething problems, we still hope to deploy the new system around the network in the first half of 2000.

### Operations

The arrival of the monsoon in India has again resulted in considerable downtime at the Udaipur site. The monsoon conditions increase the need for backup electrical power to the site, and although the diesel generator operated effectively, the circuitry that effects the changeover from utility to generator power proved unreliable. Consequently, the site was shut down continuously for a period in July and August, and intermittently throughout September. Since the weather was so poor during these months, the loss of data due to instrument downtime was comparable to that lost due to poor observing conditions. Thanks to the on-site Udaipur staff, the system was operational in time for the improving weather conditions.

In spite of two preventative maintenance trips—Learmonth, July 8-17 and Big Bear, July 29-August 5—a few minor instrument failures occurred around the network during the past quarter. The uninterruptable power supplies at Big Bear and Mauna Loa suffered component failures, resulting in total network downtime of about 20 hours. An additional 3.5 hours of lost images occurred at Mauna Loa due to a problem with the GPS timing and synchronization. CTIO experienced about 5 hours of down time, when the turret became coated with ice during two different storms.

The good news is that our timing, which depends on the GPS system, survived the GPS 1024-week rollover that occurred in August.

PM crews will be visiting Mauna Loa and Udaipur in October and November.

### Data Management and Analysis

With the upgrade of reduction software used for calibrating the raw images and producing global p-mode power spectra, the project resumed routine reduction of

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network data this past quarter. Month-long (36-day) velocity, time series, and power spectra were produced for GONG months 36, 37, 38, and 39 (ending 990310), with respective fill factors of 0.91, 0.94, 0.92, and 0.88.

The main development activities currently underway in the DMAC are related to the development and testing of the GONG+ camera and data acquisition prototype system.

## Data Algorithm Developments (and Some Science)

As mentioned above, determination of the frequencies beginning with GONG Month 36 (Sept–Oct 1998) is underway. A comparison of the results from peakfitting GM 36, reduced with and without the rectangular pixel correction, showed small differences in the odd-splitting coefficients. A comparison of the inversions of these splittings showed differences in the rotation rate near the poles. Since these results were obtained with a 36-day, instead of our typical 108-day, time series, we will compare the inversions obtained from 108-day series containing the two different versions of GM 36. Unfortunately, given the currently available resources, it will probably not be possible to test other combinations of processing; however, we will use the information from the available comparisons to estimate any systematics introduced by the processing change.

Inversions of the even-splitting coefficients are now becoming available. The images of the temporal variations in the solar structure are very similar to those of the flows. Bands of enhanced sound speed are seen to migrate from high latitudes at solar minimum to lower latitudes as activity increases, but with one important difference—the temperature excess bands are not exactly in the same place as the flows, but are displaced in latitude. This is exactly what is observed at the surface when the torsional oscillation velocity and the surface magnetic field distribution are compared.

In anticipation of the deployment of the GONG+ system, work is underway to improve the angular registration between simultaneous images at different sites. Comparison of GONG and SOI/MDI data have indicated an angular offset of about 0.1°; however, this was substantially reduced after a thorough revamping of the analysis of the drift scans, which set the absolute position angle of solar North as observed by the network.

Sasha Serbryanskiy from the Ulugh Beg Astronomical Institute in Tashkent, Uzbekistan, is working with the project in Tucson for three months. Sasha is merging SOI/MDI data into the GONG time series. During the GONG+ deployment, Sasha's merging results will be extremely valuable when we attempt to join the data obtained with the two different spatial sampling functions.

## GONG+ Development

As acceptance testing of the Data Acquisition System continues, the development team has moved ahead on other areas of the prototype. An internal committee reviewed the Data Caching Subsystem and accepted the GONG+ home-grown RAID1 data storage scheme. Production components (hard disk drives and DLT tape drives) needed for the field systems have been purchased. A committee also reviewed the modifications that have been made to the instrument's mechanical system. With the exception of a few minor refinements, all designs were accepted.