

GONG

John Leibacher & the GONG Team

The local helioseismology science pipeline, which we highlighted with the first six solar rotations worth of flow maps in the last issue of this *Newsletter*, has really started to flow, with 20 rotations now and we anticipate that **there should be 37 continuous solar rotations of science products available by the time that you read this!** (That's 1,000 earth rotations!) In addition, a second—lower-resolution, but more deeply penetrating—pipeline has come on line, with 25 solar rotations of data already analyzed (see figure 1). For the truly impatient, who can't wait to see what is going to be rotating around the limb of the Sun in a week or two, we should shortly have near-real-time images of the farside of the Sun available on line. And, there is additional new helioseismic science coming, and well-calibrated magnetograms as well.

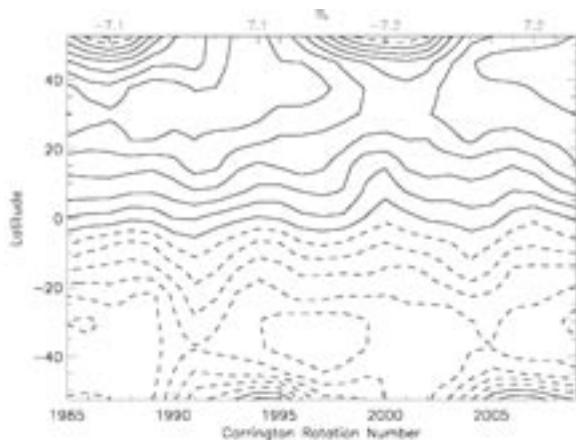


Figure 1. The evolution of meridional circulation at a depth of 28 Mm during a two-year period, January 2002–December 2003, derived from large-aperture ring diagram analysis of the GONG continuous data. The contours range from approximately -40 m/s to 40 m/s (dashed lines correspond to negative values). Counterstreamers in the northern and southern hemisphere can be seen coinciding with maximum values of the B_0 solar angle, the angle of the solar rotation axis toward Earth.

The heart of the new magnetograms—the new polarization modulator circuitry—has delivered a factor of ten decrease in the uncertainty of the magnetogram zero point, which exceeds what we need to make real measurements of large-scale photospheric field changes that could affect the structure of the coronal. A team has been identified and a design review is forthcoming. The goal is to have the upgrade operational for the entire network well before

the February 2006 launch of the STEREO mission, which will observe coronal mass ejections in three dimensions. While these improvements will bring the performance to the design goals and enable studies of the large-scale structure of the solar atmosphere, we are already getting exciting new results on significant flare related changes in the magnetic field (see figure 2).

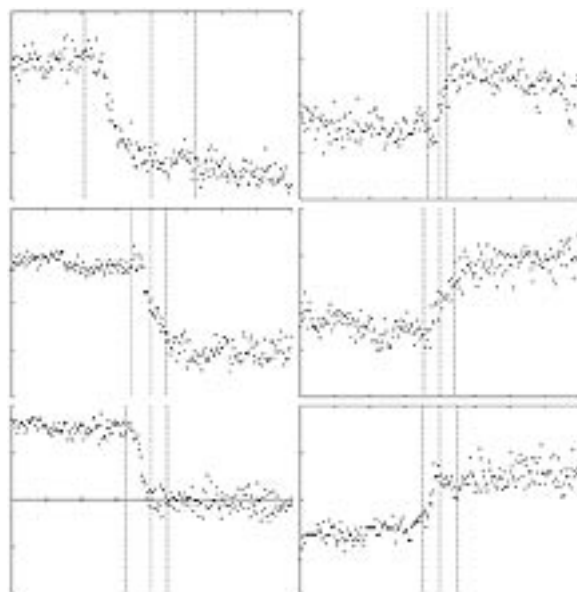


Figure 2. Six examples of the abrupt and persistent changes in the longitudinal magnetic field during X-class solar flares observed by GONG. Magnetic field strength is plotted in 100 gauss increments along the vertical axis. Time is plotted in 30-minute increments along the horizontal axis. The dashed vertical lines in each plot denote the start, the peak, and the end of the flare according to the GOES soft X-ray flux measurements.

The production of near-real-time farside images of the Sun from GONG's network is right around the corner. Currently, the engineering site at Tucson and the remote sites at Big Bear and Tenerife are capturing and transferring the 200×200 images back to Tucson, where farside maps are being produced and delivered on line. The remaining sites will be added over the next month and the resultant farside maps will be available via our Web site; stay tuned!

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GONG continued

The GONG Program welcomes a new staff member, Sushant Tripathy, who has joined us from the Udaipur Solar Observatory. Sushant is working on short-term temporal variations in the frequencies and changes in ring properties across the disk, as part of the NASA SOHO/MDI guest investigator program. Sushant has been in Tucson as a GONG visitor on several occasions, and we are happy to have him and his family back on a full-time basis.

The Program also has another new face: Aleksandr (Sasha) Serebryanskiy. Sasha is from the Ulugh Beg Astronomical Institute in Tashkent, Uzbekistan, and he has joined us for a year under a NATO/NSF postdoctoral fellowship. Sasha's primary field of study is local helioseismology.

Annie Malanushenko, from the University of St. Petersburg, worked with GONG as a summer intern on the development and production of the farside images. Annie has since returned to Russia to continue her course work, but continues to collaborate with local staff and our partners at Northwest Research Associates (Charlie Lindsey and Doug Braun).

After the GONG 2004 Meeting at Yale University in July, GONG hosted several visitors who spent considerable time in Tucson working with our staff: Hannah Schunker from Monash University, Olga Burtseva from Tashkent, and Ashok Ambastha from Udaipur, India, who left well equipped with GONG data.

On the departure side, Chirag Shroff, who has worked as GONG's real-time programmer, supporting the real-time instrument control and data acquisition systems for GONG's network of instruments, left for the commercial world in San Diego. We wish you the best!



Chirag Shroff (left) with Ron Kroll.

Sites, Instruments, and Engineering

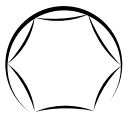
Operations events of the third quarter of 2004 centered on the preventive maintenance (PM) trip to El Teide (Tenerife, Spain) and the discoveries made during that visit. The trip took place during the second half of August and included the installation of earthquake protection hardware on the optical table, a new UPS unit, and upgraded camera power supplies, amplifier chassis, and filter/interferometer assembly.

The work progressed well, but along the way a number of anomalies were found. The first involved an issue with the filter-oven temperature, which had been noted at the previous PM and was already on the to-do list for this visit. Measurements indicated the oven temperature had changed such that the filter transmission was starting to be affected, however attempts to adjust the temperature did not improve the filter transmission and in the end no change was effected.

A second anomaly was discovered after the installation of a new camera power supply: an unusual artifact was introduced into dark images, which appeared to vary with time at an unacceptable level. The modification to the power supply causing the problem was identified and undone. This discovery is the source of some concern because similarly modified power supplies have already been installed at other sites. The good news is that significant work was done on site to make and test various modifications to determine which configuration minimized the artifacts and remained stable over time. At present, an acceptable solution is being tested at Tucson, and we expect to be able to implement it during the upcoming PM trips.

Another discovery of note was that the resistance measurements on the turret motors and cabling indicated that there is some breakdown in the insulation between the turret motor power and ground. Although the equipment continues to run, it is felt that this is an indication of a worsening condition, which might be further aggravated by the upcoming winter weather. In order to prevent a full-blown failure, which could result in damage to the motors and possibly other electronics, as well as untold instrument downtime, the turret will be replaced in short order. Fortunately, a refurbished and upgraded turret has been tested and is available for deployment. The plan is to revisit El Teide in November to replace the turret and filter oven and perform the required modifications to the camera power supplies. The calibration lens slide, which seems prone to emitting an uncomfortable squeal, will also be replaced.

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GONG continued

The Udaipur instrument was shut down most of the days due to seasonal monsoon conditions, but when attempts were made to operate, the turret pitch motor would not enable. Troubleshooting, which continued for several weeks, uncovered a faulty command board, and that fixed the pitch problem. We now have a tracking problem, which could be a related issue, and it is being addressed in a PM visit to Udaipur in progress.

Data Processing and Analysis

We have now completed ring diagram analysis of 20 Carrington rotations, 16 of which are consecutive. Data for an additional 17 rotations has been merged and ring processing is under way. By the time you read this we should have flow maps for a total of 37 consecutive rotations!

In the last quarter, the GONG distributed 442 gigabytes in response to 21 requests. Mode frequencies for GONG months 87 through 89 (ending 12 February 2004) are now available. The data reduction team is maintaining the cumulative backlog at 139 days. Installation of the automated image rejection (AIR) module is now under way. After verification and acceptance, which will be finished by the end of December, AIR will become part of the production pipeline, and will allow further reduction of the delay between data collection and delivery of the frequencies.

GONG is sporting a new look at our Web site (gong.nso.edu). After what must have felt like pulling teeth, the GONGsters were cajoled into switching over to the new NSO Web template, creating a more attractive and efficient site—thanks to all for pushing! We still have many revisions, updates, and a lot of new information and science to include.

We began the implementation of our long-term computing hardware plan to address GONG's expanded science and



"GONG the Tapestry" graces the walls of the newly remodeled GONG Data Management and Analysis Center, framed by quilt artist Molly Dodd (left) and her proud mom.

service requirements. Five new Linux workstations and one server have arrived and are being installed. Work has begun on rewriting the spherical harmonic decomposition module to take advantage of the new systems.

The refurbishment of the DMAC building is reaching completion. We have nearly doubled our office space, transforming eight offices, a large bullpen area, and a conference room, into 16 single-person offices (some even with windows). While the data processing group has shrunk, the science and analysis group has grown with the help of much-appreciated outside funding support.