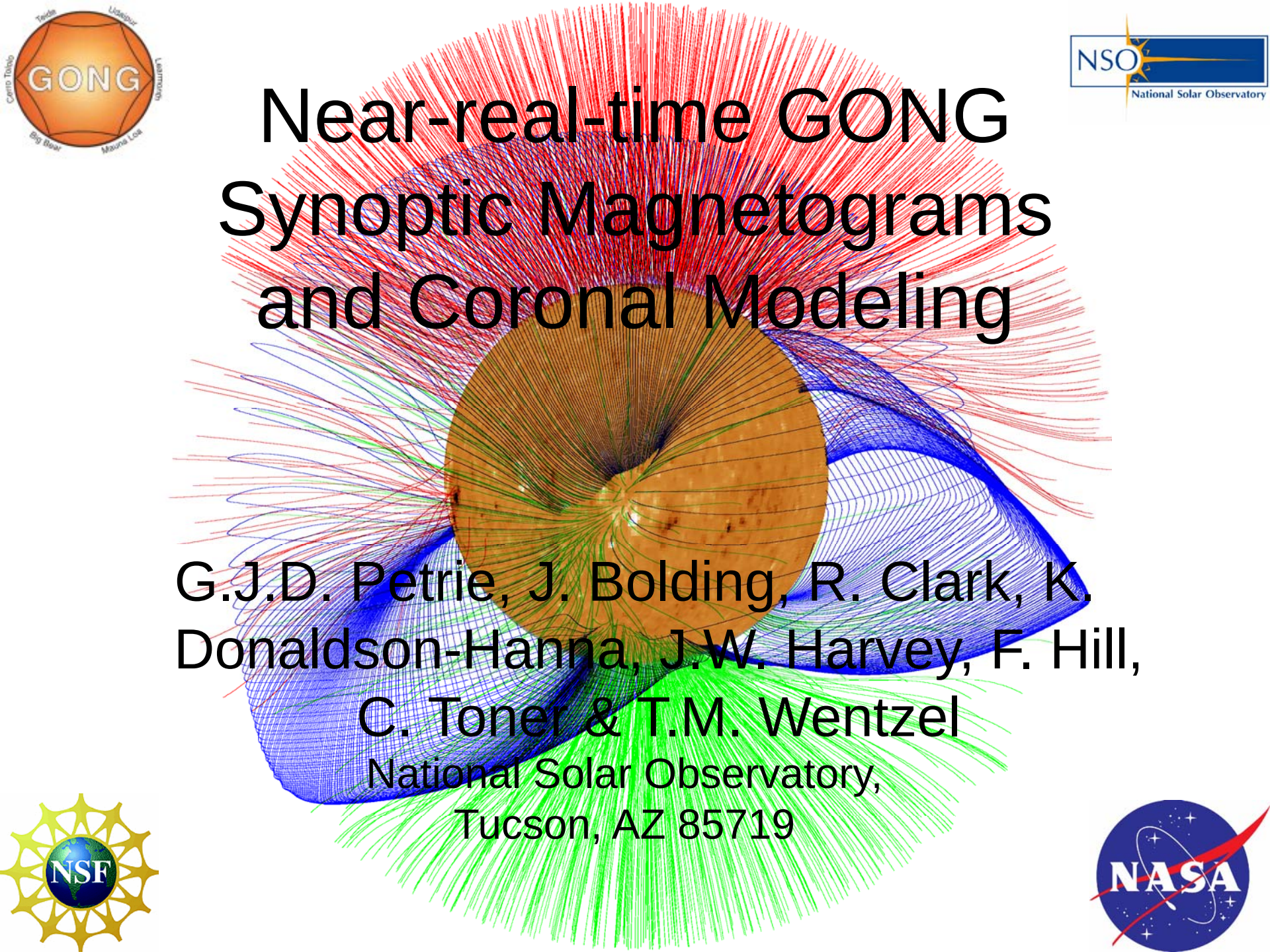
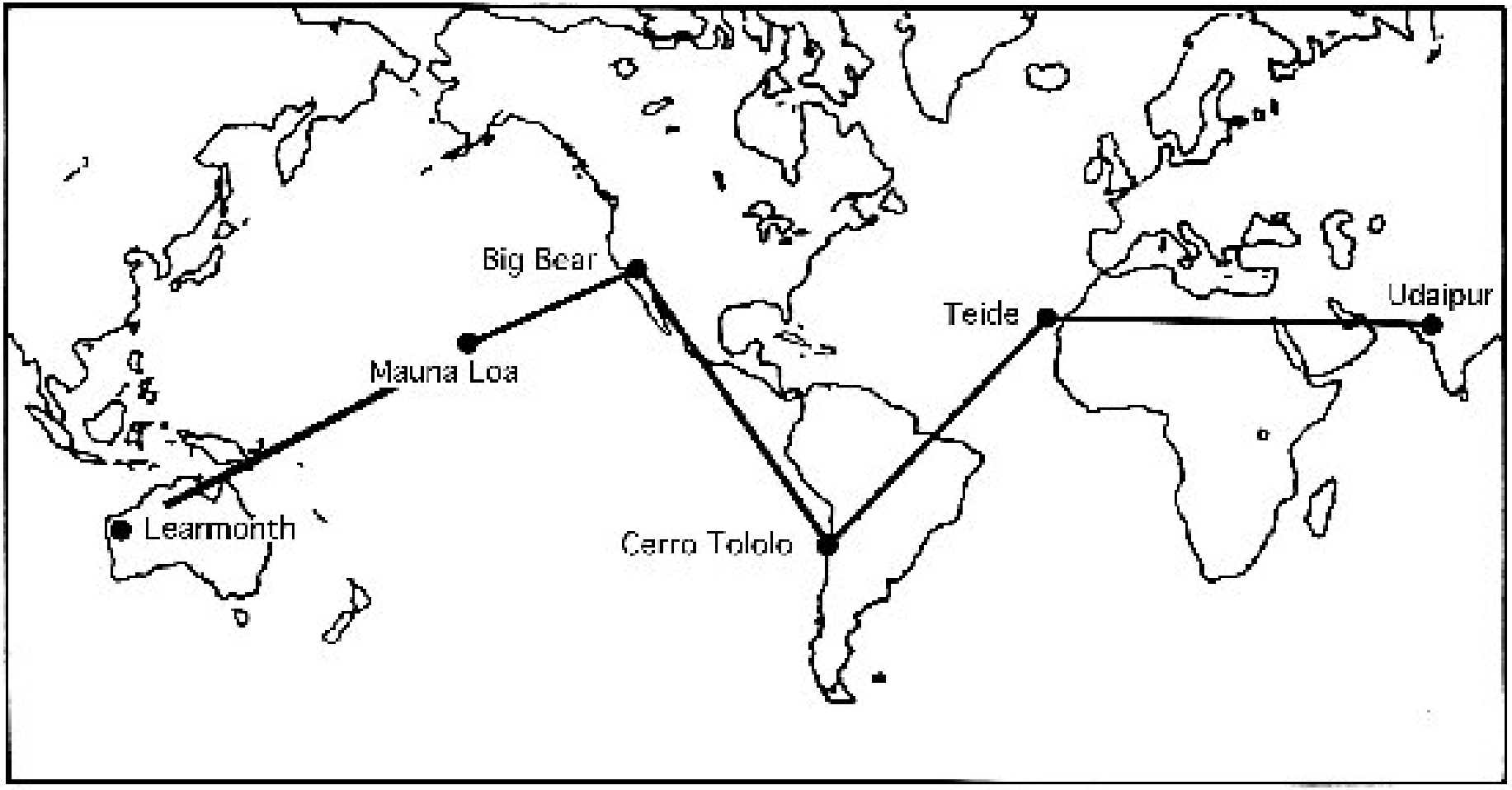


Near-real-time GONG Synoptic Magnetograms and Coronal Modeling

G.J.D. Petrie, J. Bolding, R. Clark, K. Donaldson-Hanna, J.W. Harvey, F. Hill, C. Toner & T.M. Wentzel

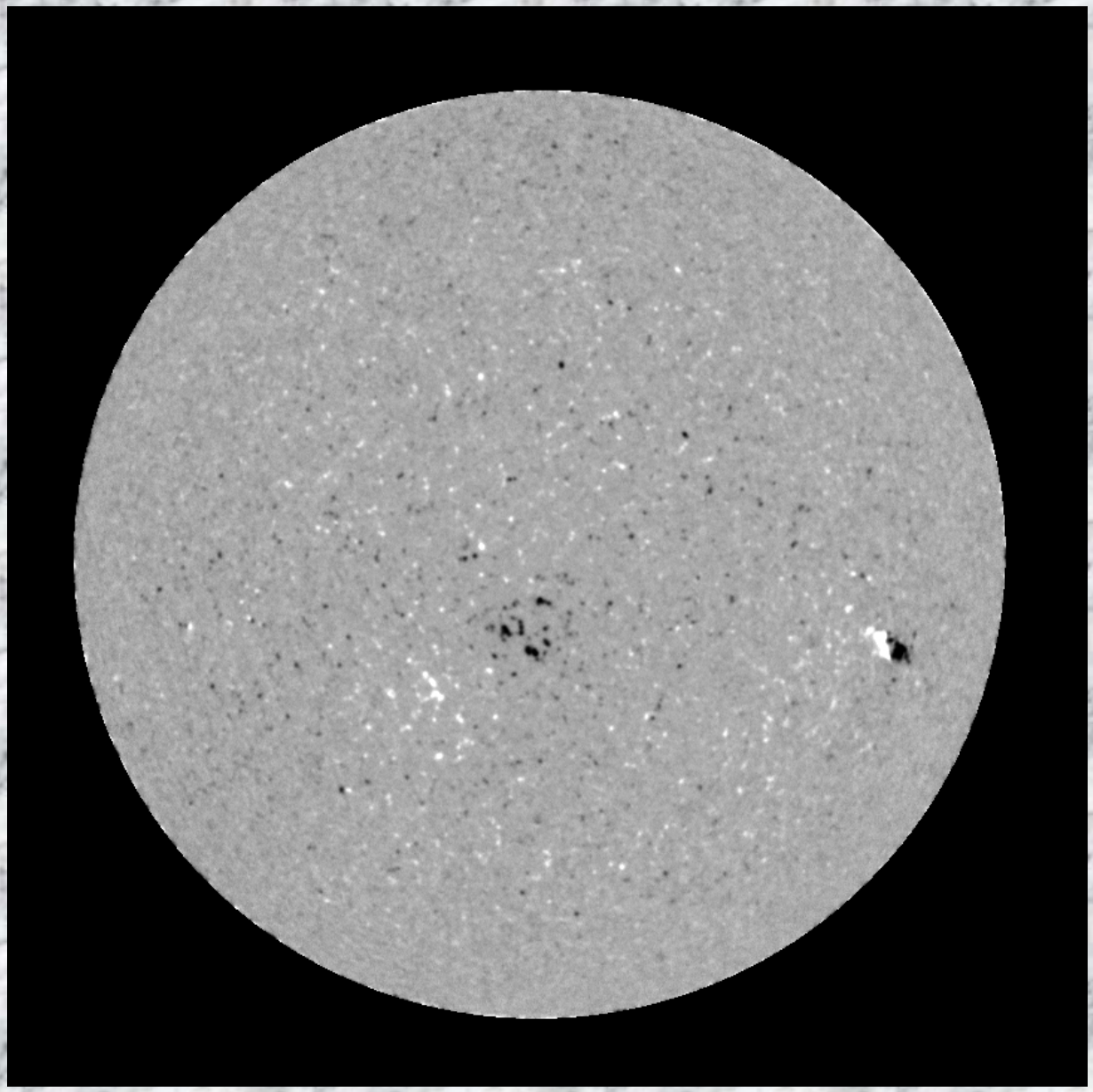
National Solar Observatory,
Tucson, AZ 85719

GONG's six sites

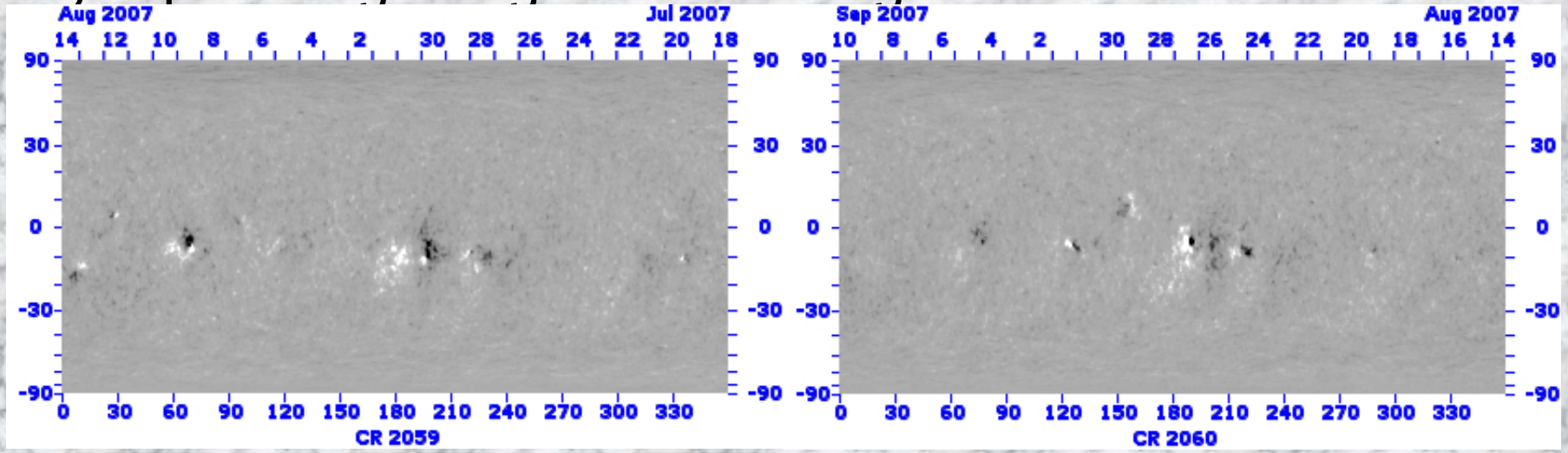


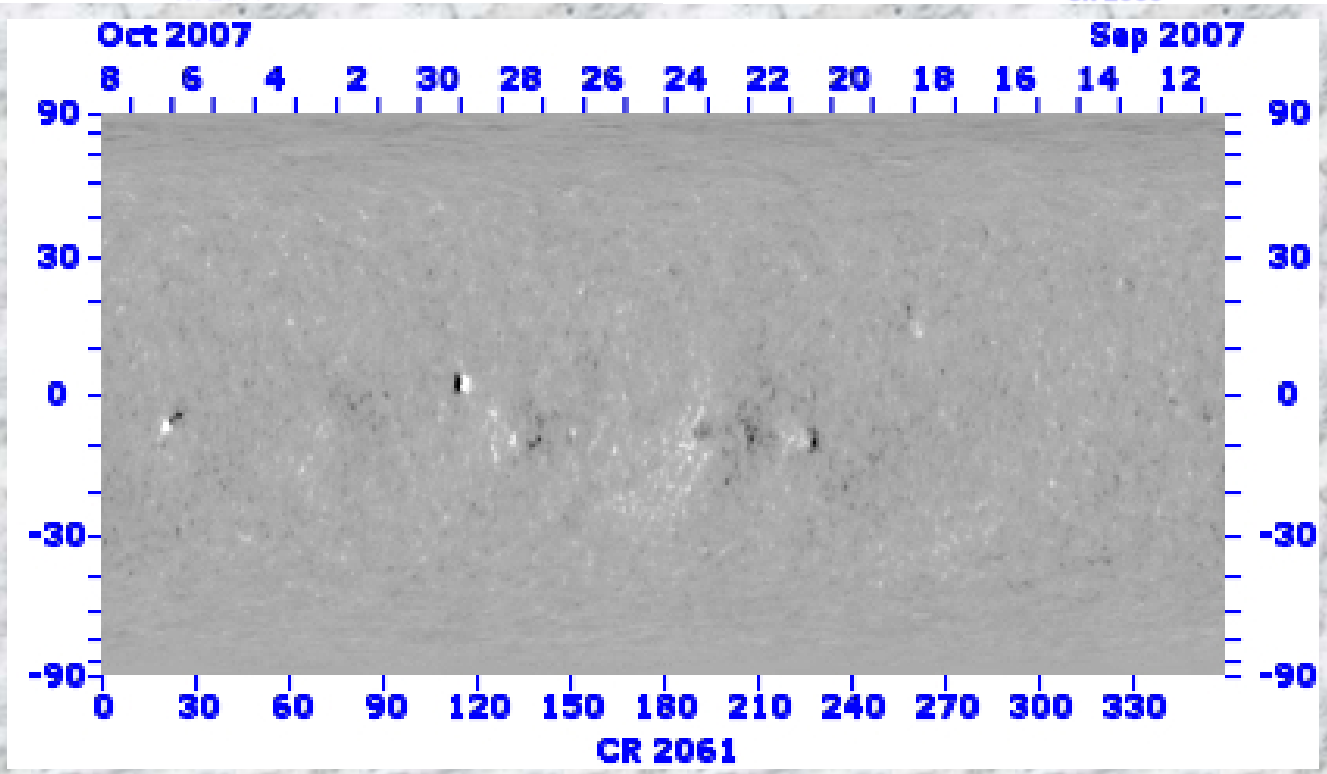
GONG Magnetograms

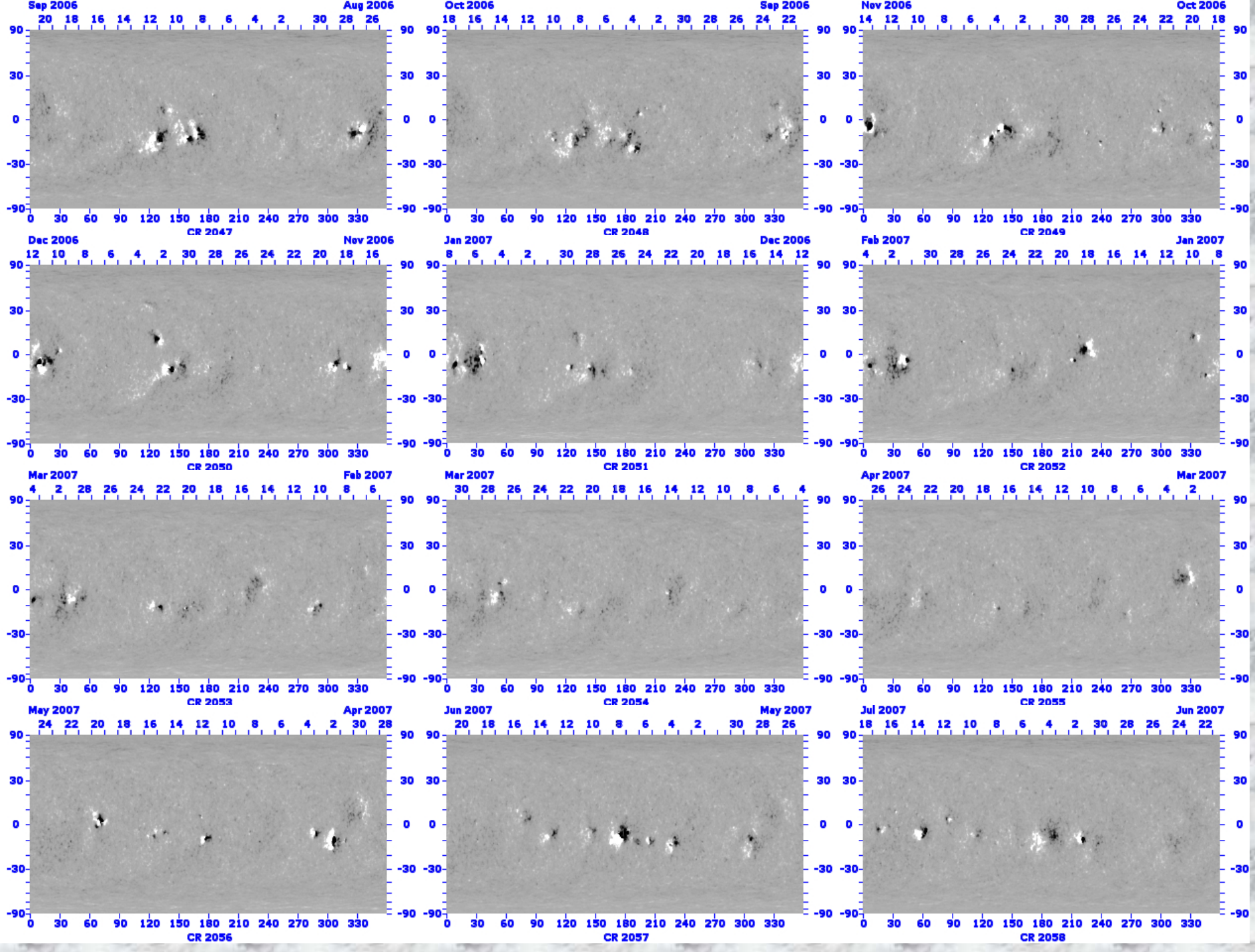
- GONG (Global Oscillations Network Group) obtains 2.5’’-pixel intensity, velocity and magnetic flux images every minute from six sites worldwide
- approximately 90% duty cycle
- Round-the-clock, high-cadence, low-noise (~3 G/pixel/min) photospheric line-of-sight magnetograms
- GONG is the provider of magnetograms for NASA’s STEREO mission.



Synoptic magnetograms: Carrington rotations 2059-2061






Sep 2006
Aug 2006
CR 2047
Oct 2006
Sep 2006
CR 2048
Nov 2006
Oct 2006
CR 2049
Dec 2006
Nov 2006
CR 2050
Jan 2007
Dec 2006
CR 2051
Feb 2007
Jan 2007
CR 2052
Mar 2007
Feb 2007
CR 2053
Mar 2007
CR 2054
Apr 2007
Mar 2007
CR 2055
May 2007
Apr 2007
CR 2056
Jun 2007
May 2007
CR 2057
Jul 2007
Jun 2007
CR 2058

Near-real-time synoptic magnetogram produced hourly

QuickTime™ and a
YUV420 codec decompressor
are needed to see this picture.

http://gong.nso.edu/data/magmap/index.html

The Coronal Model

In magnetically dominated solar corona, gas pressure, gravity and plasma inertia can usually be neglected:

$$(\nabla \times \mathbf{B}) \times \mathbf{B} = 0 \Rightarrow \nabla \times \mathbf{B} = \alpha(\mathbf{x})\mathbf{B}$$

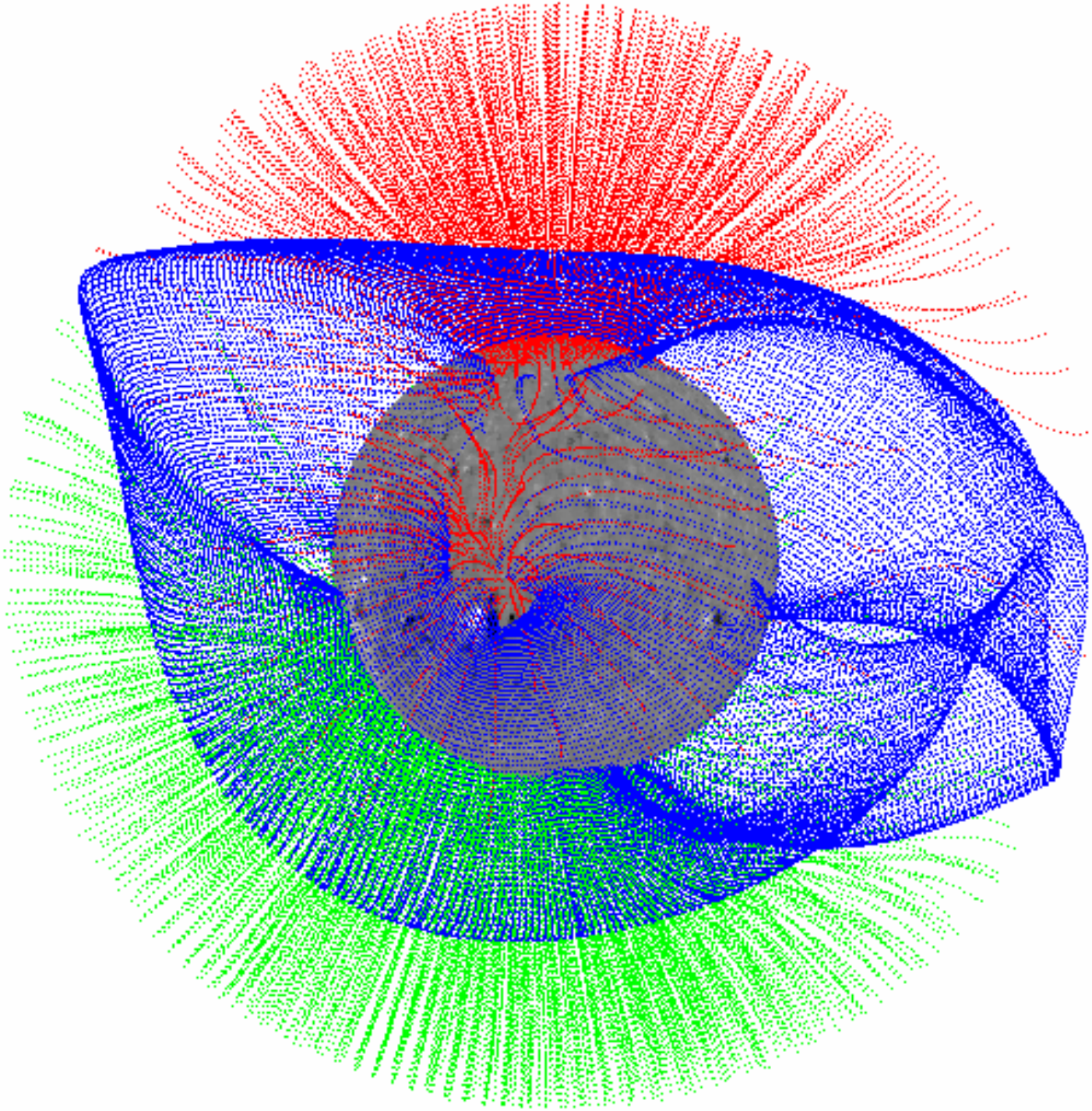
where the nonlinear force-free parameter scales as 1/*L*.

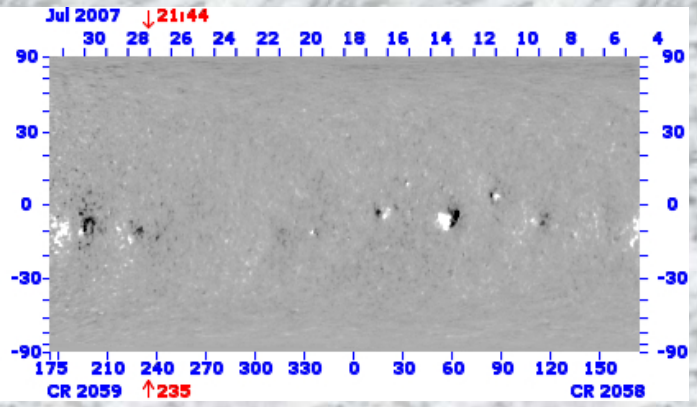
For large structures $\nabla \times \mathbf{B} \approx 0$ and use potential-field source-surface model (Altschuler & Newkirk 1969, Hoeksema 1984, Wang & Sheeley 1992).

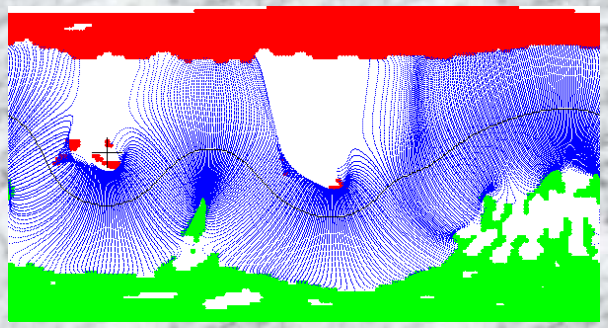
Only case where existence and uniqueness are guaranteed is

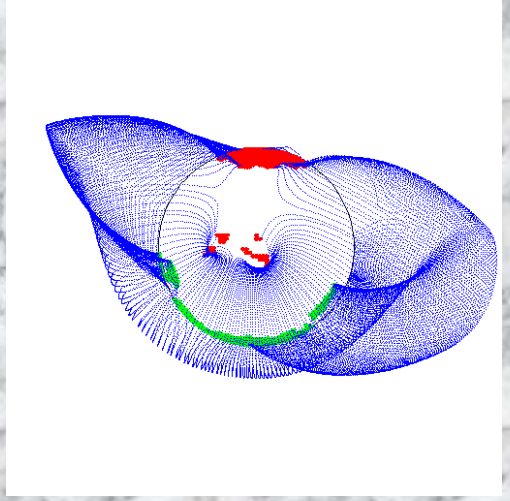
potential case (Bineau 1972, Brezis 1983, Boulmezaoud & Amari 2000, Kaiser 2000, Low & Flyer 2007).

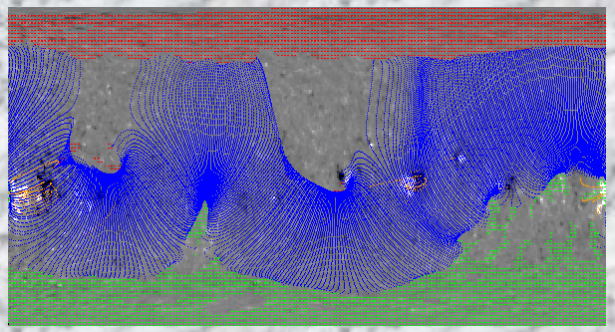
We thank Janet Luhmann, Yan Li and Xuepu Zhao for source code used in the modeling.

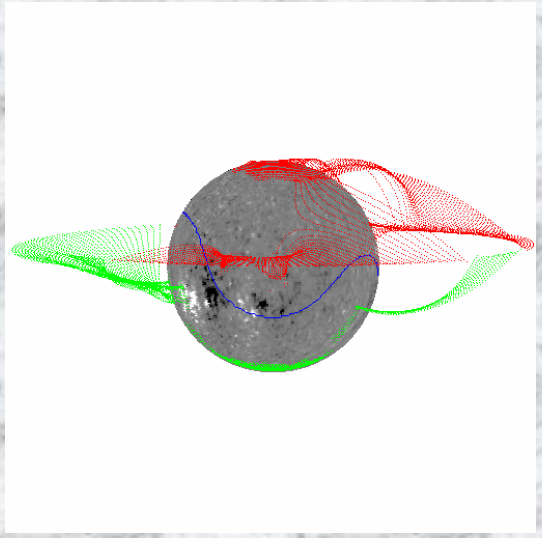


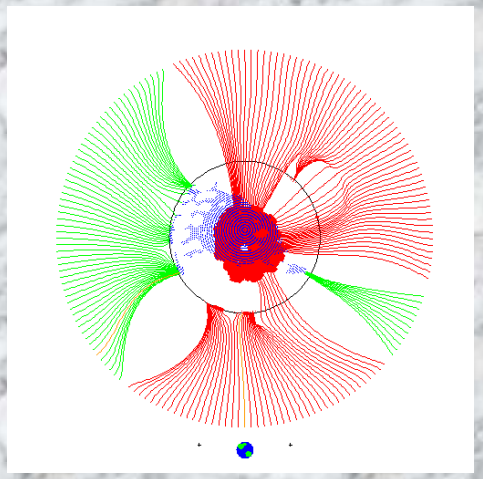

Jul 2007
21:44
30 28 26 24 22 20 18 16 14 12 10 8 6 4
90
30
0
-30
-90
175 210 240 270 300 330 0 30 60 90 120 150
CR 2059
235
CR 2058

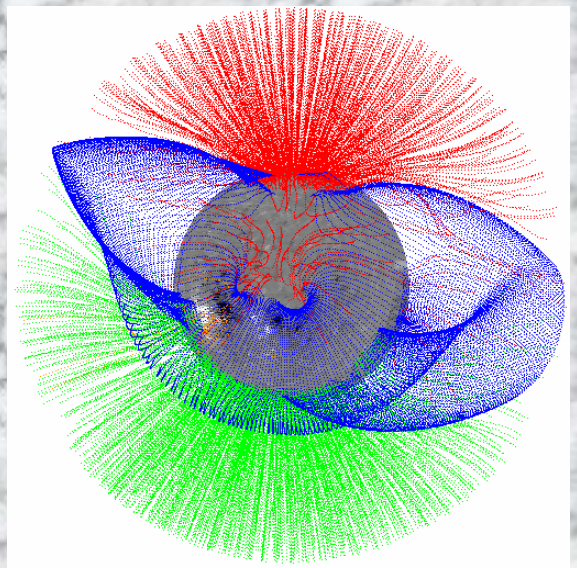


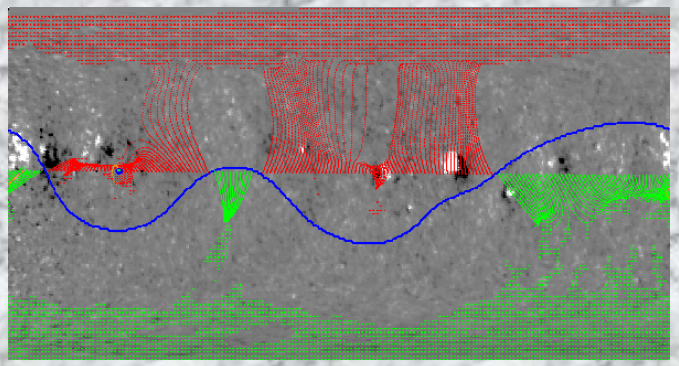




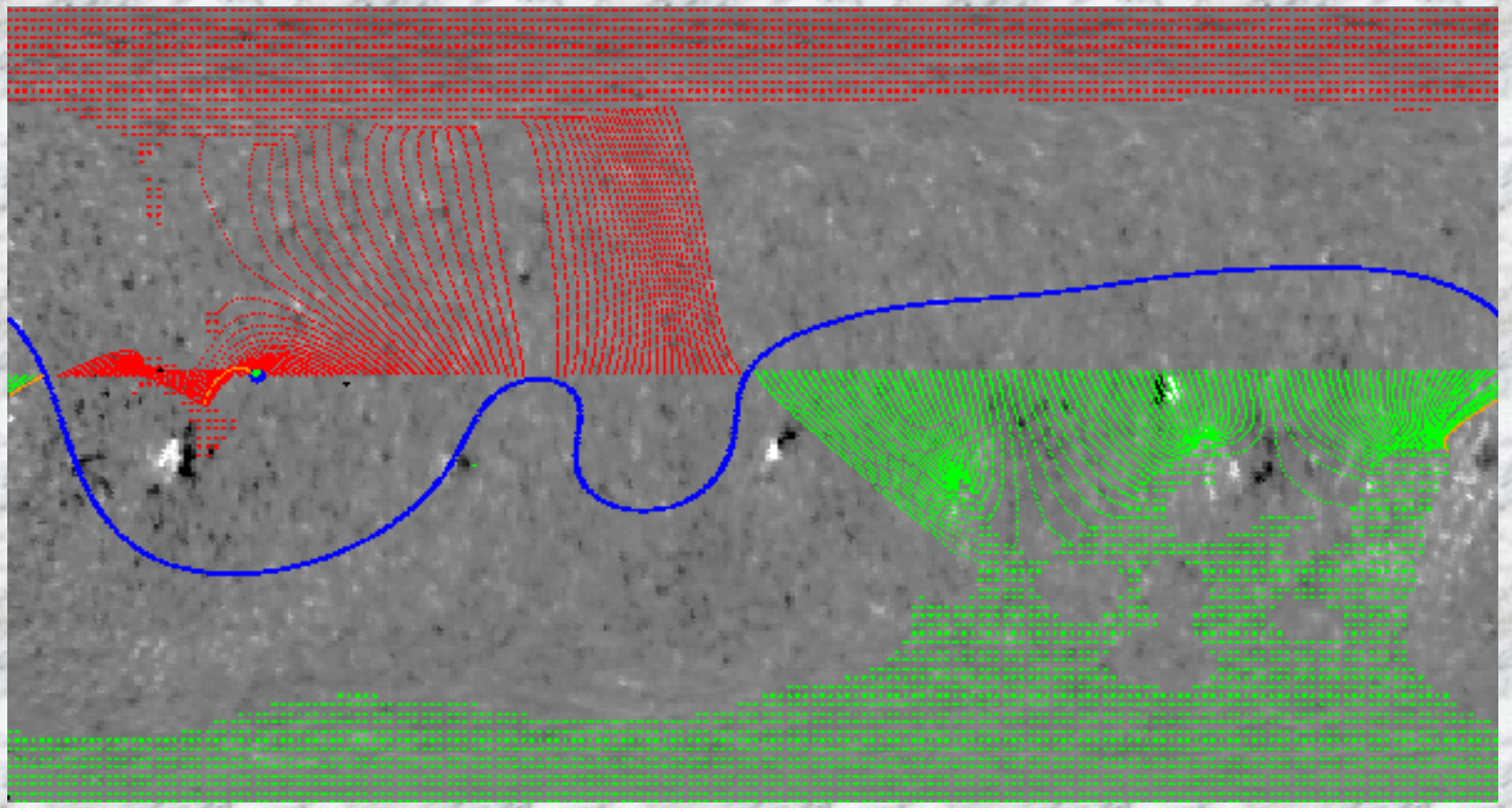




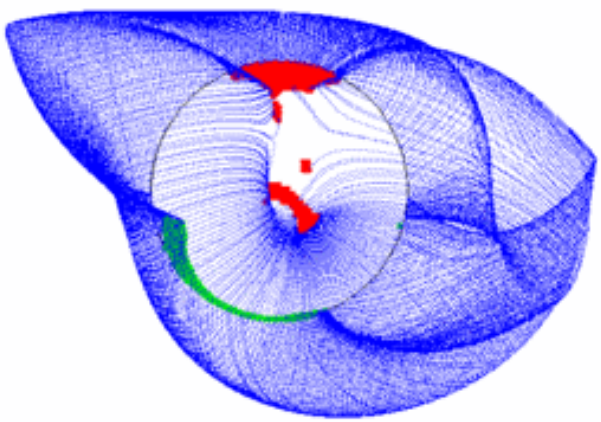


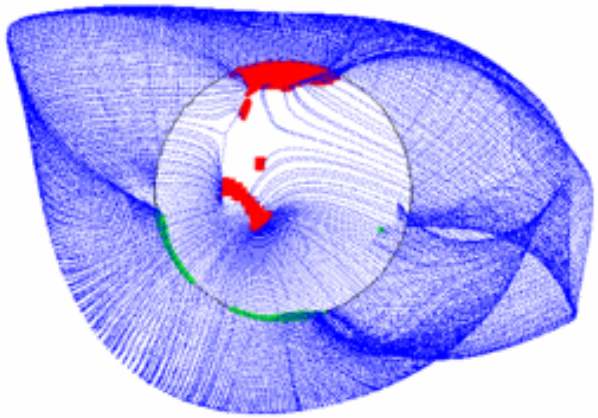


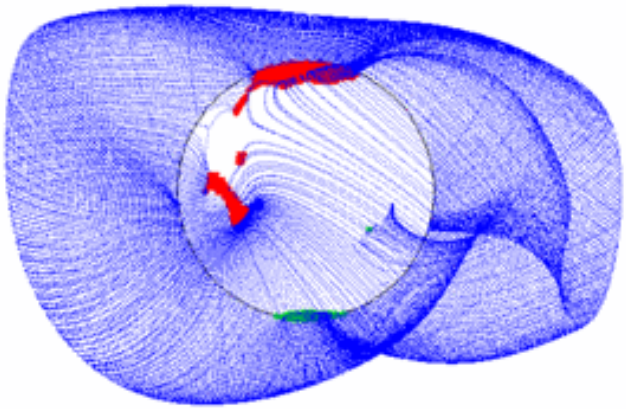
Ecliptic flux



Simulated Line-of-Sight Views from Earth and from NASA's STEREO A & B Spacecraft



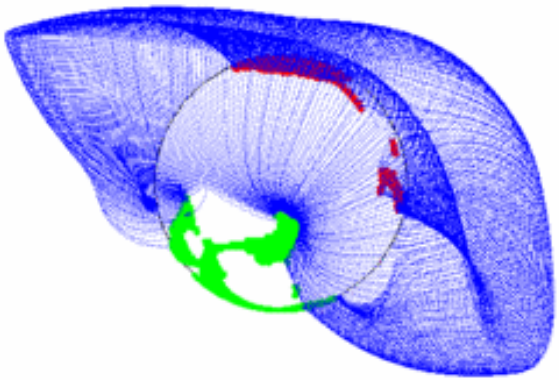




- For comparison, see the near-real-time STEREO beacon images

  htpp://stereo-ssc.nascom.nasa.gov/browse/

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.



QuickTime™ and a
TIFF (Uncompressed) decompressor
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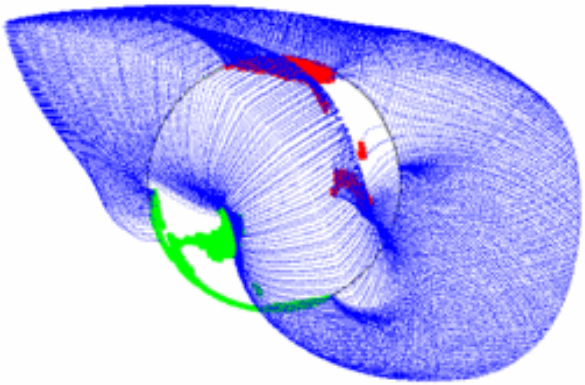

QuickTime™ and a
TIFF (Uncompressed) decompressor
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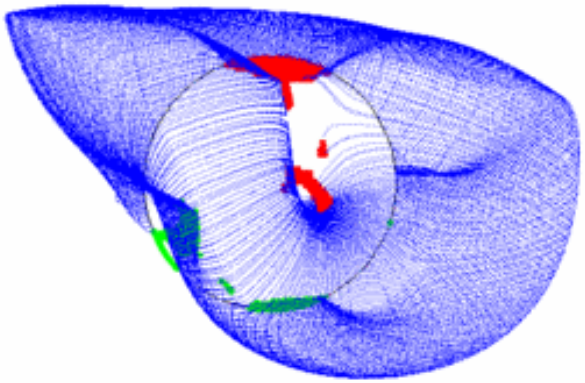

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

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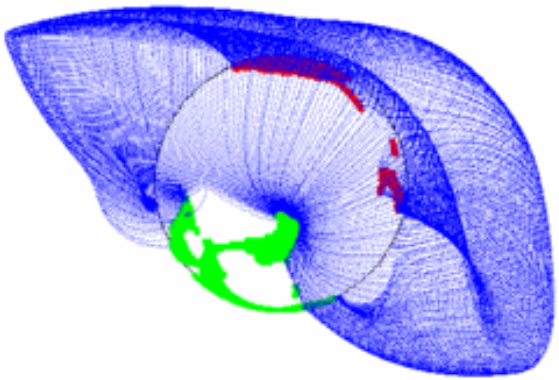
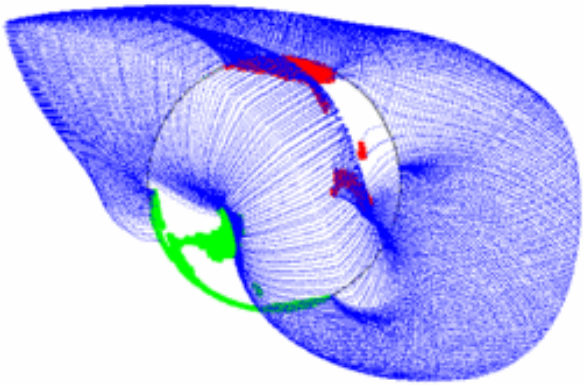
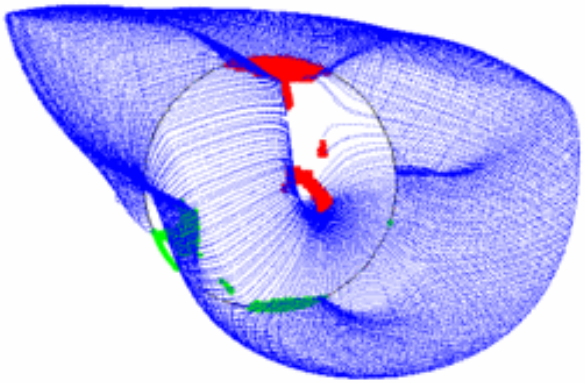
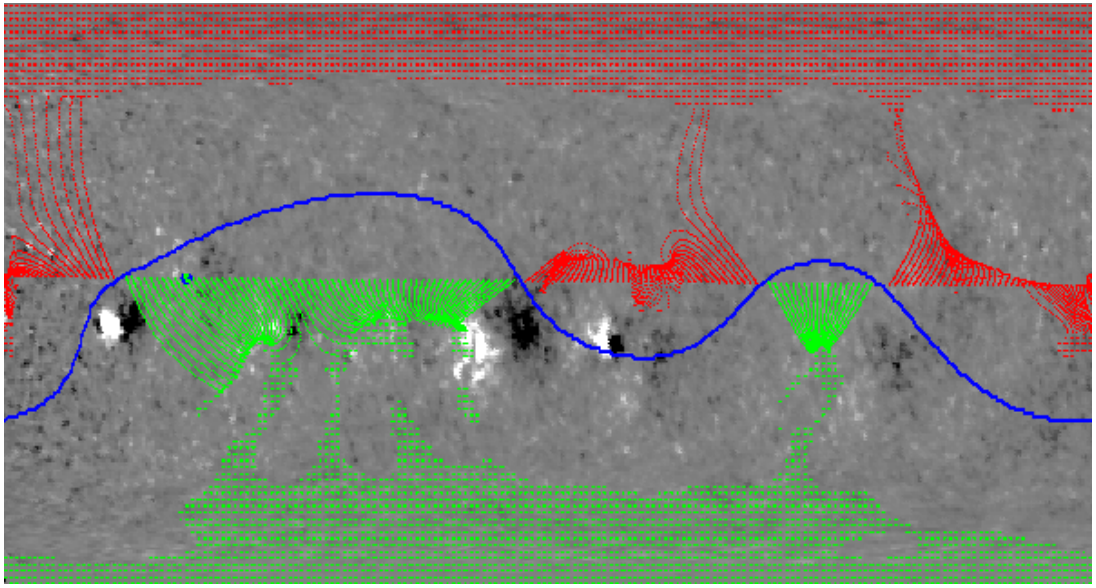


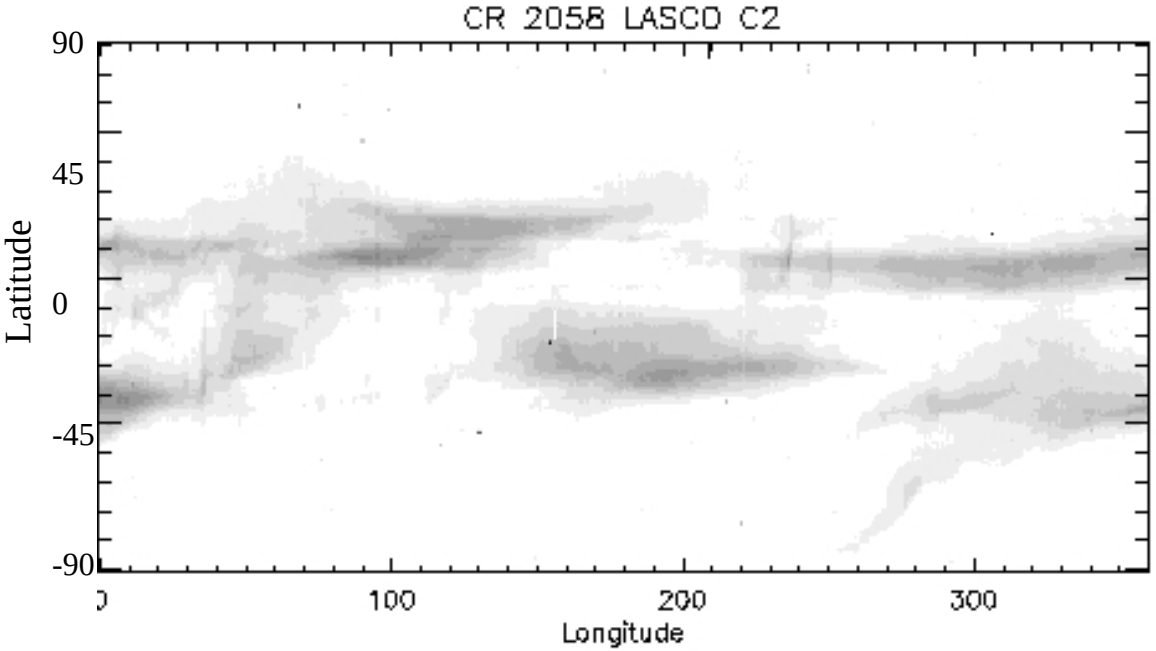






Model neutral line compared with observed location of streamers in coronal intensity:

The PFSS ecliptic field plot from GONG near-real-time synoptic magnetogram July 2007



CR 2058 - LASCO observations of streamer locations (thanks to Aimee Norton)

Last Slide

- Magnetograms used by, e.g., NASA's CCMC and WSA model at NOAA/SWPC
- Please use data and model products & suggest new ones you'd like
- Plan to add gradient and flow maps & running SHT coefficient plots, quantify open/closed/ total flux & topological changes
- Exploit SOLIS photospheric vector (CME energetics), chromospheric l.o.s. (nearly force-free?) data

http://gong.nso.edu/data/magmap/index.html