

# Minutes of the 39<sup>th</sup> SOHO SWT “Executive” Meeting

Fort Lauderdale, Florida

29 May 2008

## Agenda

- 1) NASA Senior Review
- 2) Operations during the Bogart Mission
  - Changes to operations
  - EOF  $\Rightarrow$  BOF (Bogart Operations Facility)
  - Remote teams' IT infrastructure
- 3) New ESA procedure for mission extensions
- 4) Spacecraft rolls (MDI)
- 5) Final SOHO archive
- 6) 10<sup>th</sup> anniversary of the recovery of SOHO
- 7) Future meetings

## Participants

F. Auchère, W. Curdt, B. Fleck, C. Fröhlich, J. Gurman, J. Kohl, A. Poland, P. Scherrer, E. Valtonen

## Actions

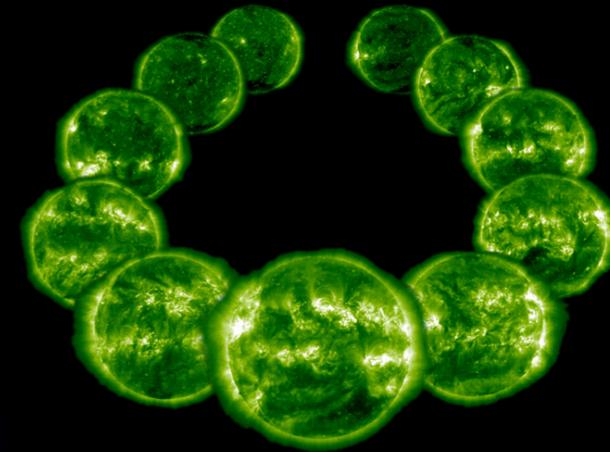
**39-1: on remote teams:** verify bootability and patchability of current dungeon systems by 30 November 2008. If systems cannot be booted or patched, they should be replaced before 31 May 2009.

## Summary

- agreed to pursue spacecraft roll for solar shape measurement and instrument calibrations
- agreed to have SWT meeting + dinner honoring the recovery team in Toulouse in late October (exact date TBD)
- endorsed proposal for SOHO-22 jointly with STEREO in the spring of 2009 in the UK
- MDI/HMI team is considering a SOHO/GONG/SDO meeting in the fall of 2009 after MDI-HMI cross-calibration
- UVCS team is considering to organize a “Solar Minimum” meeting



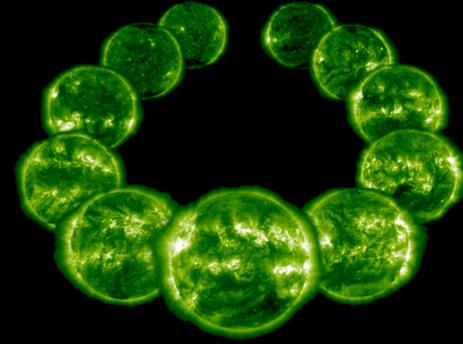
# SOHO SWT-39



1. NASA Senior Review
2. Operations during the Bogart Mission
  - 2.1. Changes to operations
  - 2.2. EOF → BOF (Bogart Operations Facility)
  - 2.3. Remote teams' IT infrastructure
3. New ESA procedure for mission extensions
4. Spacecraft rolls (MDI)
5. Final *SOHO* archive
6. Tenth anniversary of the recovery of *SOHO*
7. Future meetings



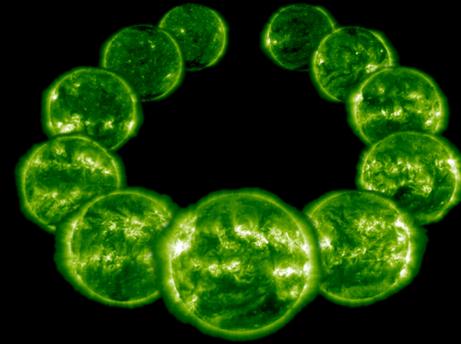
# NASA Senior Review (I)



- Proposal submitted 2008 February 21
- Oral presentation 2008 April 9 (Gurman, Raymond, Ipavich)
- Results communicated by phone 2008 May 16
- Guidance letter received 2008 May 22



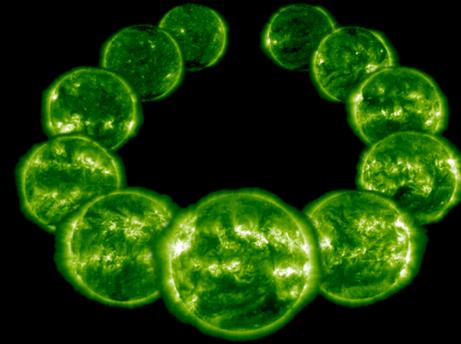
# NASA Senior Review (II)



- Overall rating: “science is excellent, but less compelling” – in other words, not a new mission, but doing interesting science relevant to NASA’s priorities
- Panel found that, “[C]ontinued limited operation of *SOHO* is critical to the ongoing effort to understand the solar influence on the heliosphere and geospace.
- Congratulations from Dick Fisher to you all “on this positive result”



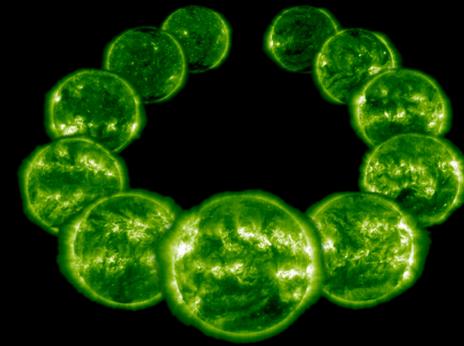
# NASA Senior Review (III)



- Chuck Holmes noted on May 22 that *SOHO*, together with *ACE* and *STEREO*, is still considered essential by the space weather community, as evidenced by comments at Space Weather Enterprise Forum last week
- Nominal budget guidance presents a dilemma: less than optimal (in FY I I, even baseline) budget, but directed to “[F]ind.... a way to establish a limited capability for both UVCS and the NASA-funded portion of CELIAS.”
- So what does this mean for NASA funding and Bogart operations?



# NASA Senior Review (IV)



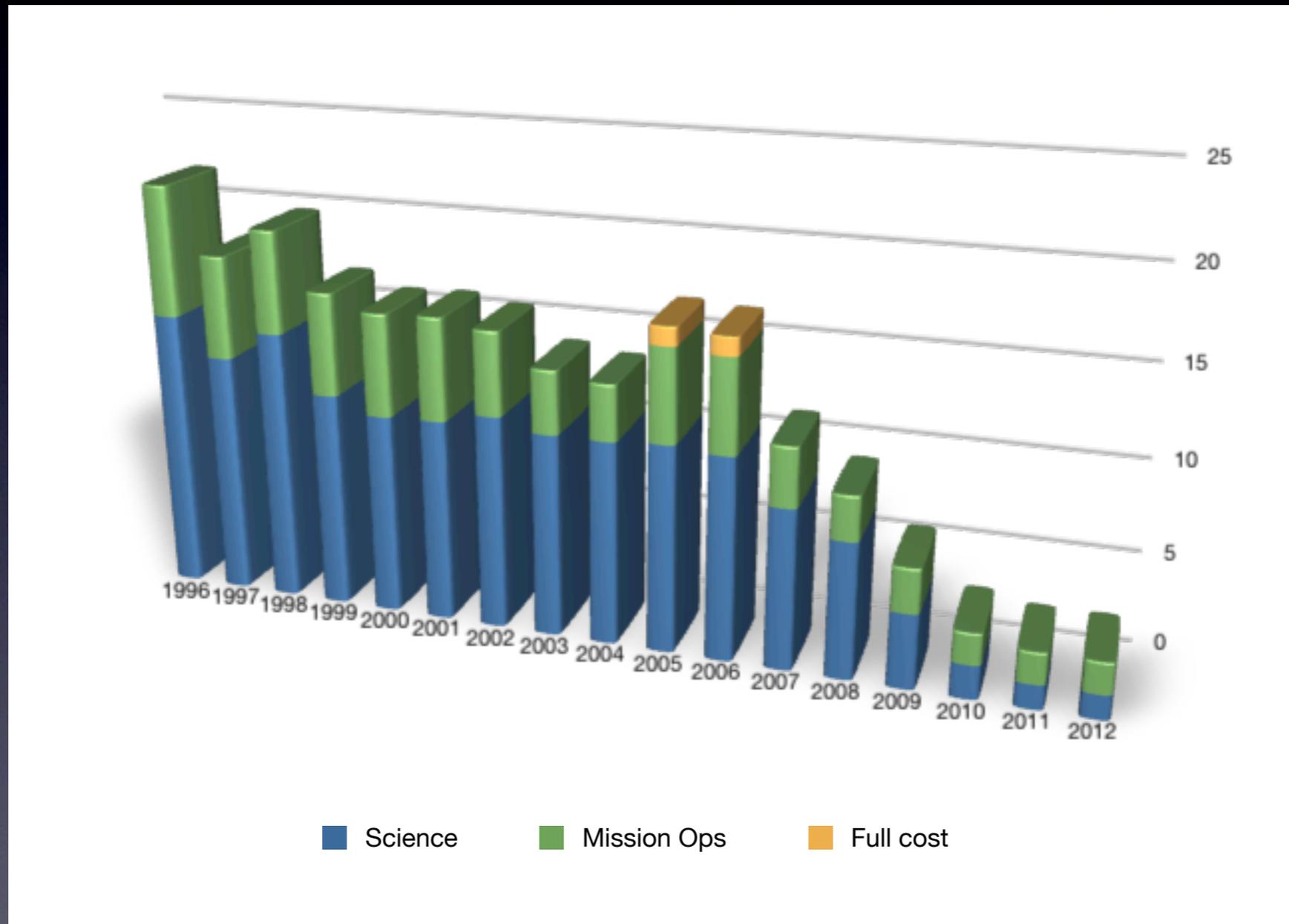
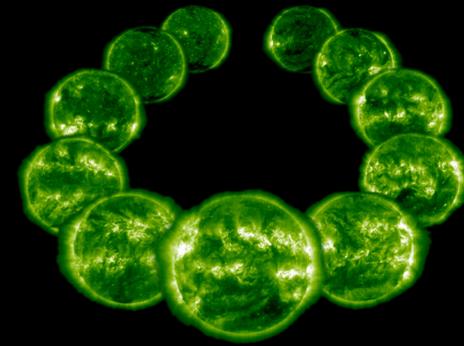
- Figures in US\$M (an ever-shrinking unit)

US fiscal year	2009	2010	2011	2012
Baseline proposal	6.430	3.443	3.027	2.918
Optimal proposal	6.430	3.869	3.464	3.374
Guidance letter	6.430	3.500	3.000	3.000
Guidance plus shift of FY08 \$	TBD	TBD	TBD	TBD

- Bottom line: We will continue to operate CELIAS and UVCS as proposed in our optimal budget.

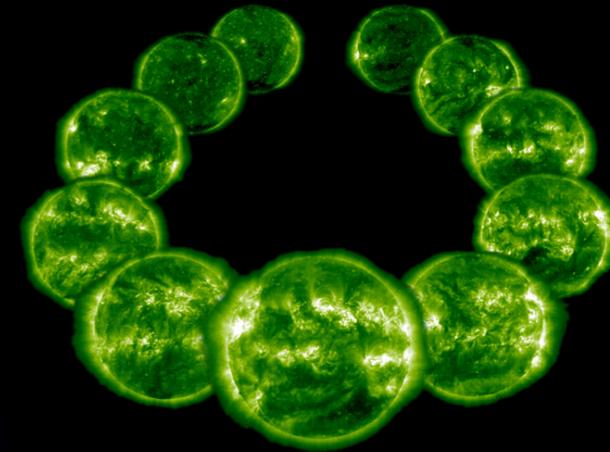


# SOHO budget in \$M, NOT adjusted for inflation





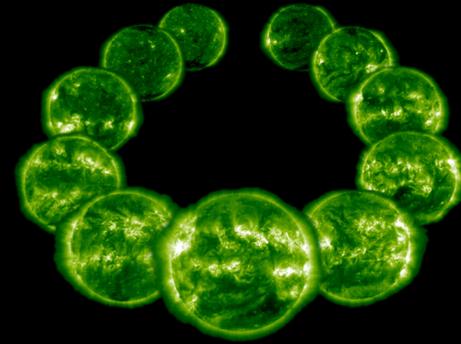
# SOHO SWT-39



1. NASA Senior Review
2. Operations during the Bogart Mission
  - 2.1. Changes to operations
  - 2.2. EOF → BOF (Bogart Operations Facility)
  - 2.3. Remote teams' IT infrastructure
3. New ESA procedure for mission extensions
4. Spacecraft rolls (MDI)
5. Final *SOHO* archive
6. Tenth anniversary of the recovery of *SOHO*
7. Future meetings



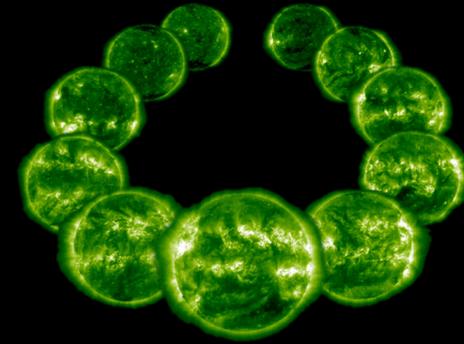
# *Changes to Operations (I)*



- Changes to operations (steady-state, CY2010 and after)
  - Much less realtime contact
  - Not necessarily geared to EOF local time
  - Fully automated spacecraft operations
  - FOT reduced to Observatory Engineers (including managing engineer) and a part-time DSN scheduler
  - No more EOF



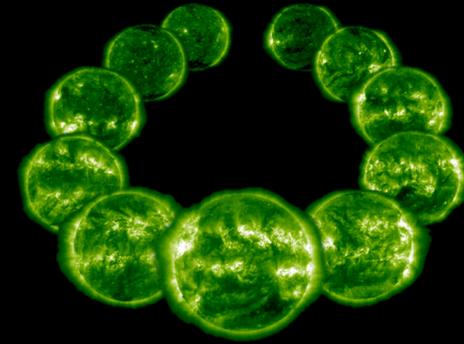
# Changes to Operations (II)



- To get to that steady state, we will go through:
  - Overtime for Observatory Engineers to assure minimum loss of MDI high-rate during MDI-HMI intercalibration
  - Transition to fully automated s/c operations
  - Porting of EOF Core System (ECS) to more sustainable platform (Linux), rackmount hardware
  - Porting of LASCO science ops software to more sustainable platform (newer Solaris, Mac OS X)
  - Porting of DPS to more sustainable platform (TBD)



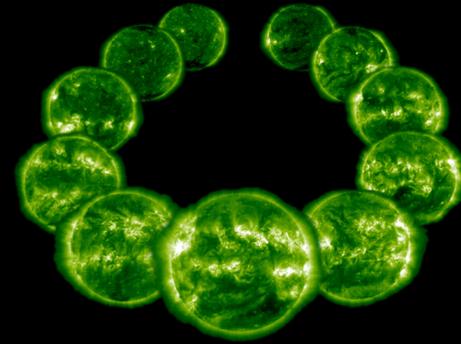
# EOF-BOF transition (I)



- “Science Exploration” building now being constructed at Goddard (where Soil Conservation Road used to be); will house almost all of Astrophysics and Planetary, but none of Heliophysics
- Heliophysics will take over most of Building 21 (library, cafeteria)
- After MDI is turned off, no more SOC's
- SOHO science personnel and remaining IWS systems move out of EOF ~ CY2010 Q2 or Q3



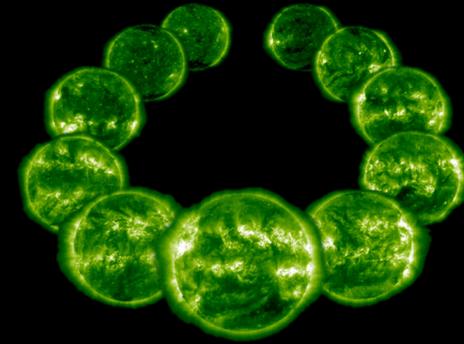
# *EOF-BOF transition (II)*



- Our network (IONet) connections will be preserved
- Office/ops space for science ops teams (LASCO, UVCS, SUMER/other visitors), project scientists
  - Considerably less floor space per team than at EOF
  - Will need to reduce number of workstations per team
- Computer room for rackmount h/w (ECS, SDAC)... two floors away (would also prefer COSTEP use rackmount)
- “Dungeon” for remote teams will remain in Bldg. 3
- CDS accommodation TBD



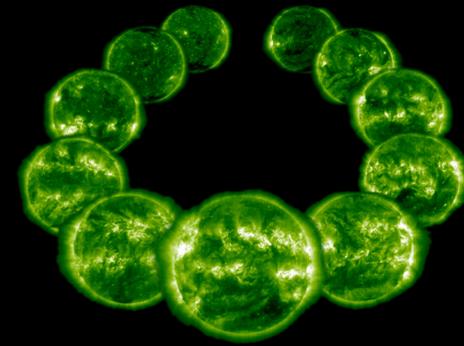
# Remote Teams' IT Infrastructure (I)



- Hardware currently in “dungeon” may not be bootable
  - > 15 years old in many cases
  - not patchable for strict IT security regime in IONet
- The Bogart mission is designed to last the full, 5-year lifetime of SDO – at least until 2013
  - We can't really expect 1993 systems to work in 2013
  - But remote teams have limited resources (e.g. COSTEP laptop)



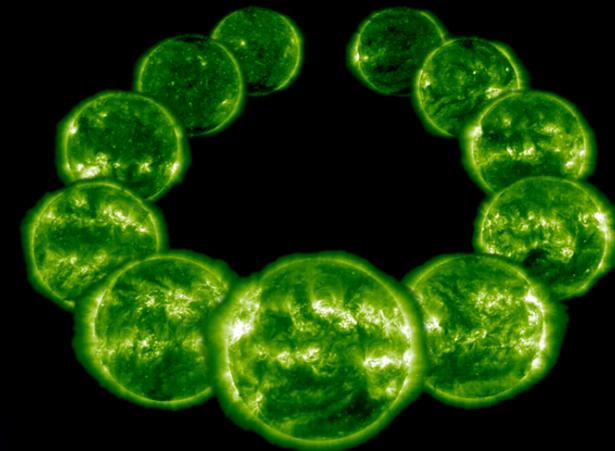
# Remote Teams' IT Infrastructure (II)



- All remote teams should verify by NLT 2008 November 30:
  - the bootability of current dungeon systems
  - the patchability of those systems
- If systems cannot be booted or patched, they should be replaced by NLT 2009 May 31 with something more sustainable
- If constrained resources prevent such h/w refreshment,
  - unusable systems should be removed/excessed in place
  - the expectation will be that any PI team troubleshooting will be carried out remotely... or not at all



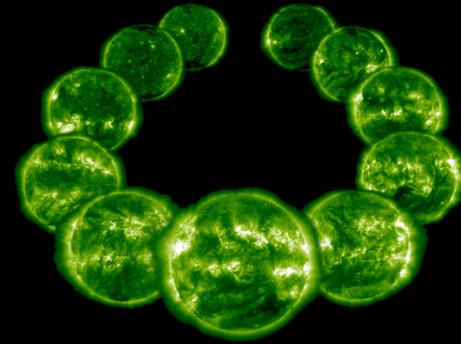
# SOHO SWT-39



1. NASA Senior Review
2. Operations during the Bogart Mission
  - 2.1. Changes to operations
  - 2.2. EOF → BOF (Bogart Operations Facility)
  - 2.3. Remote teams' IT infrastructure
3. New ESA procedure for mission extensions
4. Spacecraft rolls (MDI)
5. Final *SOHO* archive
6. Tenth anniversary of the recovery of *SOHO*
7. Future meetings



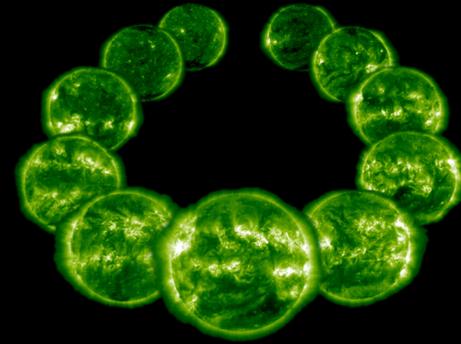
# Current ESA procedure for mission extensions



- In the past, mission extensions considered as needed on a case by case basis
- Scientific productivity assessed **non competitively** by working groups and SSAC
- No comprehensive planning procedure for mission extensions
- Science Programme Review Team (SPRT) raised concerns over the increasing fraction of the ESA Science programme devoted to “complementary” costs against development activities and recommended to bring the programme closer to a 60-40 split



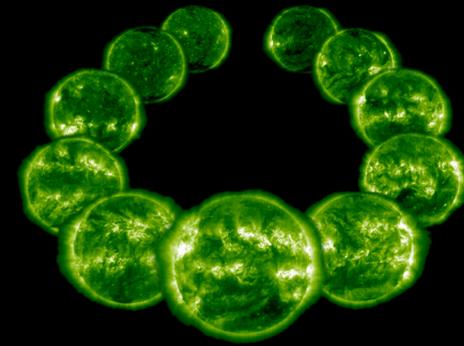
# New ESA procedure for mission extensions (I)



- Mission extension no longer considered on a case by case basis, but should be seen in the context of a programme-wide operations plan
- plan would take into account all missions in operation and future operations of projects under development
- biennial review of all mission candidates for extension
- competitive process for resources from dedicated operations envelope
- Basis for extension: 4 year roll forward process with intermediate review every 2 years



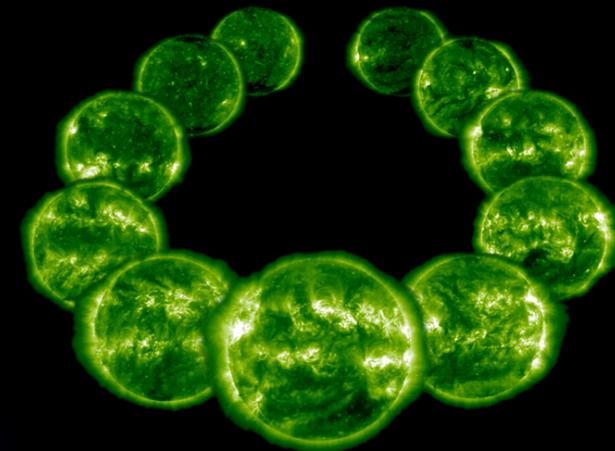
# *New ESA procedure for mission extensions (II)*



- SOHO currently approved through end 2009
- Mission operations plan foresees planned extension of SOHO to end 2012 (same time frame as NASA Senior Review)
- SPC to discuss proposal for new procedure at June meeting and decide on budgetary envelope
- First round of extension review expected for fall 2008, with selections at November SPC meeting



# SOHO SWT-39



1. NASA Senior Review
2. Operations during the Bogart Mission
  - 2.1. Changes to operations
  - 2.2. EOF → BOF (Bogart Operations Facility)
  - 2.3. Remote teams' IT infrastructure
3. New ESA procedure for mission extensions
4. Spacecraft rolls (MDI)
5. Final *SOHO* archive
6. Tenth anniversary of the recovery of *SOHO*
7. Future meetings

# MDI migration to HMI

- The launch of SDO is expected in the December to April interval – i.e. within a year.
- There is a 3 month commissioning and early observation tuning interval after launch.
- After the 3 month interval we expect to obtain at least 144 days of MDI “Structure Program” and 60 days of “Dynamics Program” observations (overlapped).
- Thus with present schedules, if all goes well, MDI overlap observations will be complete between Sept and December 2009.
- We are examining what, if any, special calibration runs we should make before the end of MDI observations.
- Obvious topics include MTF determination, Image center determination, special HMI comparison observations, etc.
- Additionally we are considering special observations such as the solar shape determination as previously done in 1997 and 1999.
- Several of these goals would include a SOHO roll with dwells at 8 to 12 angles for 10s of minutes.
- Preliminary questions to Joe and Bernhard tell us that it is possible.
- Question here is, should we proceed to study the feasibility and benefits?

## Solar Shape Measurements in Conjunction with a SOHO Roll Maneuver

- The Sun's oblateness was determined from MDI observations made during SOHO roll maneuvers in 1997 and 2001.
- An additional SOHO roll with MDI high rate telemetry would provide a comparison with the previous solar minimum measurements in 1997.
- The HMI instrument on SDO will continue the solar shape measurements, and a contemporary observation with MDI will allow comparison of the instrument performance on the measurements.

# Comparison of Solar Shape near Solar Minimum (1997) and Solar Maximum (2001)

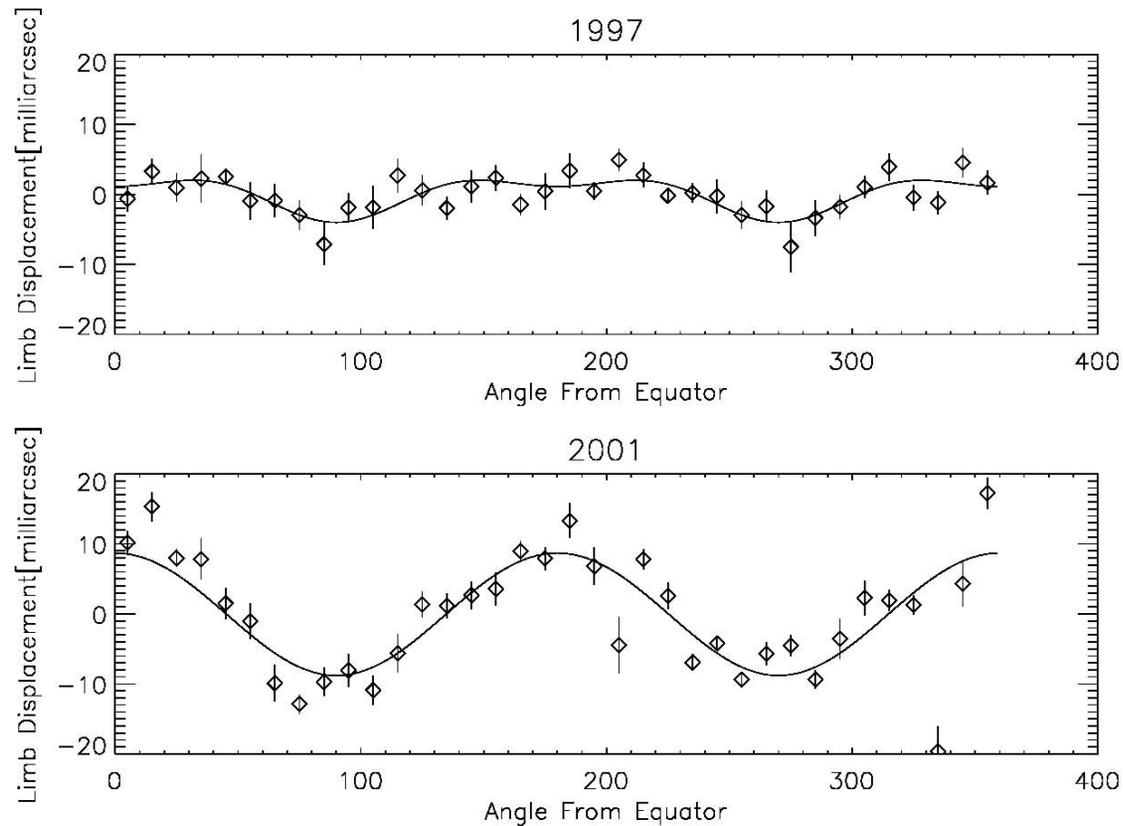


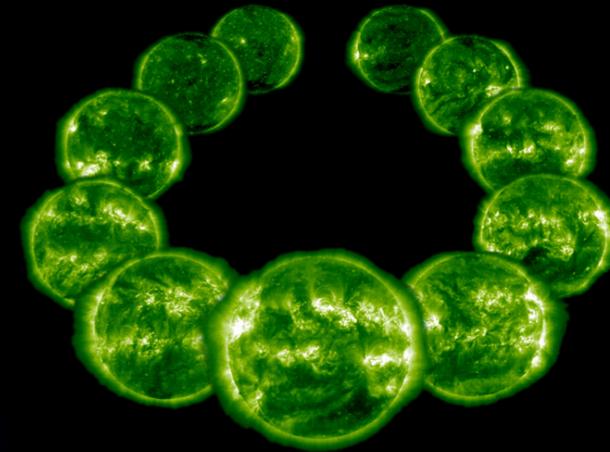
Fig. 2.— The limb shape from 1997 and 2001 is plotted here. The equator corresponds to position angle 0. Data have been averaged into 10 degree wide bins and the best fit  $l = 2$  (oblateness) and  $l = 4$  (hexadecapole) Legendre Polynomial have been plotted. The shape distortion after correcting for bright contamination is nearly a pure oblateness term in 2001, while 1997 has a significant hexadecapolar shape contribution.

## Solar Shape Papers

- The Sun's Shape and Brightness, Kuhn et al, Nature, Vol. 392, pp 155-157, 1998 March.
- A Changing Solar Shape, Emilio et al, Astrophysical Journal, Vol. 660, pp L161-L163, 2007 May 10.



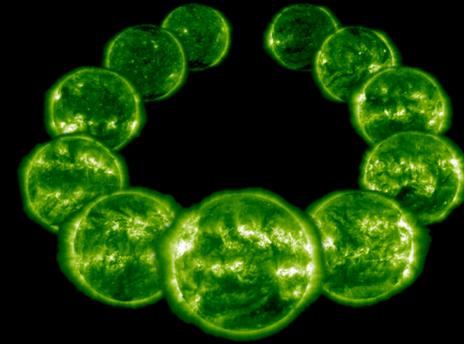
# SOHO SWT-39



1. NASA Senior Review
2. Operations during the Bogart Mission
  - 2.1. Changes to operations
  - 2.2. EOF → BOF (Bogart Operations Facility)
  - 2.3. Remote teams' IT infrastructure
3. New ESA procedure for mission extensions
4. Spacecraft rolls (MDI)
5. Final *SOHO* archive
6. Tenth anniversary of the recovery of *SOHO*
7. Future meetings



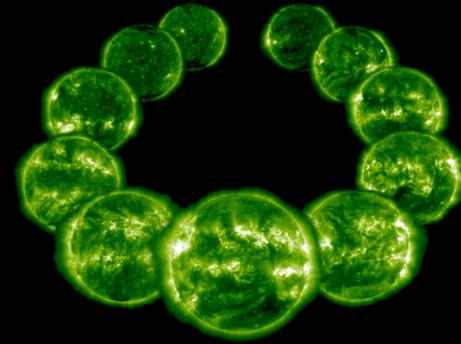
# *Final SOHO Archive: Plans for Existing Archive*



- **GSFC:**
  - Bring our software up to date (it is 10 years old already).
    - Database migration from Oracle v.8 to MySQL v.5
    - Redo the data ingestion procedures to avoid Oracle PL/SQL and gain performance.
    - Integrate all data collections in the same database (science, ancillary, TLM, real time, bibliography, etc.)
- **ESAC:**
  - Development of long term archive within the existing ESA science archive framework already in place at site (hosts ESA's Astronomy and Planetary science archives, and virtual observatory activities).
  - Long term archive maintenance done by ESA's Science Archive Team.
  - Improve the capabilities of the archive reusing tools already developed by the Science Archive Team, in particular, data visualization.



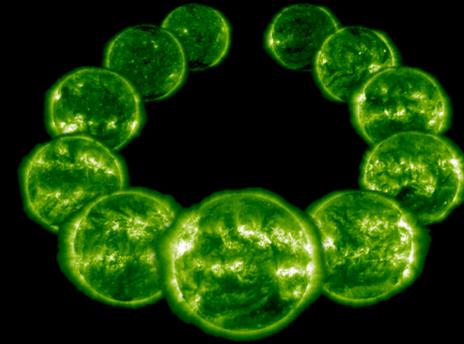
# *Final SOHO Archive Execution of Archive Plans*



- **GSFC:**
  - Proof of concept already implemented, tested, and deployed for the real time images in the web.
  - Science data and bibliography migrated, tested, and verified (mid May)
  - Testing and verification of new science data ingestion software ongoing.
  - Inclusion of ancillary data and telemetry after new ingestion SW is working.
- **ESAC:**
  - First version of archive already functional (ingestion, search, distribution).
  - Currently in alpha test using data from 3 instruments (CDS, EIT, VIRGO).
  - New capabilities for image, movie and time series data visualization after all science data is ingested.
  - Data duplication GSFC ↔ ESAC complete providing disaster recovery.



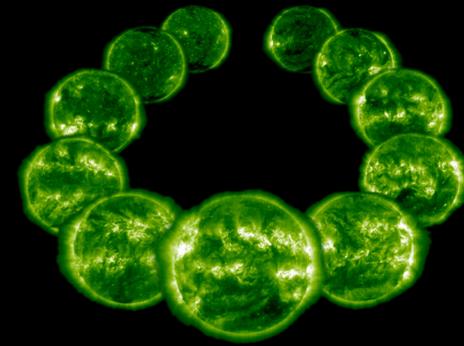
# SOHO Archive: *Current Issues*



- **We are facing some issues with the current archive:**
  - Reached an Oracle v.8 internal limit on table sizes preventing ingestion of new science data.
  - No impact on searches on the current archive.
  - Ingestion of new science data currently on hold until a fix is found (i.e. table split) or new ingestion software fully tested.
- We are also reviewing every data set we hold, as we believe some are not complete. For a few science data sets, I will be contacting the PI teams (for clarification or to fix delivery problems in certain cases).



# Current Archive Status

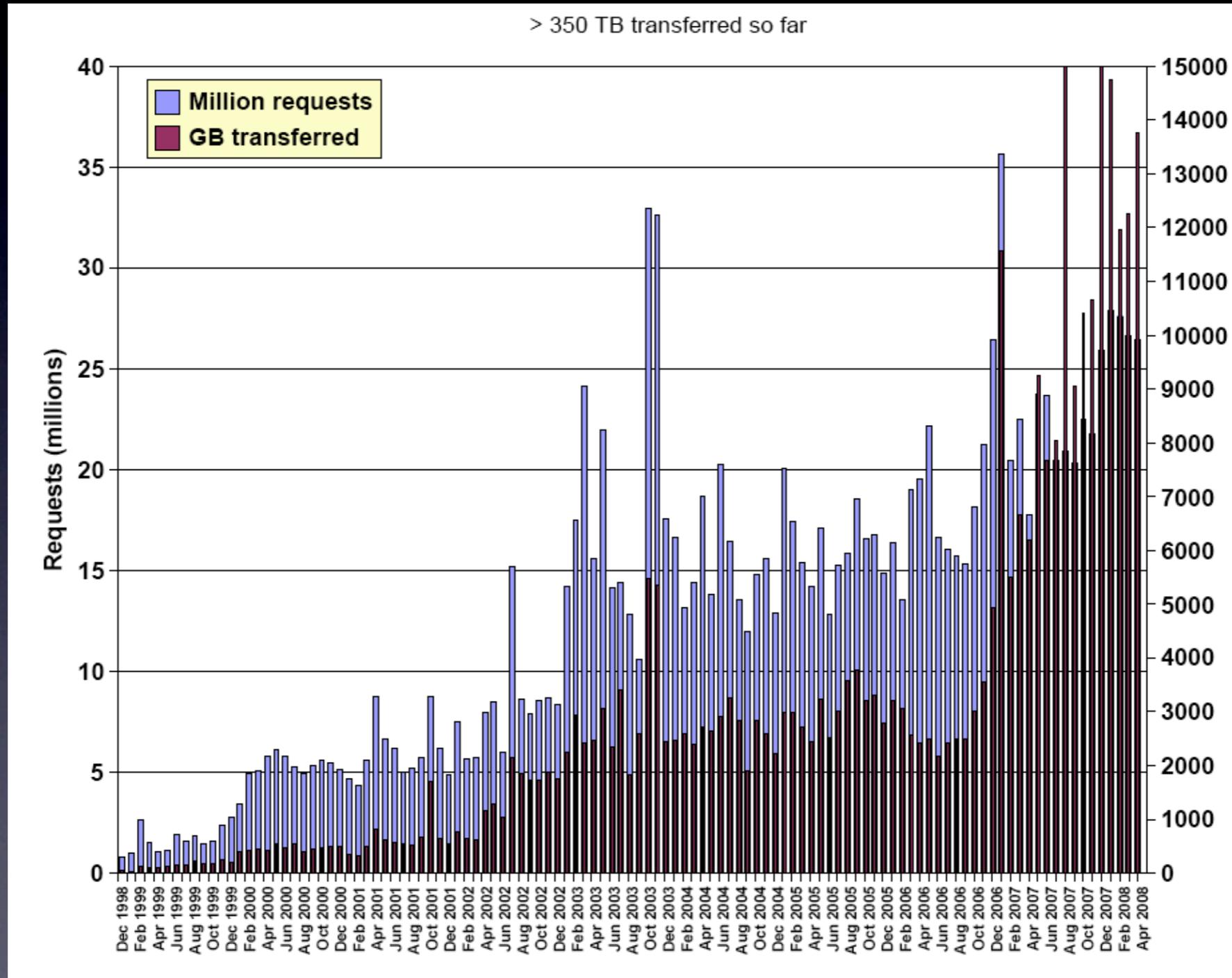
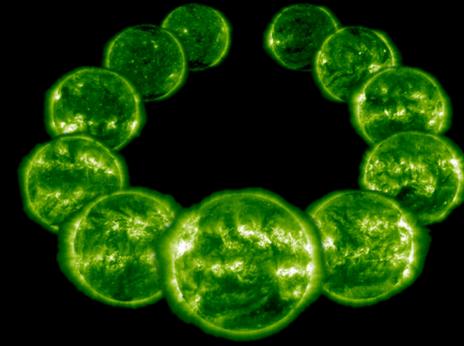


Instrument	Latest data	Updated on
CDS	07-MAR-2008	07-MAR-2008
CELIAS	24-JUN-2007	18-JAN-2008
COSTEP	01-DEC-2007	18-DEC-2007
EIT	20-JAN-2008	15-FEB-2008
ERNE	14-DEC-2007	18-DEC-2007
GOLF	18-DEC-2006	12-JAN-2007
LASCO	29-SEP-2007	19-JAN-2008
MDI	01-MAR-2008	07-MAR-2008
SUMER	13-NOV-2007	15-FEB-2008
SWAN	28-JUL-2007	31-AUG-2007
UVCS	02-MAR-2008	07-MAR-2008
VIRGO	06-MAR-2008	07-MAR-2008

*Some additional data are already available and pending ingestion.*

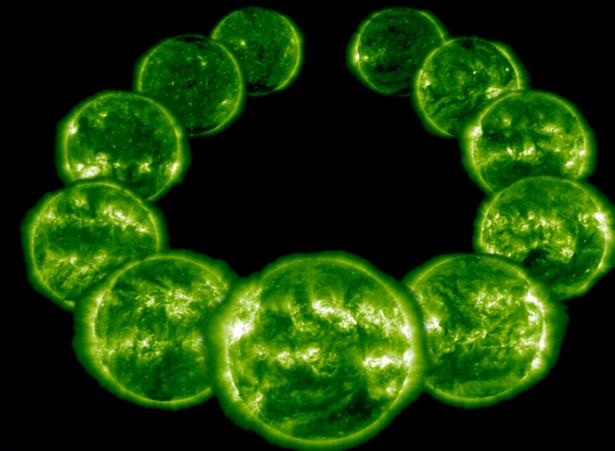


# Archive Statistics





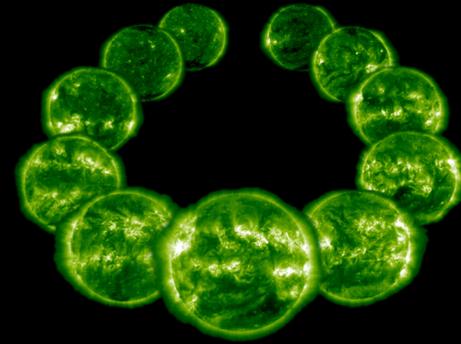
# SOHO SWT-39



1. NASA Senior Review
2. Operations during the Bogart Mission
  - 2.1. Changes to operations
  - 2.2. EOF → BOF (Bogart Operations Facility)
  - 2.3. Remote teams' IT infrastructure
3. New ESA procedure for mission extensions
4. Spacecraft rolls (MDI)
5. Final *SOHO* archive
6. Tenth anniversary of the recovery of *SOHO*
7. Future meetings



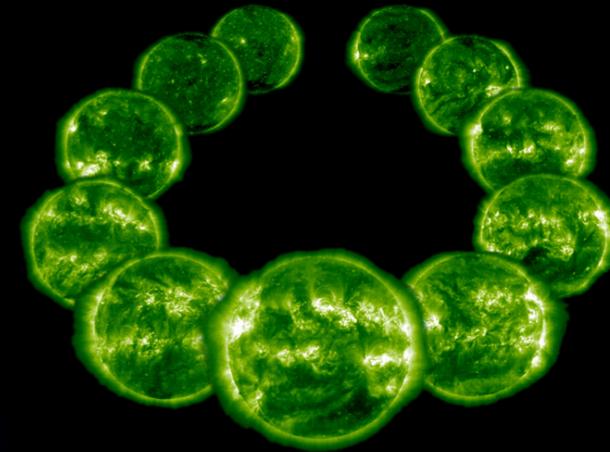
# *10th anniversary of SOHO recovery*



- 24 June: loss of contact
- 16 September: return to sun-pointing attitude
- 25 September: back to normal mode
- 4 November: recommissioning completed
- Suggest to celebrate and honor the people who made that possible
  - SWT mtg + dinner with engineers in Toulouse in the fall



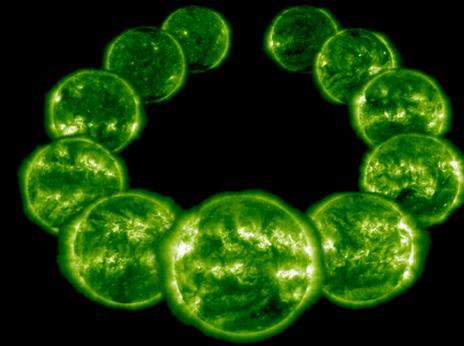
# SOHO SWT-39



1. NASA Senior Review
2. Operations during the Bogart Mission
  - 2.1. Changes to operations
  - 2.2. EOF → BOF (Bogart Operations Facility)
  - 2.3. Remote teams' IT infrastructure
3. New ESA procedure for mission extensions
4. Spacecraft rolls (MDI)
5. Final *SOHO* archive
6. Tenth anniversary of the recovery of *SOHO*
7. Future meetings



# *Future Meetings*



- SOHO 21 / GONG 2008 on “Solar-stellar dynamos as revealed by helio- and asteroseismology” in Boulder, CO (August 11-15, 2008)
- SOHO 22 jointly with STEREO in the spring of 2009, in the south of England (Oxford?)
  - Organizer: Richard Harrison (RAL)
- Any other volunteers?