



Whole Heliosphere and  
Planetary Interactions

***WHPI WORKSHOP  
SEPT. 13-17, 2021***

# Whole Heliosphere and Planetary Interactions (WHPI)

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Whole Heliosphere and Planetary Interactions

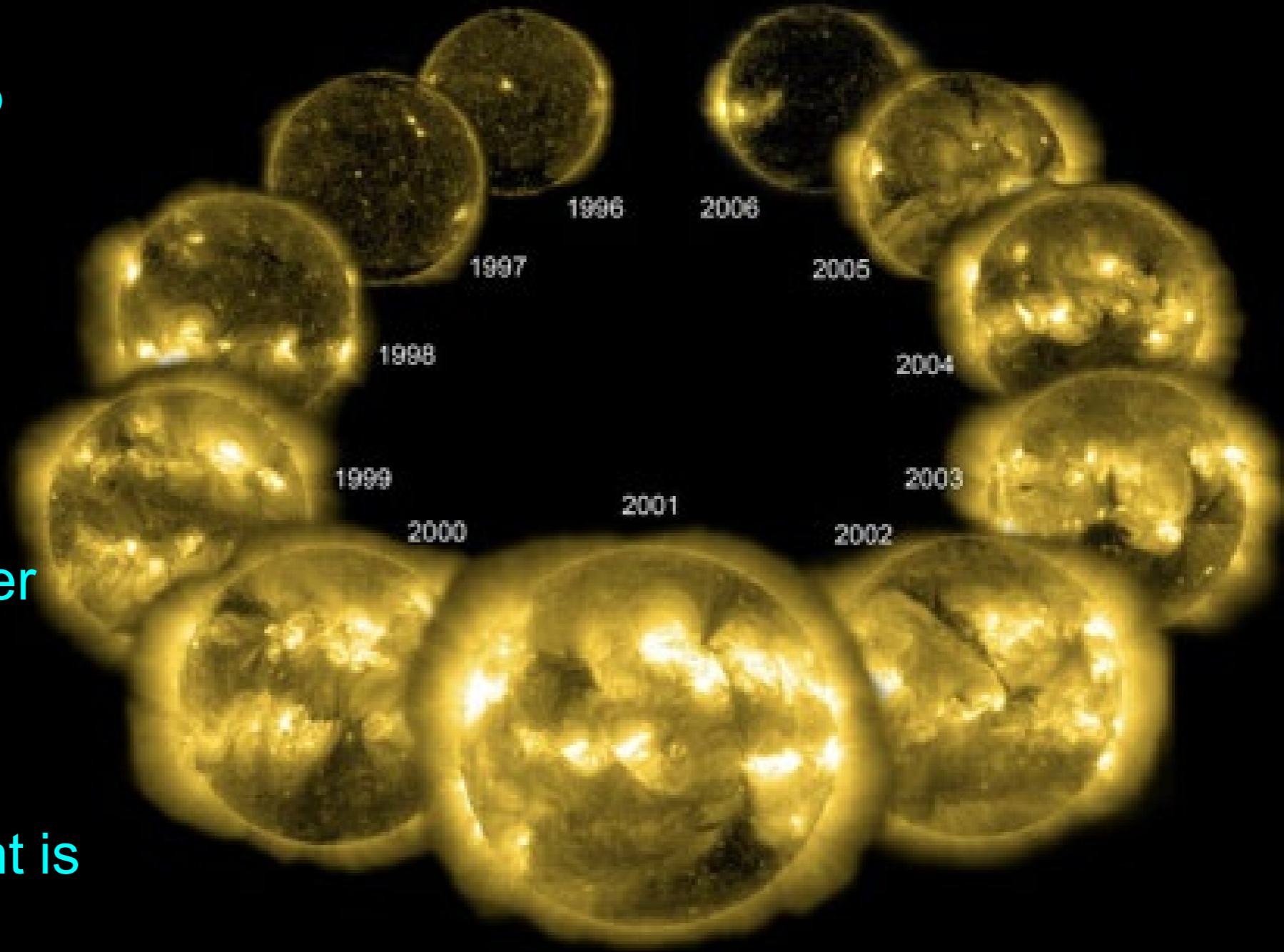
# *Why study solar minima?*

Isn't it boring?

Solar activity is low

The solar wind is slower and less variable

The space environment is less energized





Whole Heliosphere and Planetary Interactions

# *Why study solar minima?*

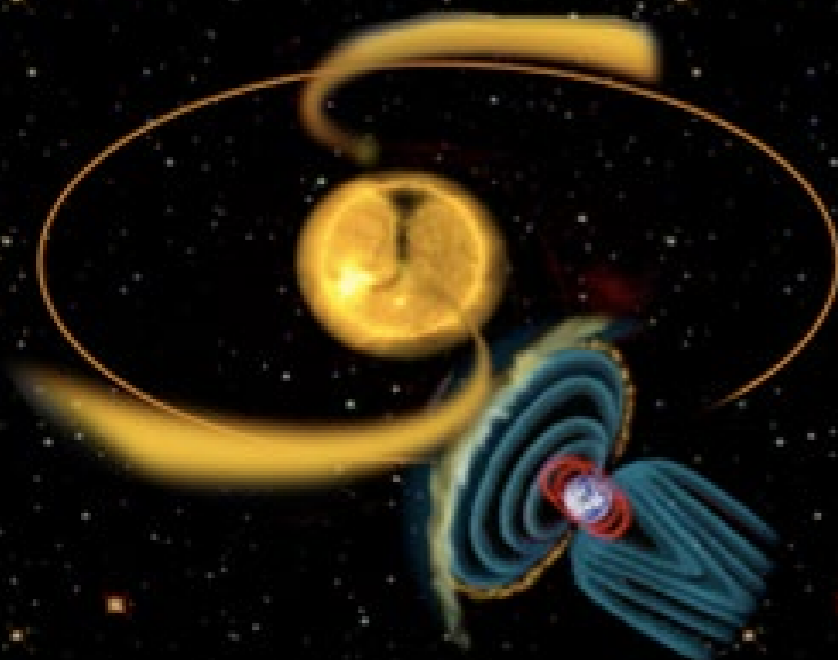
Solar minimum is the perfect time to trace events “end to end”.

No two solar minima are the same.

Solar minimum is the perfect time to characterize the “baseline” system.

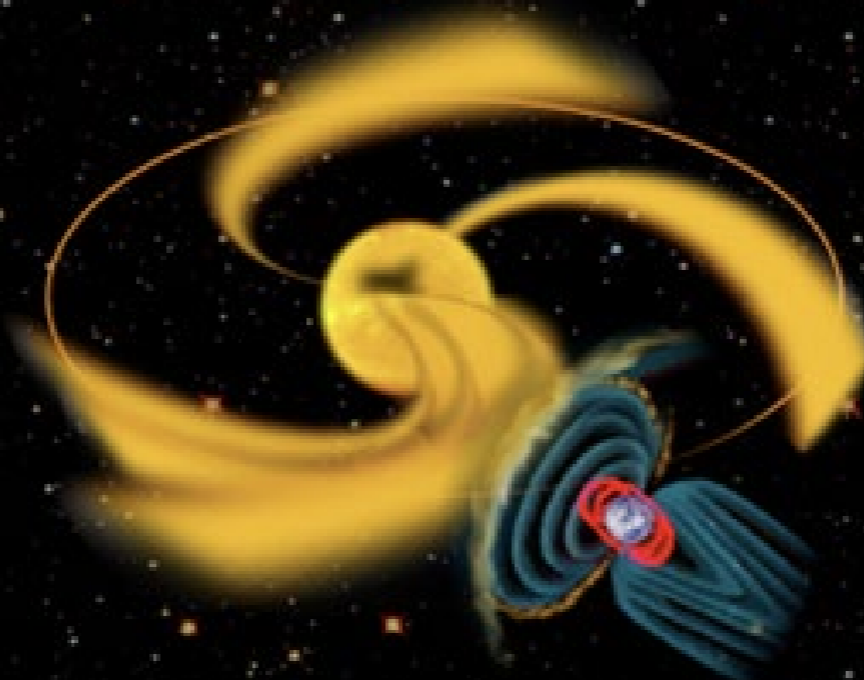
Solar Minimum 1996

Narrow equatorward extensions from polar coronal holes



Solar Minimum 2008

Multiple broad low-latitude coronal holes



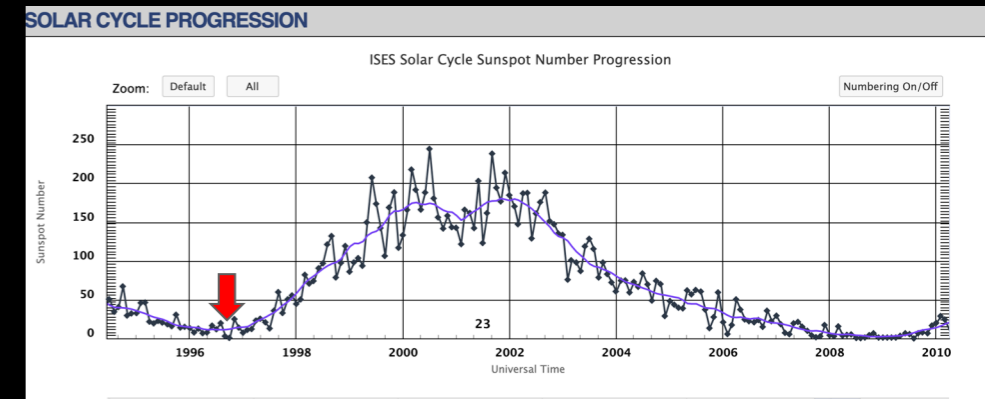


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# Why study solar minima?

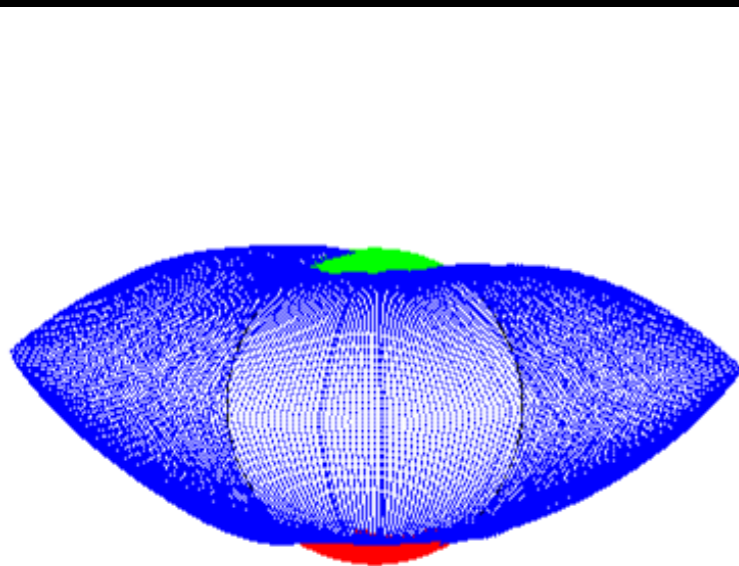
## Cycle 22: Whole Sun Month (WSM)

- August 10 - September 8, 1996
- 11 solar and 7 solar wind/heliosphere instruments
- ~50 participants

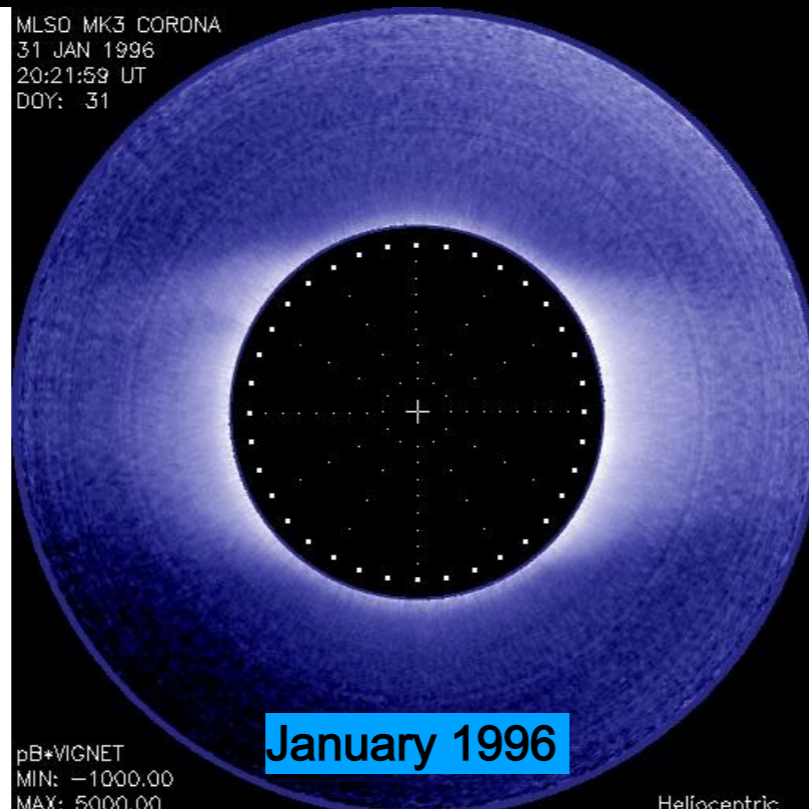


### Solar Minimum 1996

Narrow equatorward extensions from polar coronal holes



January 1996

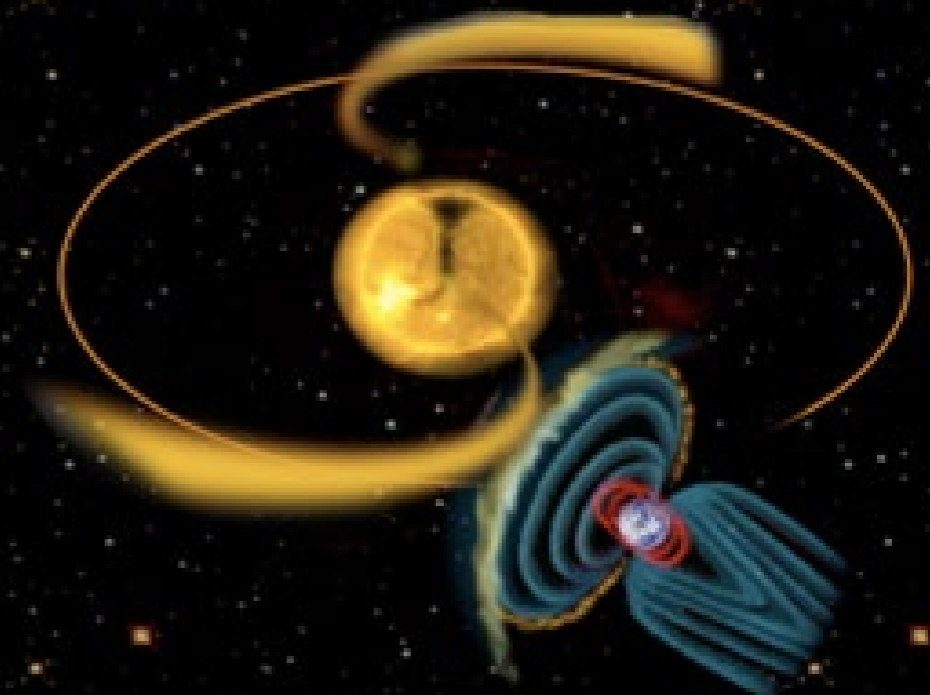


January 1996

MLSO MK3 CORONA  
31 JAN 1996  
20:21:59 UT  
DOY: 31

pB+VICNET  
MIN: -1000.00  
MAX: 5000.00

Heliocentric

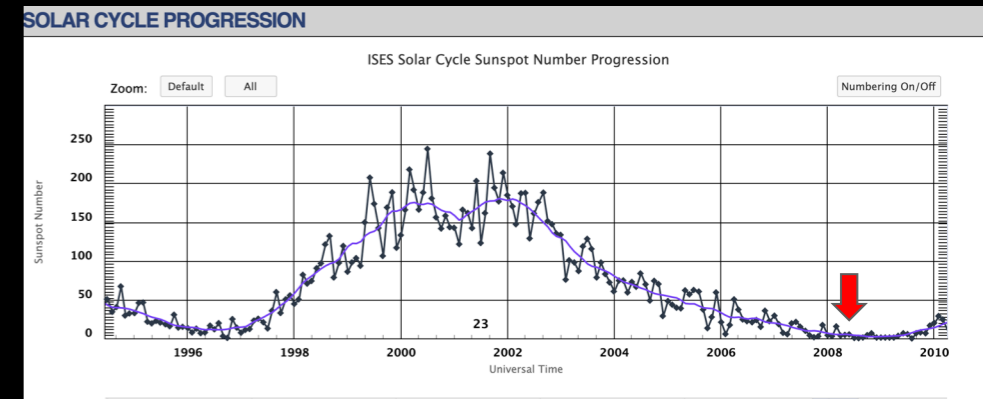




# Why study solar minima?

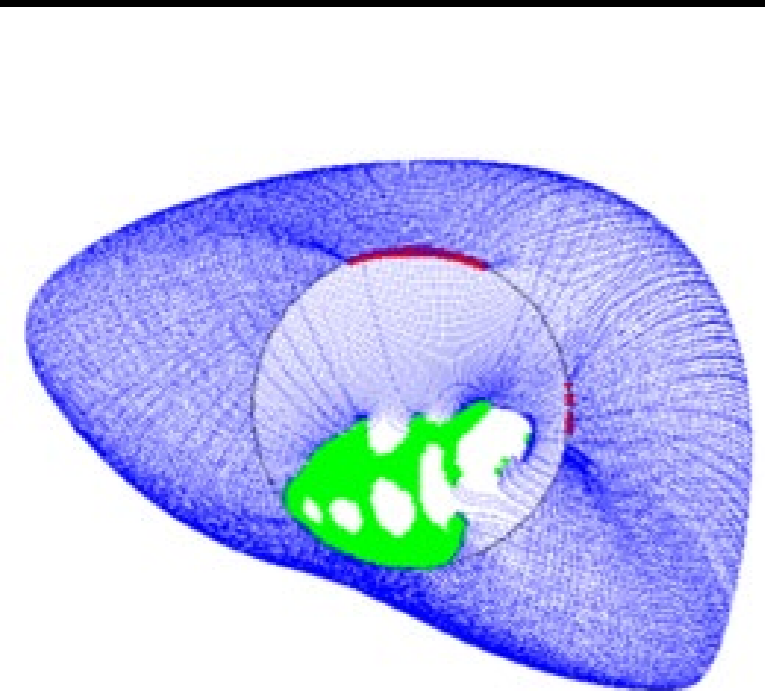
## Cycle 23: Whole Heliosphere Interval (WHI)

- Carrington Rotation 2068: March 20 - April 16, 2008
- 27 solar, 19 heliospheric, and 21 geospace instruments
- ~200 participants



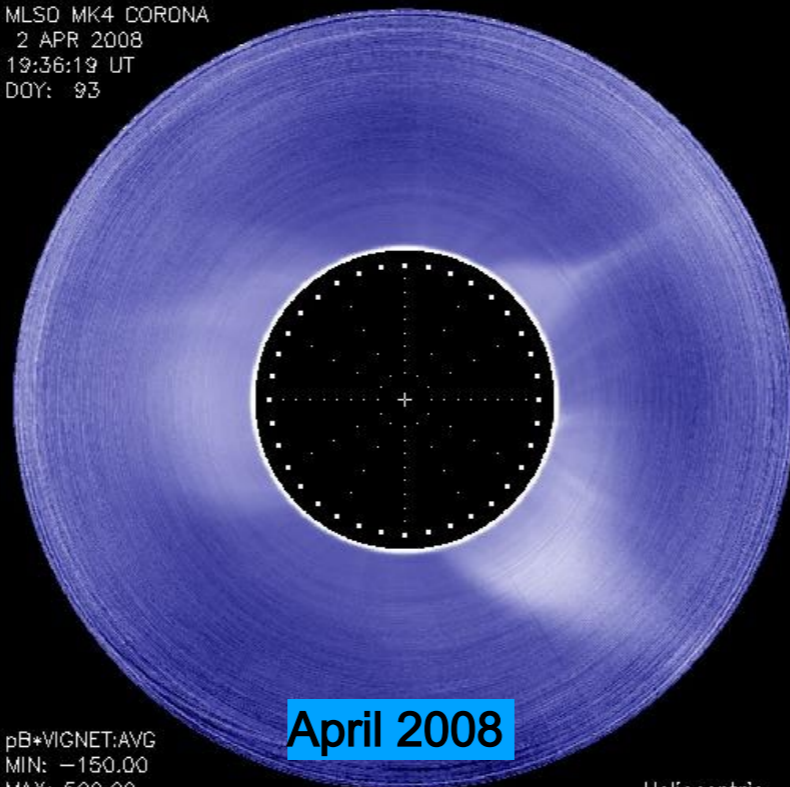
### Solar Minimum 2008

Multiple broad low-latitude coronal holes



April 2008

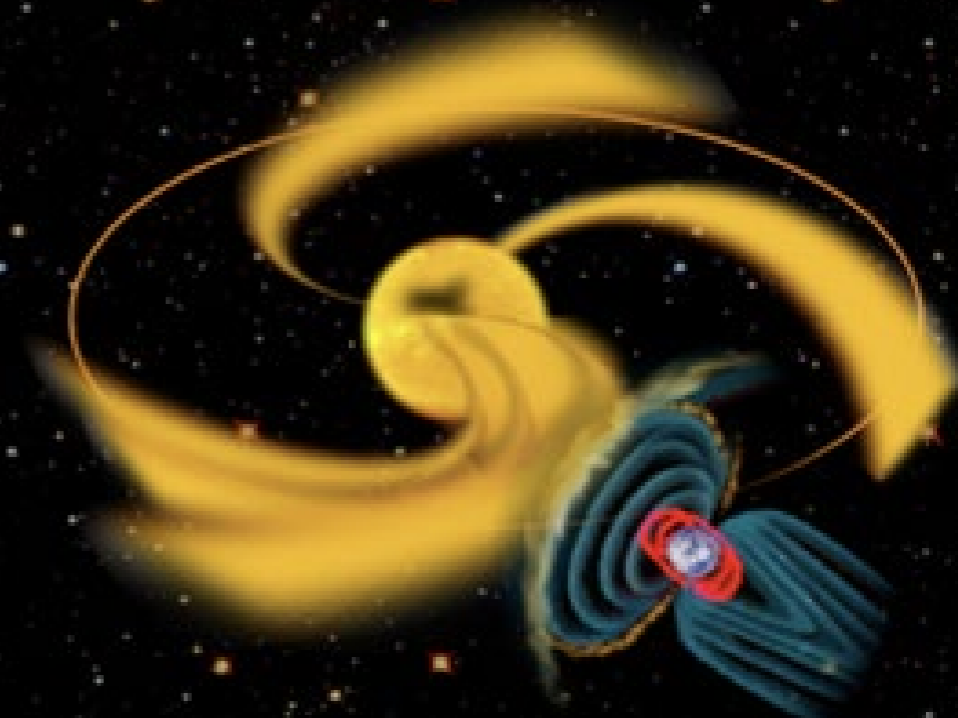
MLSO MK4 CORONA  
2 APR 2008  
19:36:19 UT  
DOY: 93



April 2008

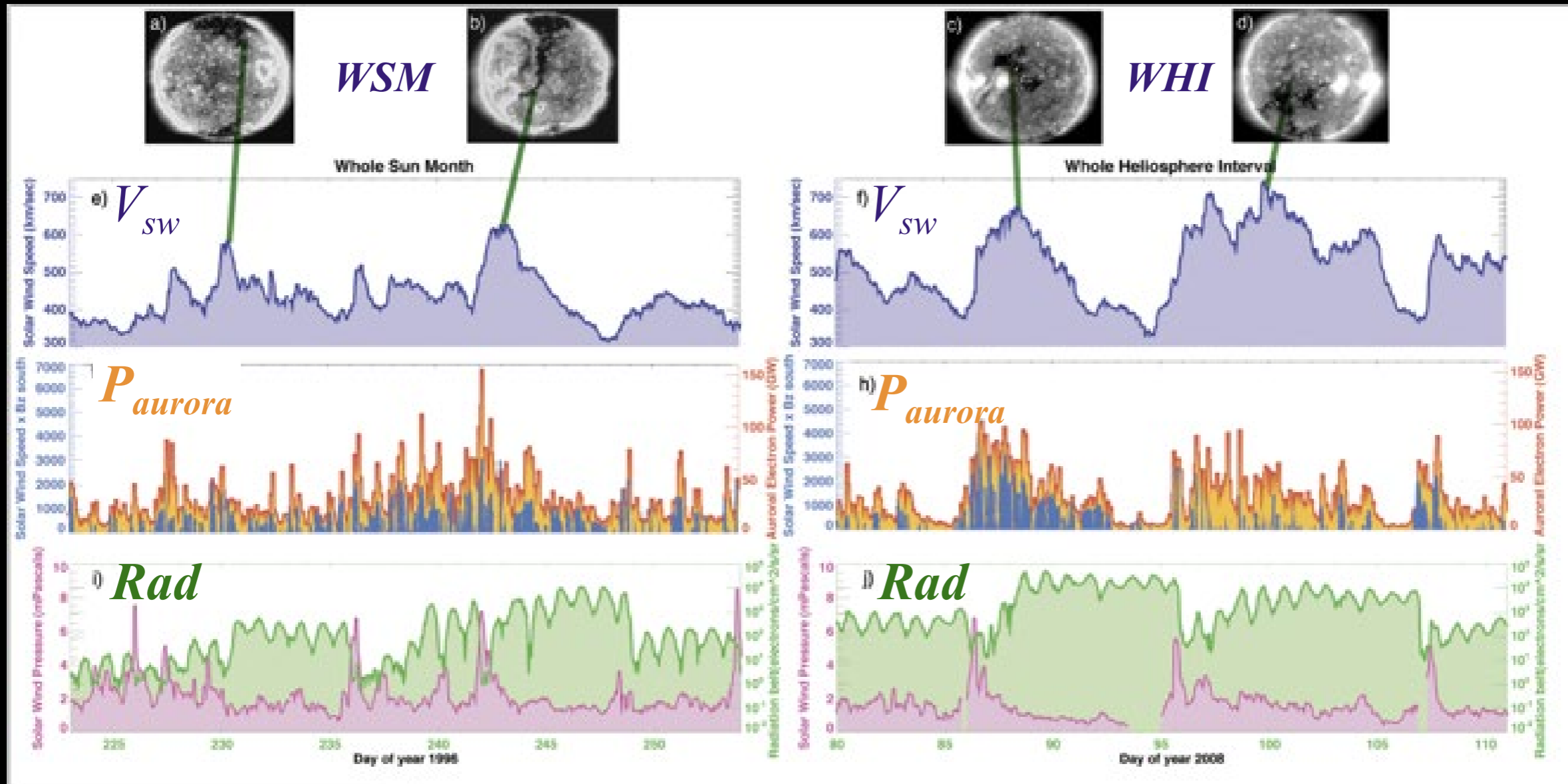
pB+VIGNET:AVG  
MIN: -150.00  
MAX: 500.00

Heliocentric





# Why study solar minima?



Disorganized short-duration energy flows into the Earth's atmosphere.

Weak radiation environment

Periodic long-duration energy flows into the Earth's atmosphere. Atmosphere ringing with solar wind periodicities.

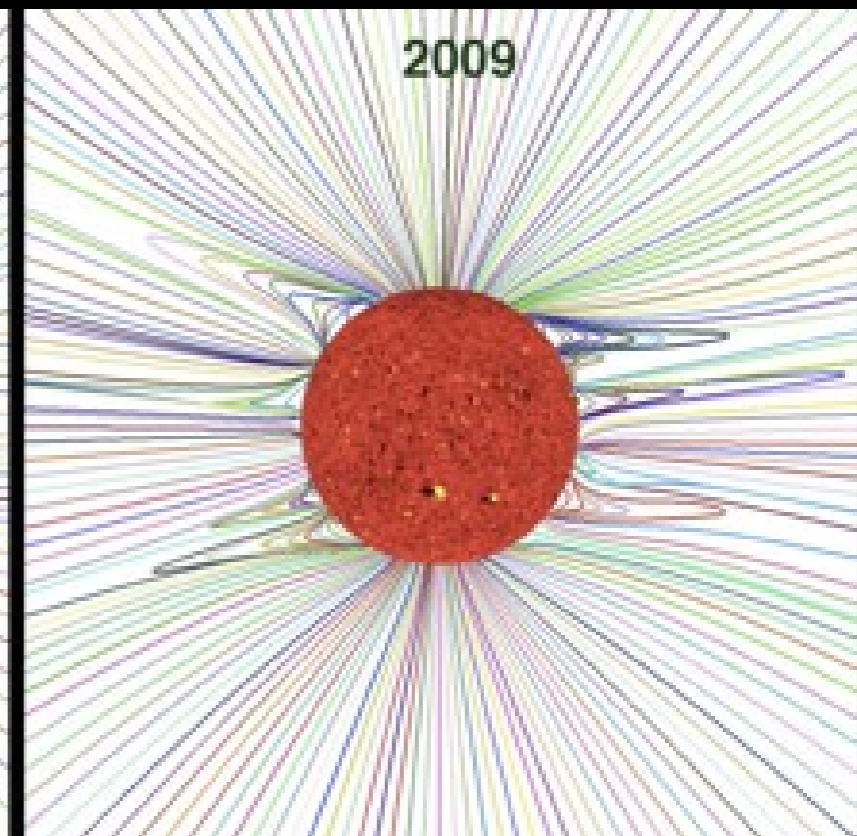
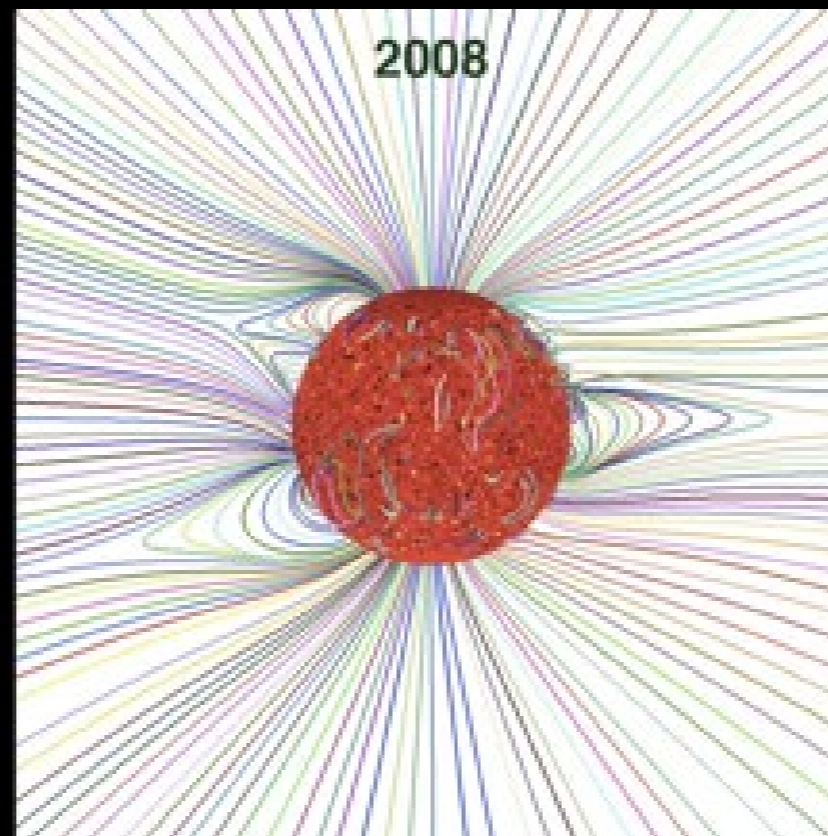
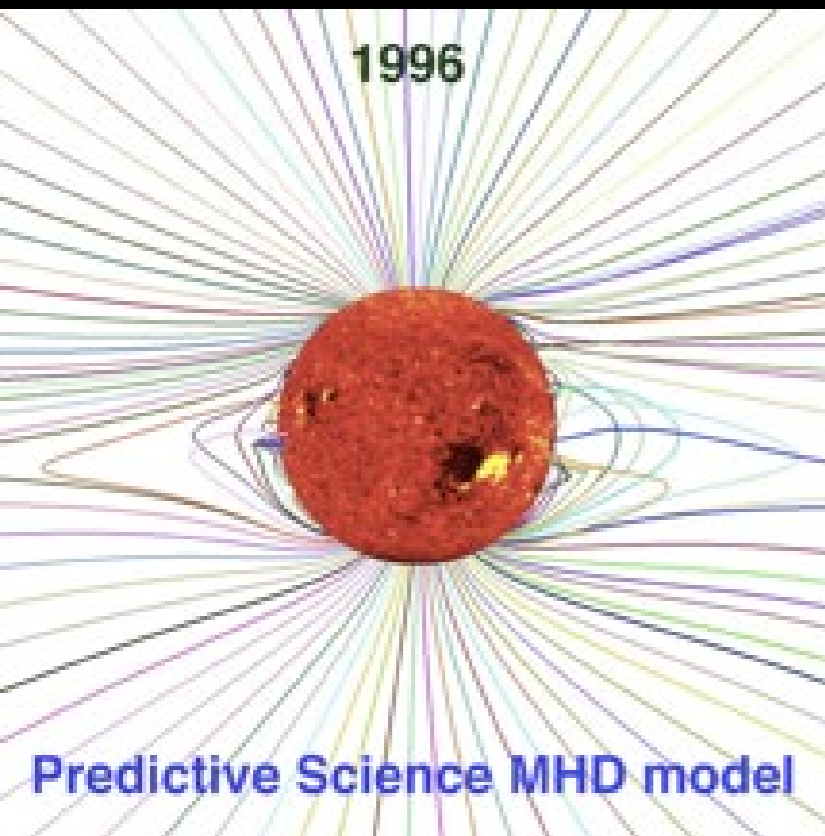
Enhanced radiation environment - mechanisms yet unknown



Whole Heliosphere and Planetary Interactions

# *Why study solar minima?*

Our whole concept of solar minimum changed.



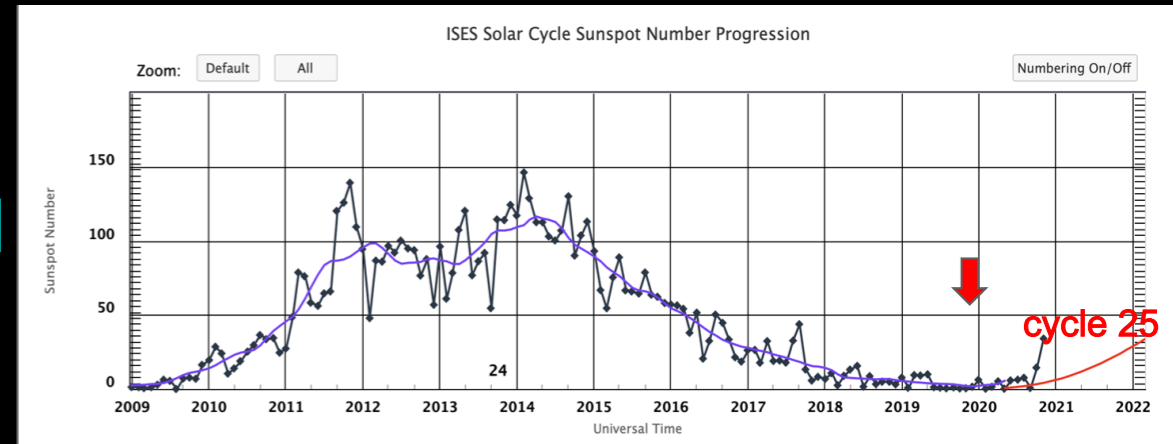


Whole Heliosphere and Planetary Interactions

# Where are we going with WHPI?

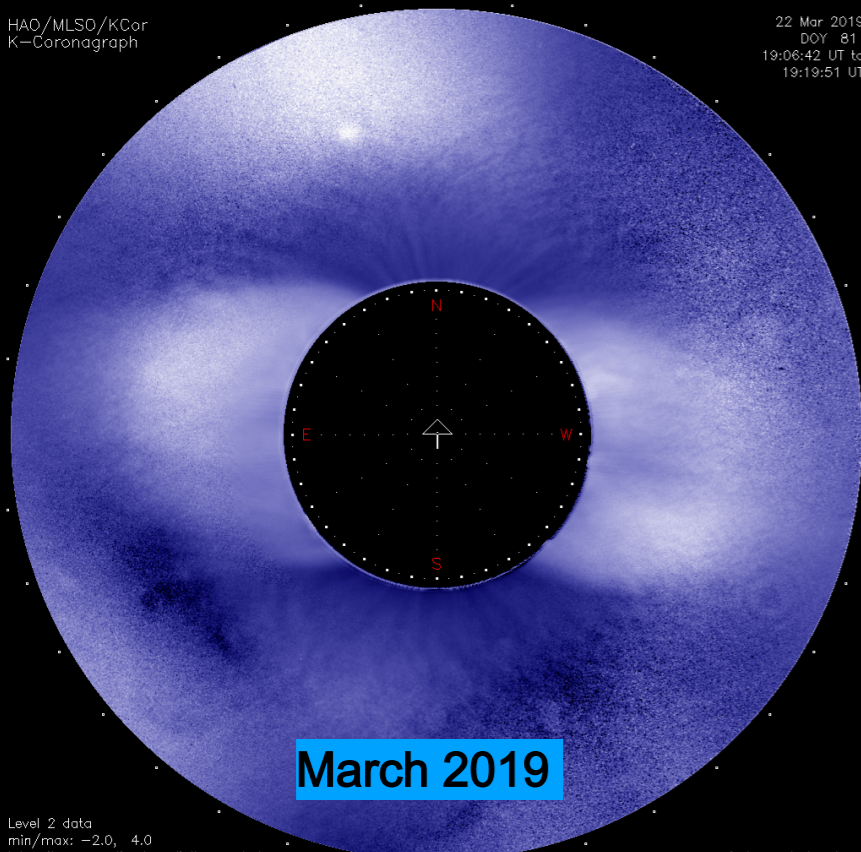
## Cycle 24: Whole Heliosphere and Planetary Interactions (WHPI)

- Spans period from late 2018 to early 2020 (solar minimum in December 2019)
- 33 solar, 7 heliospheric, 15 geospace, and 3 planetary missions/projects
- ~600 participants



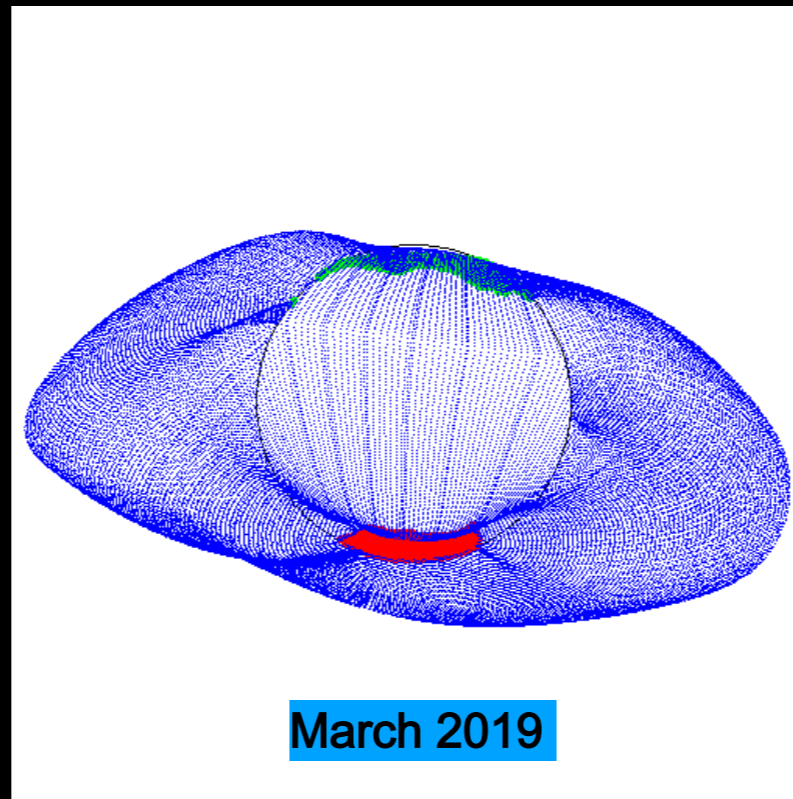
HAO/MLSO/KCor  
K-Coronagraph

22 Mar 2019  
DOY 81  
19:06:42 UT to  
19:19:51 UT



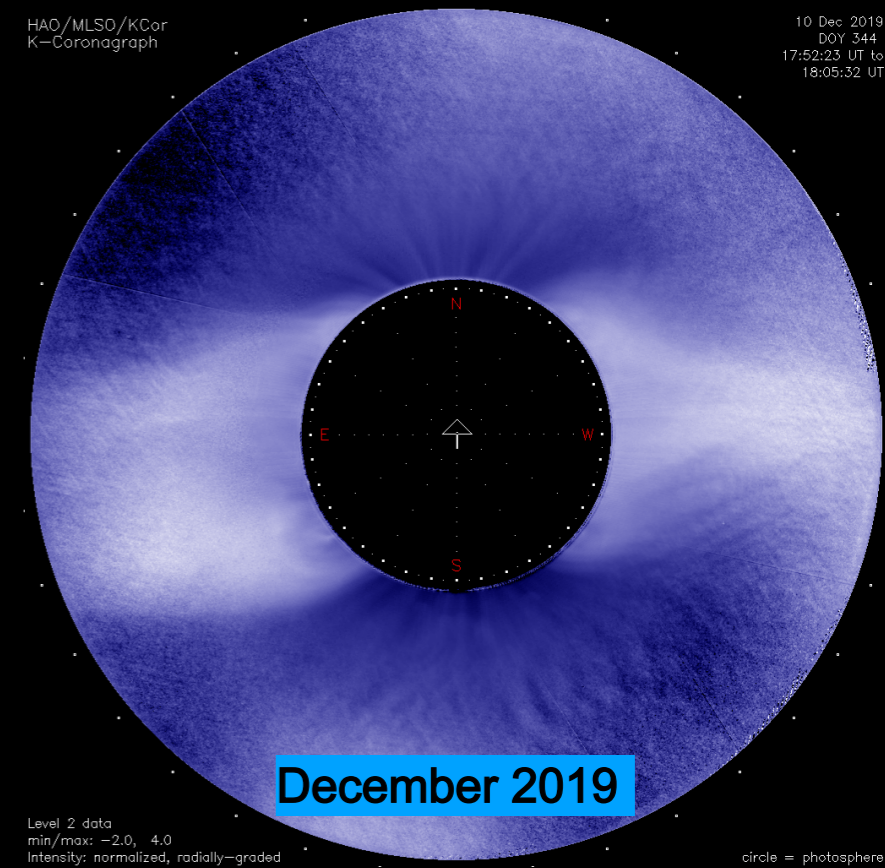
Level 2 data  
min/max: -2.0, 4.0  
Intensity: normalized, radially-graded

circle = photosphere



HAO/MLSO/KCor  
K-Coronagraph

10 Dec 2019  
DOY 344  
17:52:23 UT to  
18:05:32 UT



Level 2 data  
min/max: -2.0, 4.0  
Intensity: normalized, radially-graded

circle = photosphere





Whole Heliosphere and Planetary Interactions

# WHPI coordinated activities



# WHOLE HELIOSPHERE & Planetary Interactions

- Home
- Science
- Campaigns
- Resources
- Participate

## LATEST UPDATES AND NEWS

### WHPI WORKSHOP

September 13-17, 2021

Abstract submission deadline: **July 15, 2021**

Registration deadline: **August 31, 2021**

[More information](#)

*WHPI Workshop!*



### WHPI SHOW AND TELL DAYS

Next Show and Tell: **October 21<sup>st</sup>, 2021**.

### WHPI WEB COLLOQUIA

Next colloquium: **November 18<sup>th</sup>, 2021** at 9 AM PDT.

*Data portal!*



### WHPI DATA PORTAL

See Barbara Thompson give an overview of the [HSC WHPI data portal \(33MB mp4\)](#). Please join us for the [Data-gathering day at the WHPI Workshop](#) (Monday, September 13, 2021) and add your data and model!





Whole Heliosphere and Planetary Interactions

# *WHPI coordinated activities*

## CAMPAIGN PERIODS:

 Planet positions during campaign periods

Recurrent Coronal Holes/High Speed Solar Wind Streams Mar 12 - Apr 8 2019, Carrington Rotation **2215**

Total Solar Eclipse Campaign Jun 29 - Jul 26, 2019, Carrington Rotation **2219**

### PARKER SOLAR PROBE CAMPAIGNS

Parker Solar Probe 4th Perihelion Campaign Jan 15 - Feb 11, 2020 ( See the **observational highlight page** )

Parker Solar Probe 7th Perihelion Campaign Jan 12 - 23, 2021

Parker Solar Probe 8th Perihelion Campaign April 28 - May 7, 2021 ( See the **observational highlight page** )

## OTHER INTERESTING TIME INTERVALS

"Parker Solar Probe First Perihelion" Oct 31 - Nov 11, 2018, Carrington Rotation **2210**

"Parker Solar Probe Third Perihelion Campaign" Aug 22 - Sep 19, 2019, Carrington Rotation **2221**

"PSP and STEREO-A Closest Approach" Oct 16 - Nov 12 2019, Carrington Rotation **2223**

"Parker Solar Probe Venus Flyby Campaign" Dec 10 2019 - Jan 6 2020, Carrington Rotation **2225**



## *WHPI workshop goals*

Organized by four working groups:

- WG1 – Characterizing the Whole Heliosphere at Solar Minimu
- WG2 – Origins and Impacts of High-Speed Solar Wind Streams
- WG3 – Comparative Solar minima
- WG4 – Solar Activity throughout the Heliosphere

Scene setting talks, focused oral presentations and panel discussion

Plenary discussions:

- Model and Data Assessment
- Collaboration Planning

Posters

Icebreaker activity (today!)



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# *WHPI workshop logistics*

Zoom chat for technical/logistical questions

Slido for science questions

Questions raised in Slido will be revisited "out loud" during discussions.

You can also raise your hand to ask a question during the discussions.

Kelvin will tell you more about Slido now!