Helioviewer

Discovery for Everyone Everywhere

Jack Ireland & Helioviewer Team

ADNET Systems, Inc.

Helioviewer

Discovery for Everyone Everywhere

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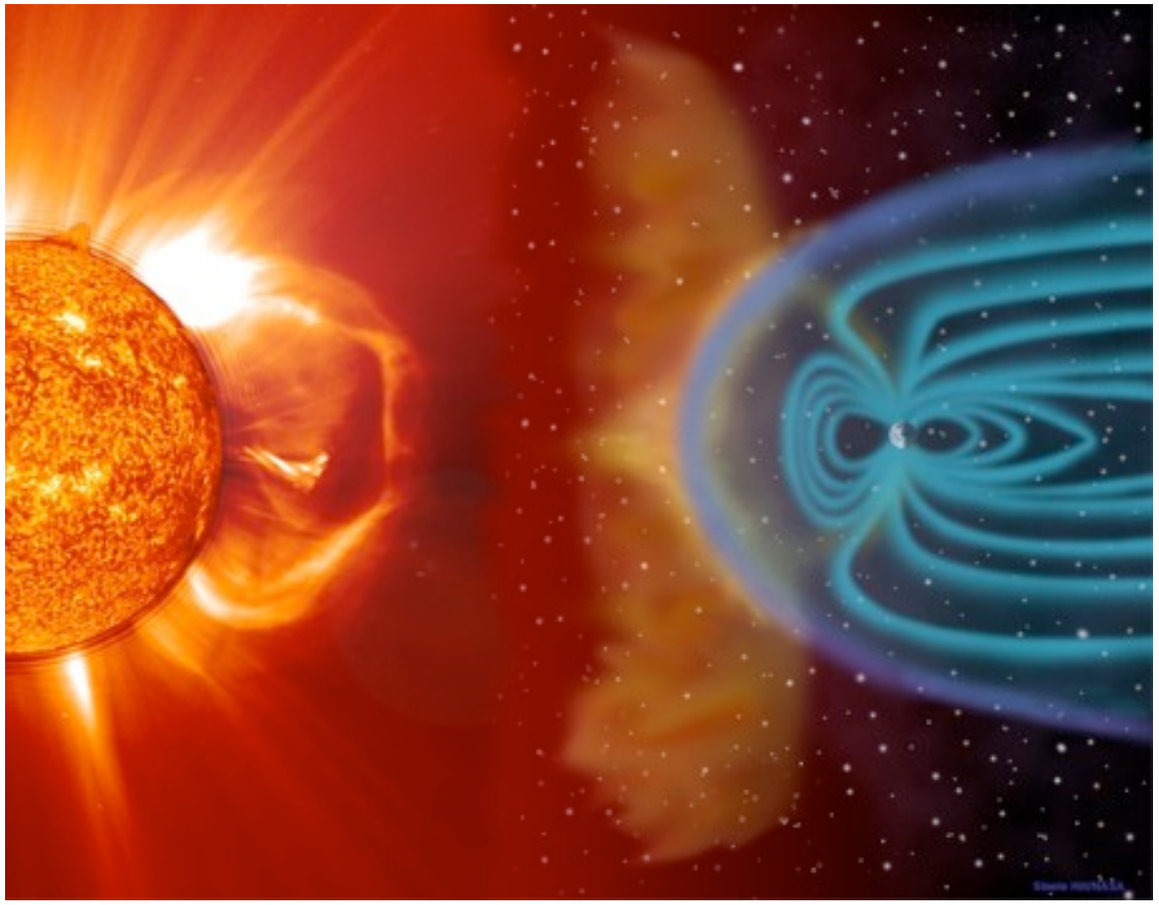
The Helioviewer Project

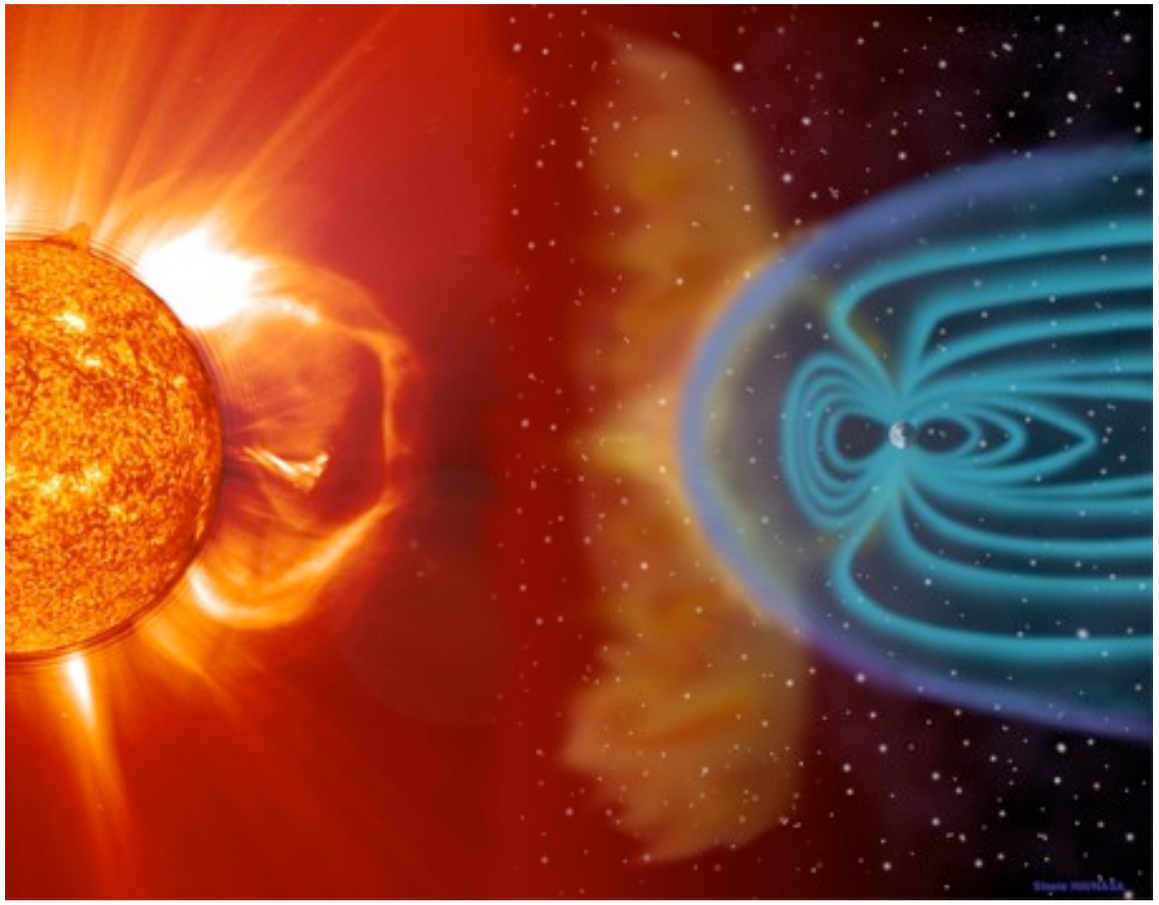
- Challenges
  - Huge amounts of data:
    - SOHO: ~0.2 Gbyte/day
    - SDO: ~1400 Gbyte/day
  - Large range of time & length-scales
  - Many different data products
  - Distributed archives
  - Multiple interest groups



There are many distributed sources of information for one physical system - the heliosphere.

The Helioviewer Project

- Goals
  - Enable efficient data browsing and visualization for users everywhere
  - Transparent access to multiple distributed archives e.g. HEK, VSO, GOES flare catalogs, ground based data
  - Extensible, open design that requires a minimal effort to join



Create a discovery infrastructure that allows users to explore the heliosphere as a physical system

Components

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  - Database of images from multiple observatories
  - JPEG2000 compression scheme - *many advantages*
  - API to use service - open to all

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- Browse tools
  - www.helioviewer.org - web interface
  - JHelioviewer - Java application

Image storage with JPEG2000

JPEG2000 = new wavelet-based compression standard

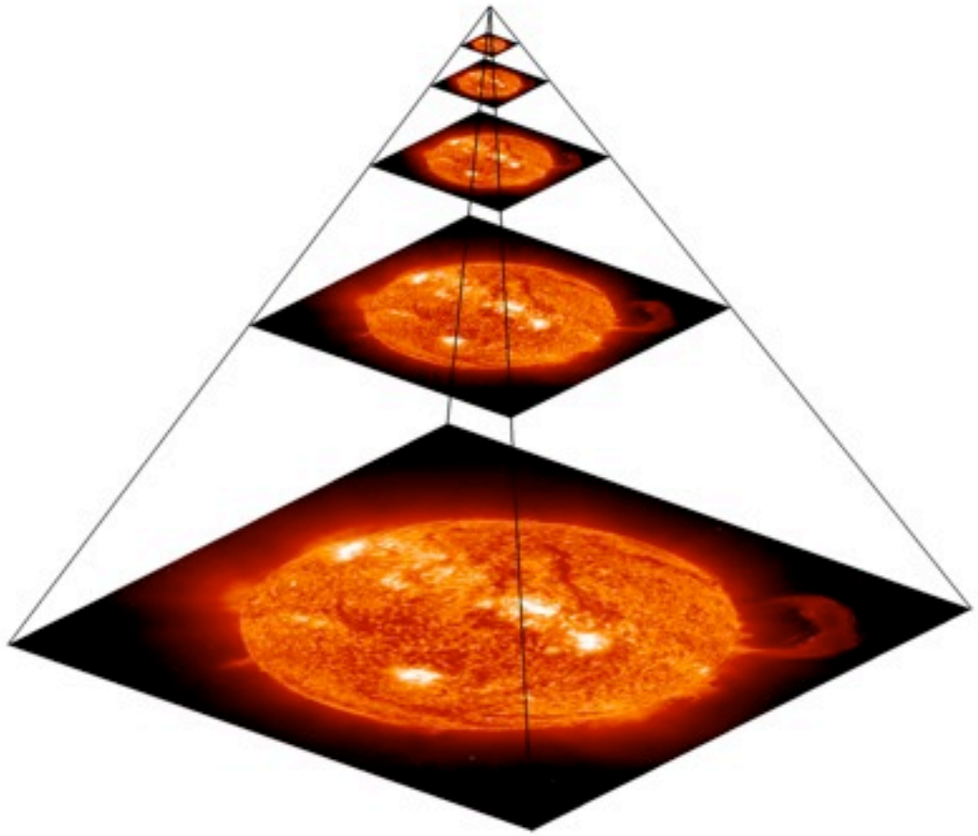
Advantages:

- Multiple resolutions

  [Images at different resolutions are automatically created during wavelet compression process]
- Random image access

  [Selected parts + quality layers can be accessed]
- Flexible file format *[for metadata]*
- Well-suited for archives

  [lossless mode, "Compress once, decompress many ways"]



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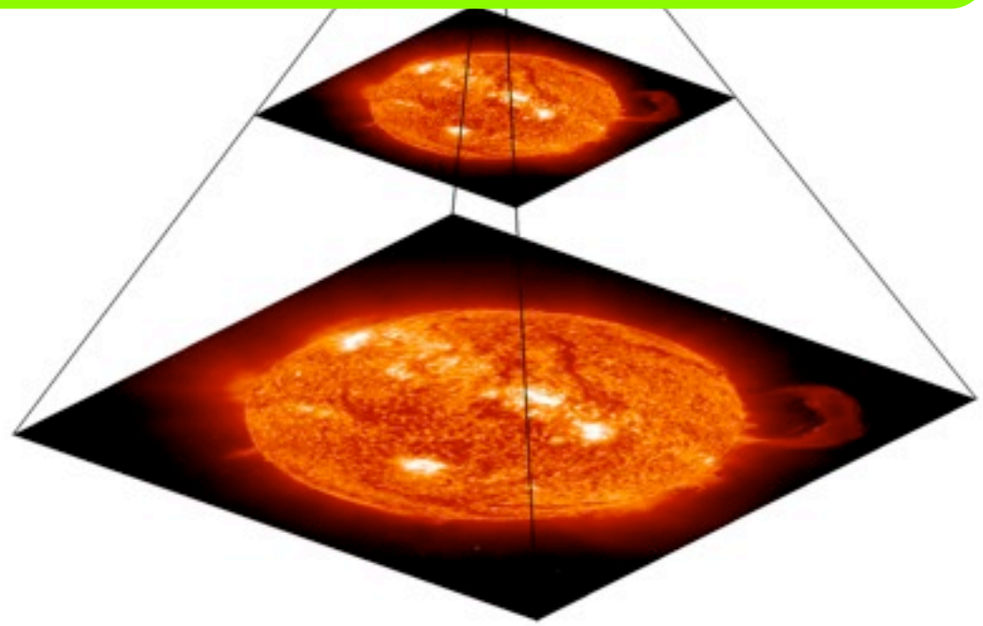

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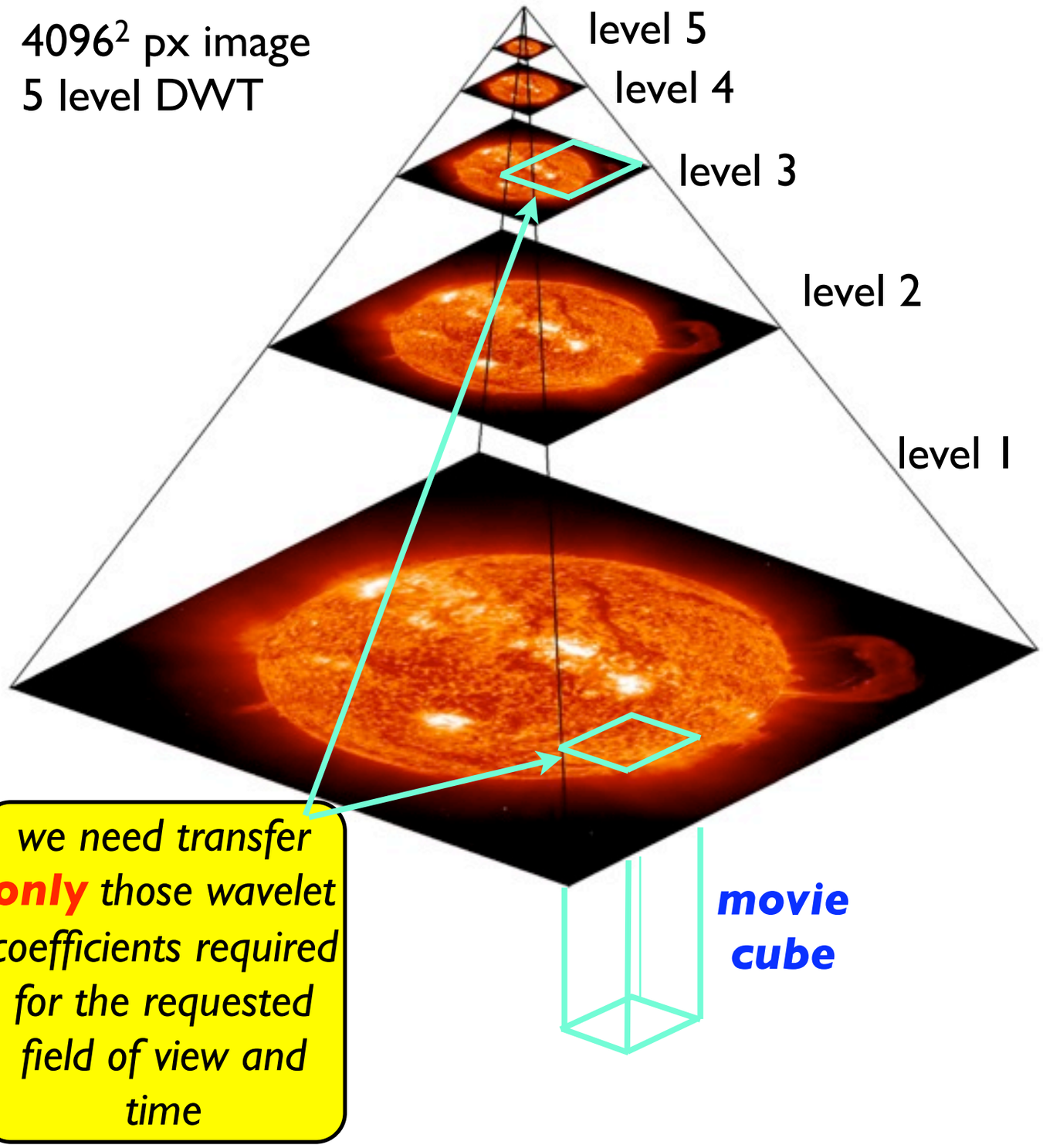
✓ lower data transfer requirements for distributed archives

Remote Access to Image Data

- JPIP = JPEG2000 Interactive Protocol
- JPIP provides a client −server architecture for transmitting JPEG2000 imagery over networks
- Can query arbitrary parts, quality levels of images and movies
- IDL, Solarsoft, Kakadu JPEG2000 libraries



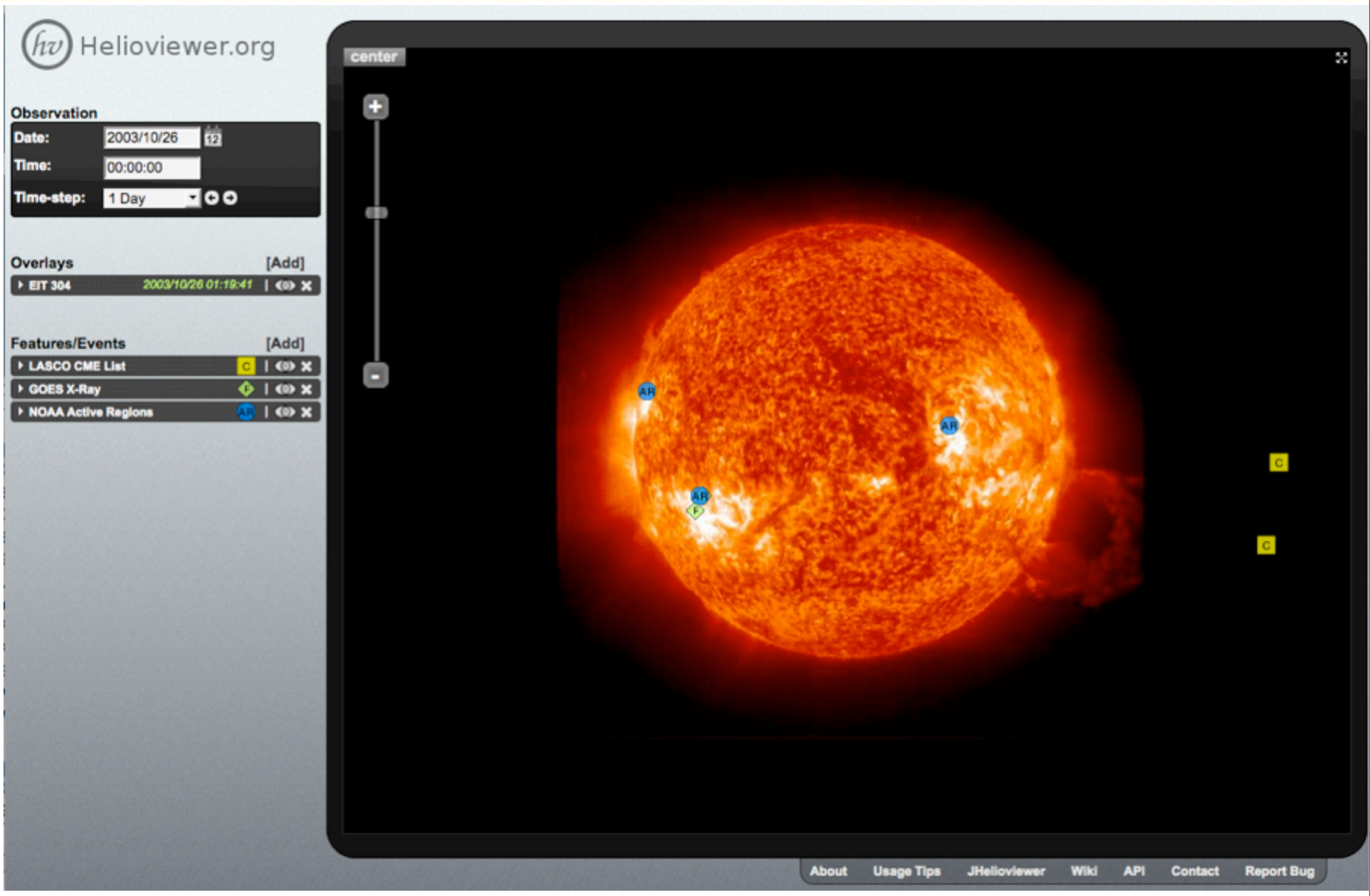
SDO-AIA image data

- JPEG2000 compression by a factor 16 yields reasonable browse EIT images.
- 16x compression @ 1 minute cadence yields ~ 0.3 Tb/year/wavelength.
- Keep most recent data (1-3 mo.) at full cadence?
- Permanent library of browsable images for entire mission.
- Very easy to concatenate JPEG2000 files to make movies and serve them *remotely*.

Feature/event service

- Works with heterogenous feature/event services and archives, e.g., HEK, VSO, stand-alone catalogs (e.g., GOES)
- Transparent to the user
- API is open to other developers
- Many types of meta-data are handled

www.helioviewer.org



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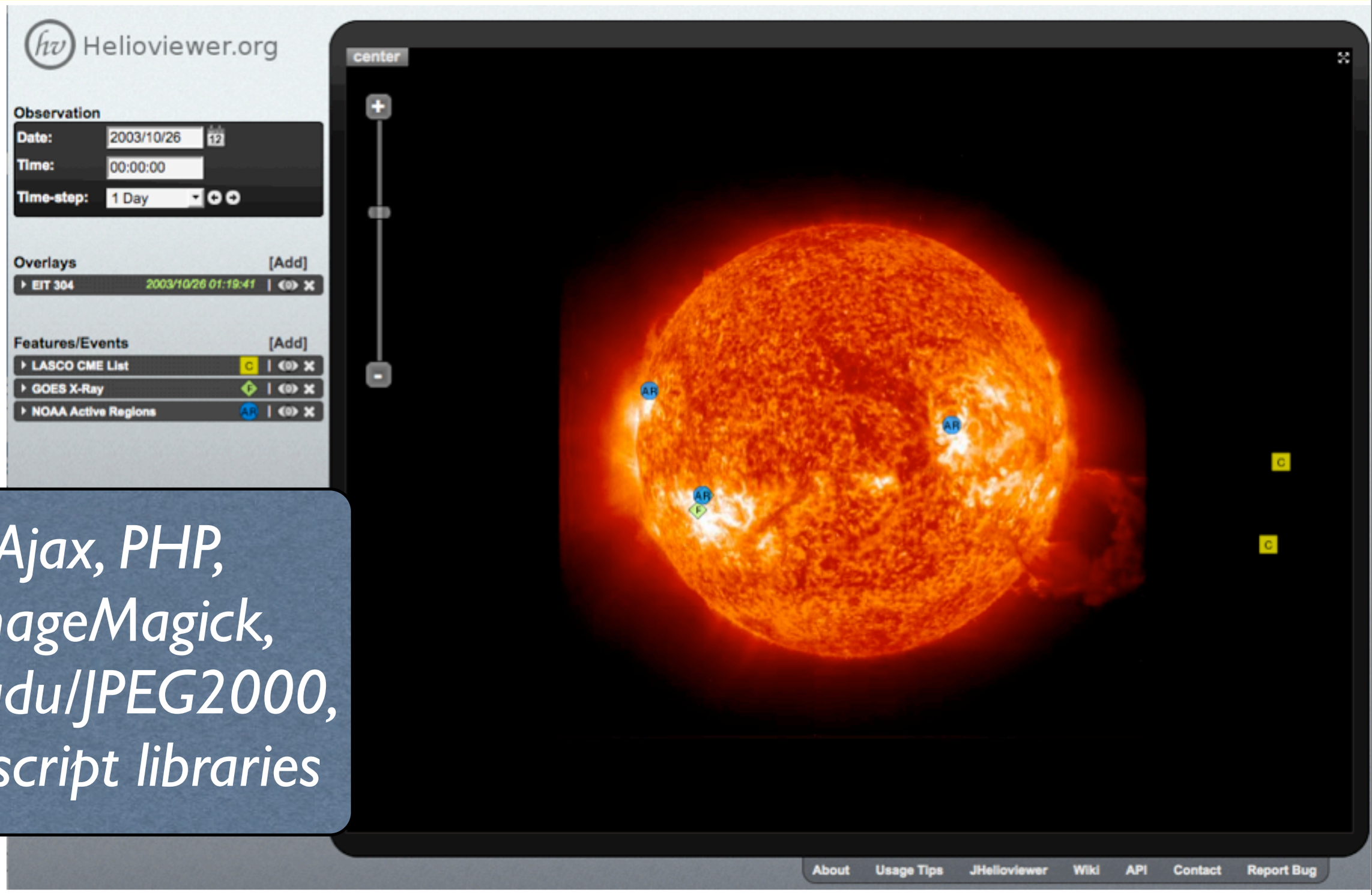

Ajax, PHP, ImageMagick, Kakadu/JPEG2000, Javascript libraries

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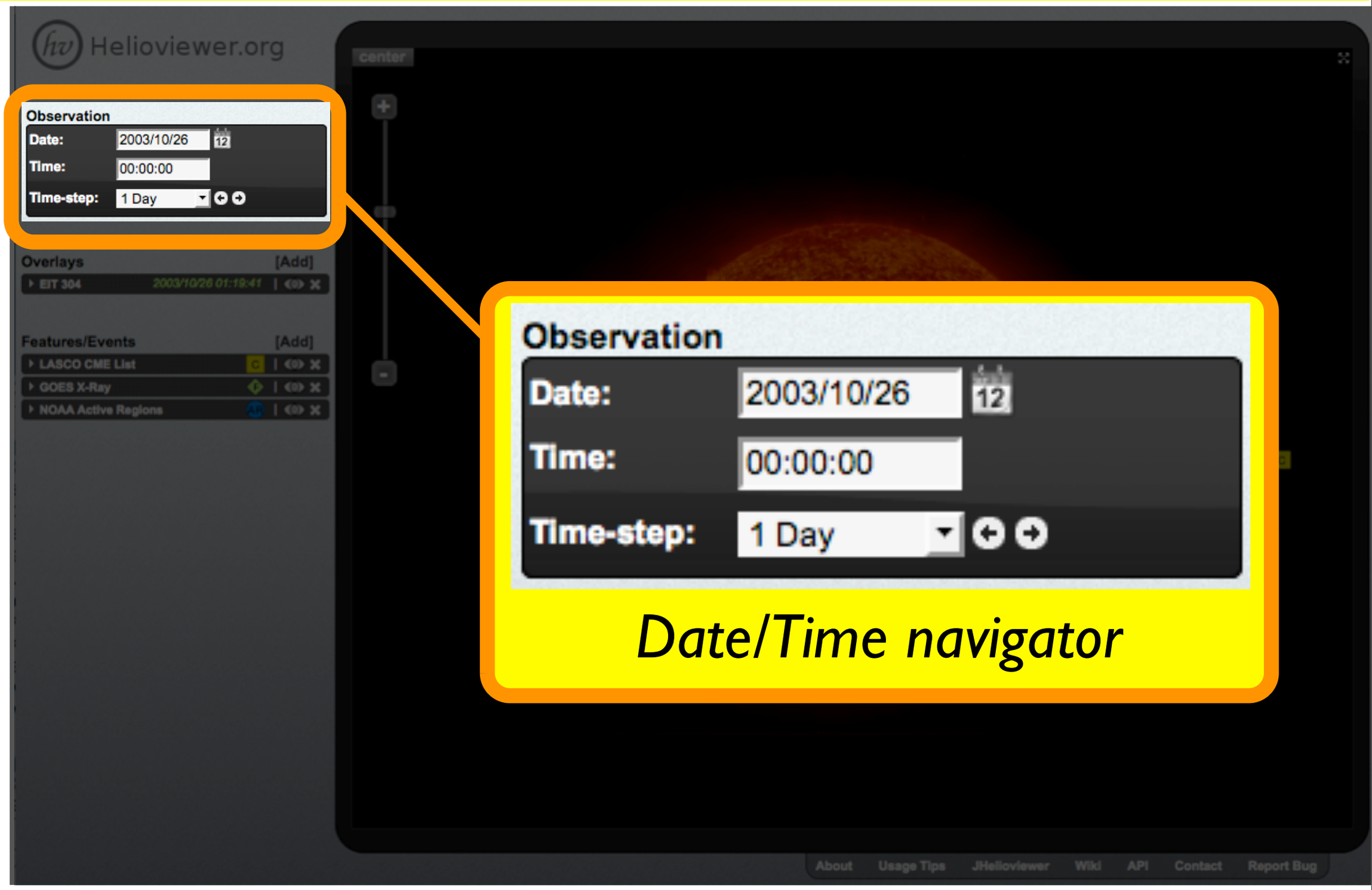

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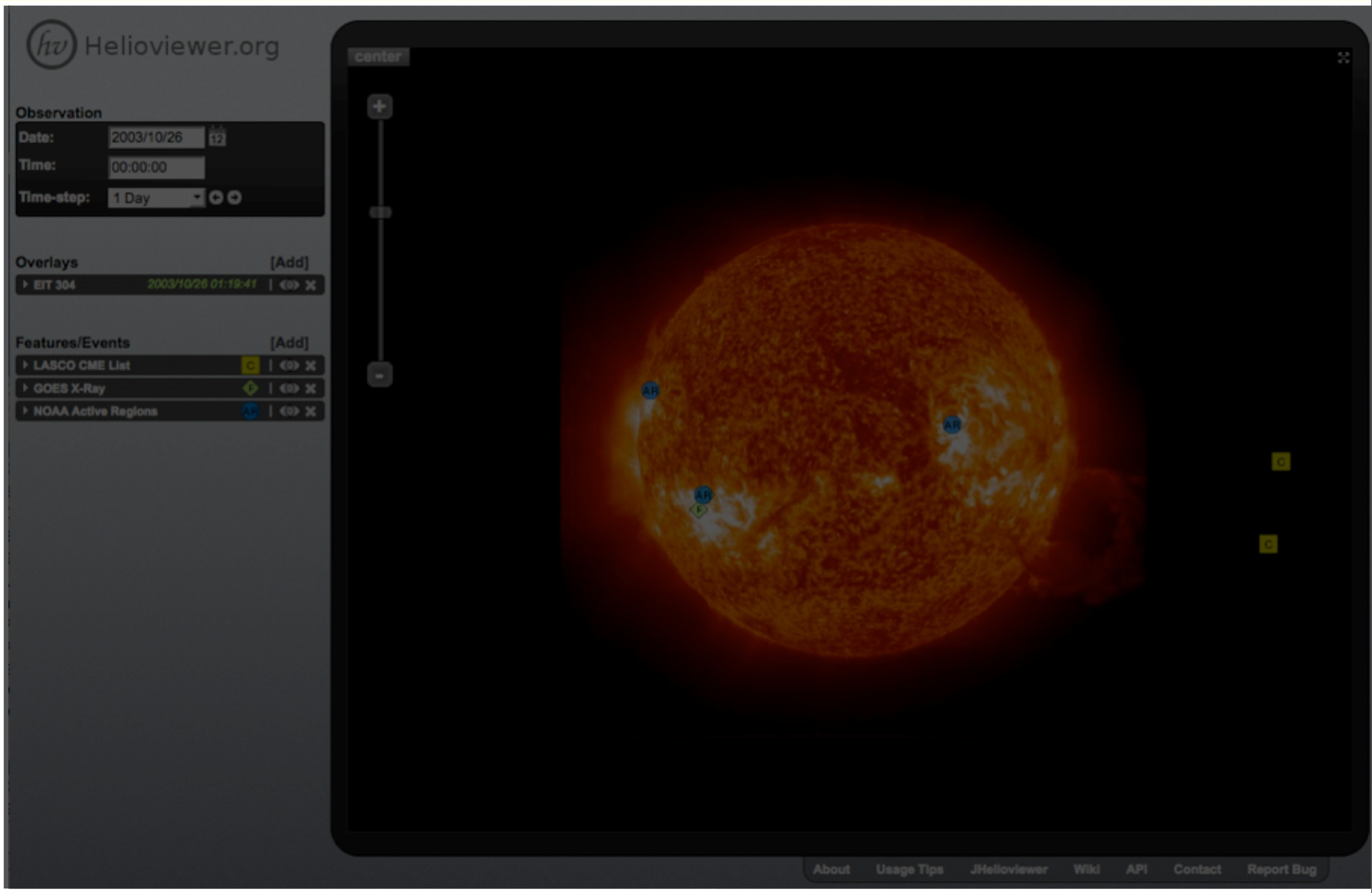

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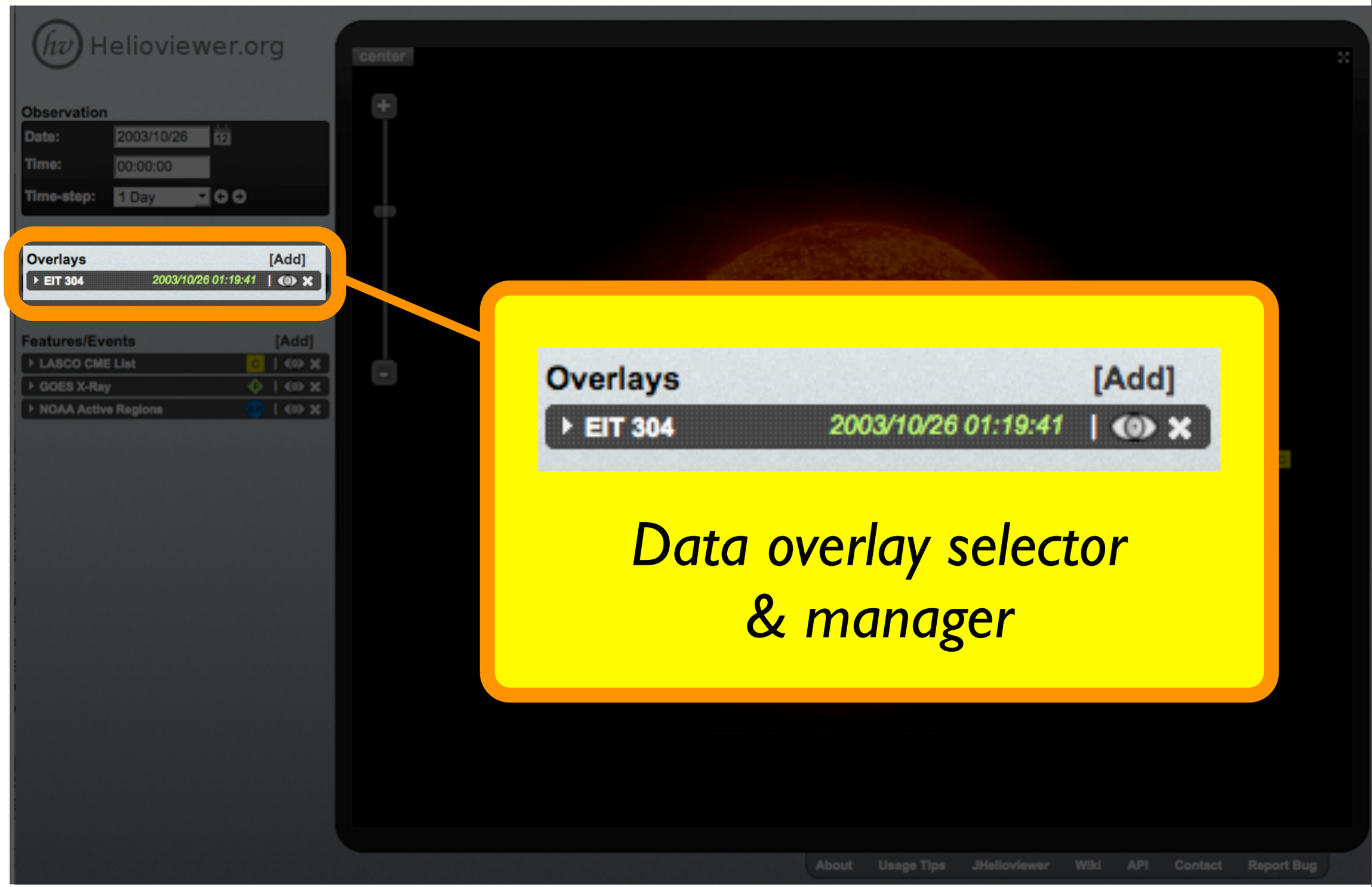

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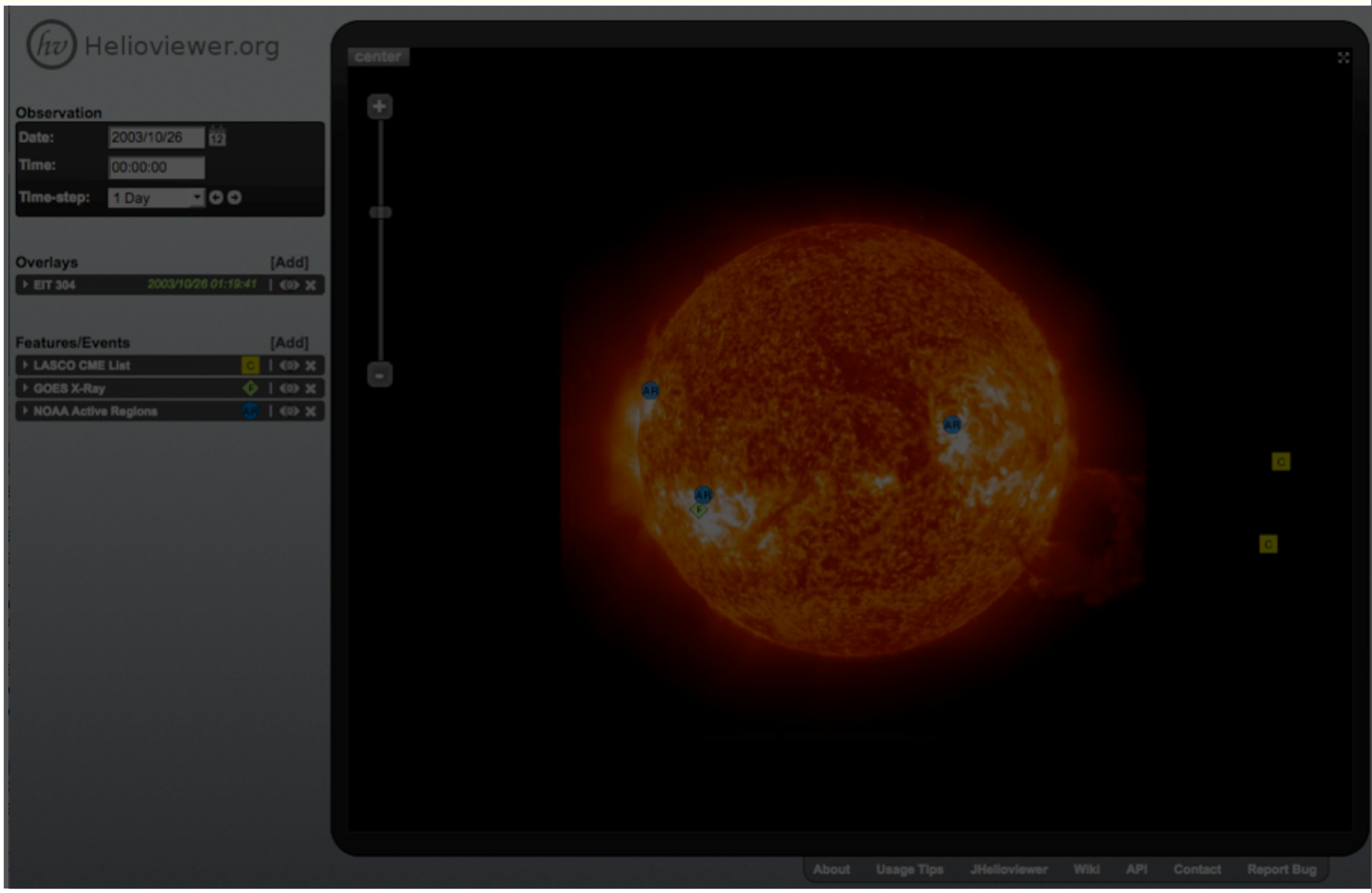

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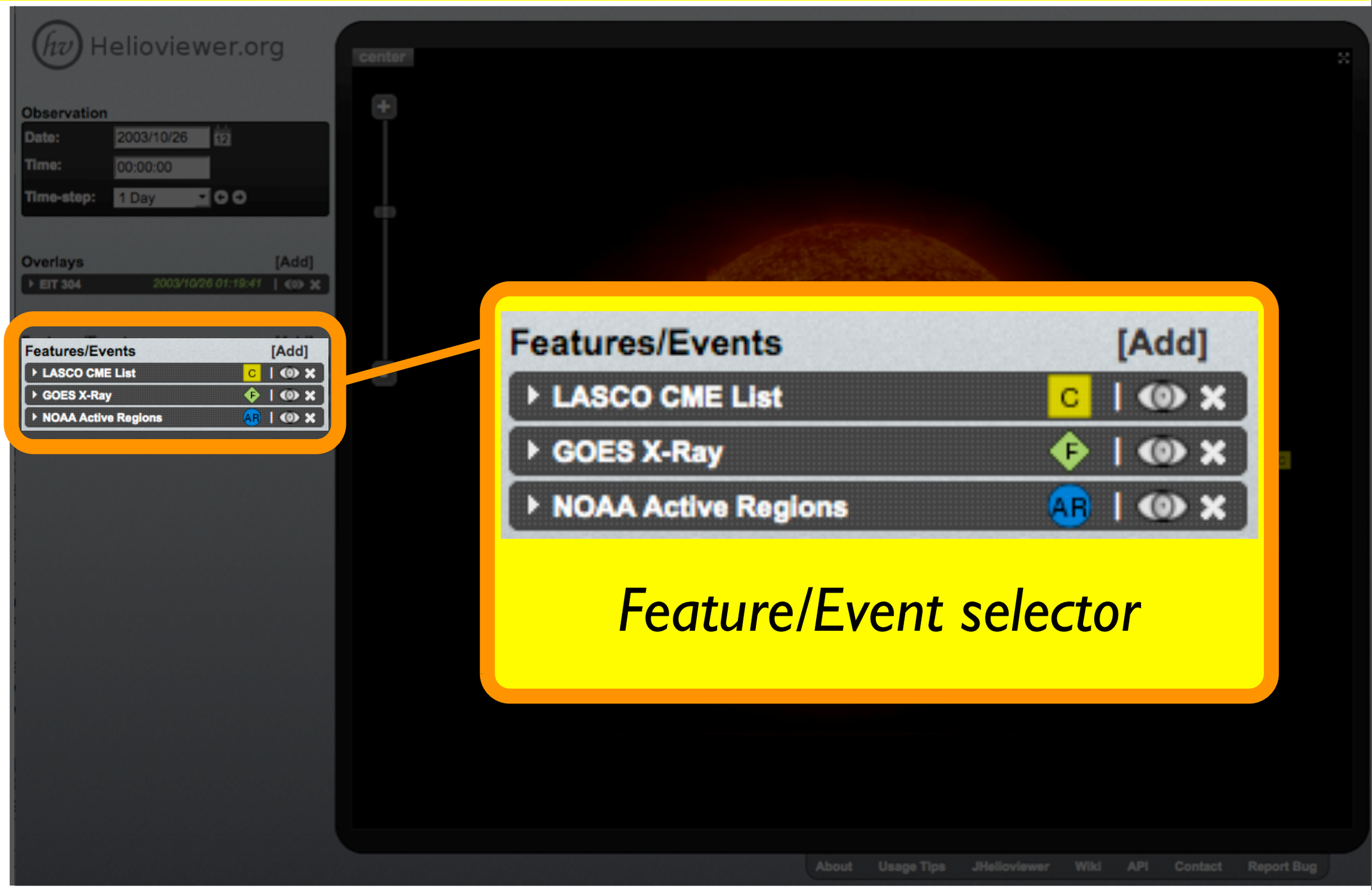

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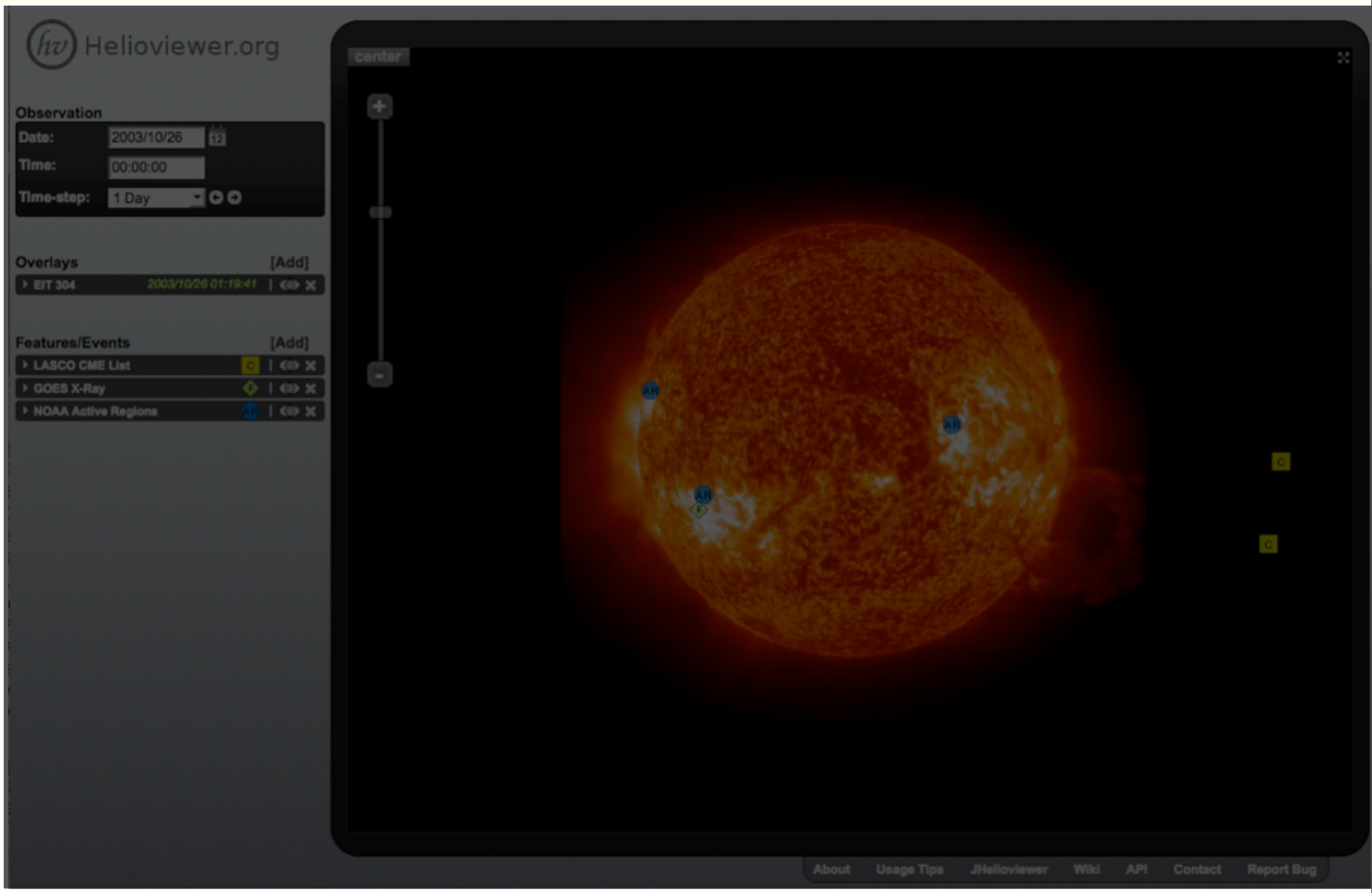

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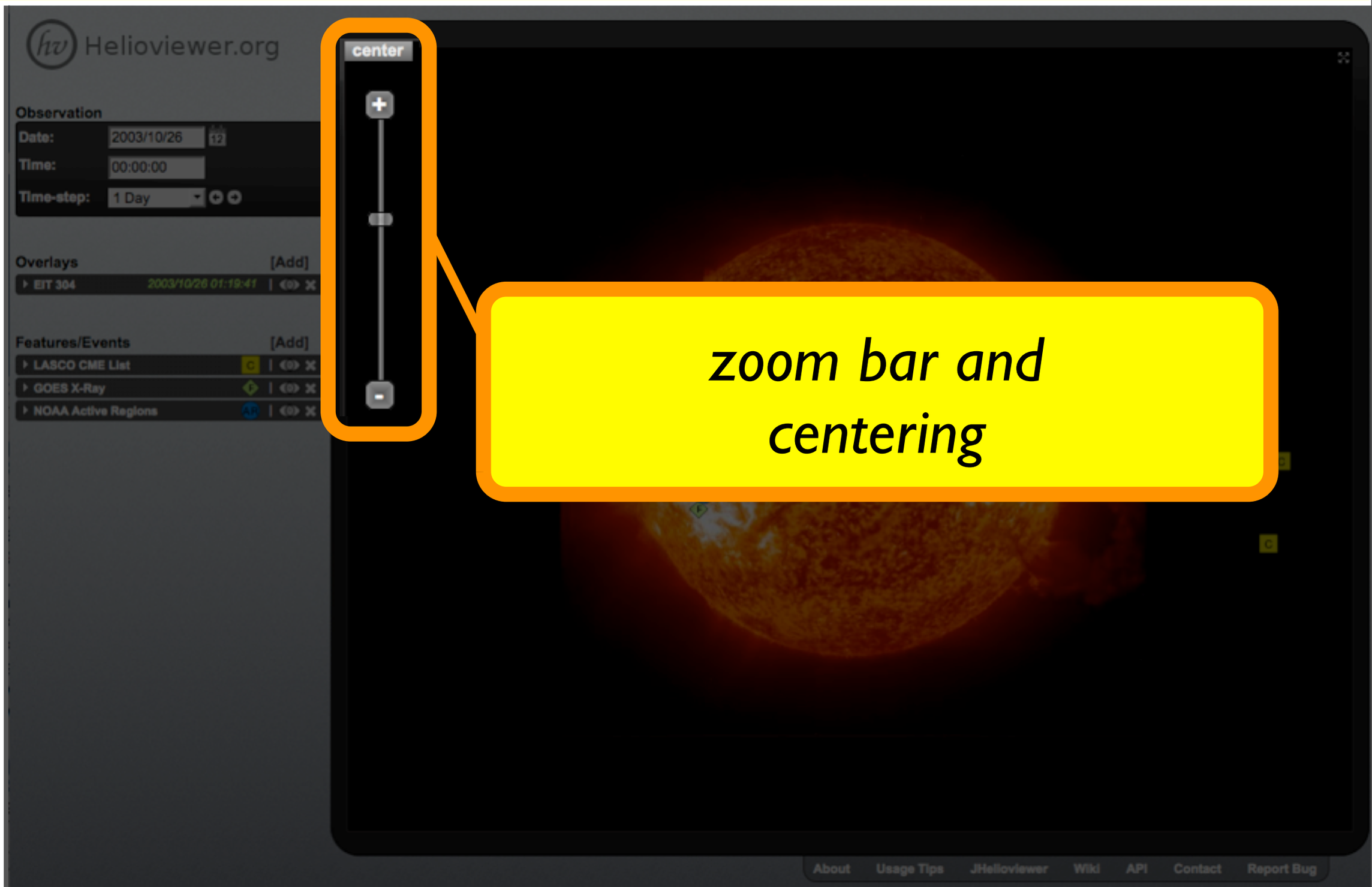

zoom bar and centering

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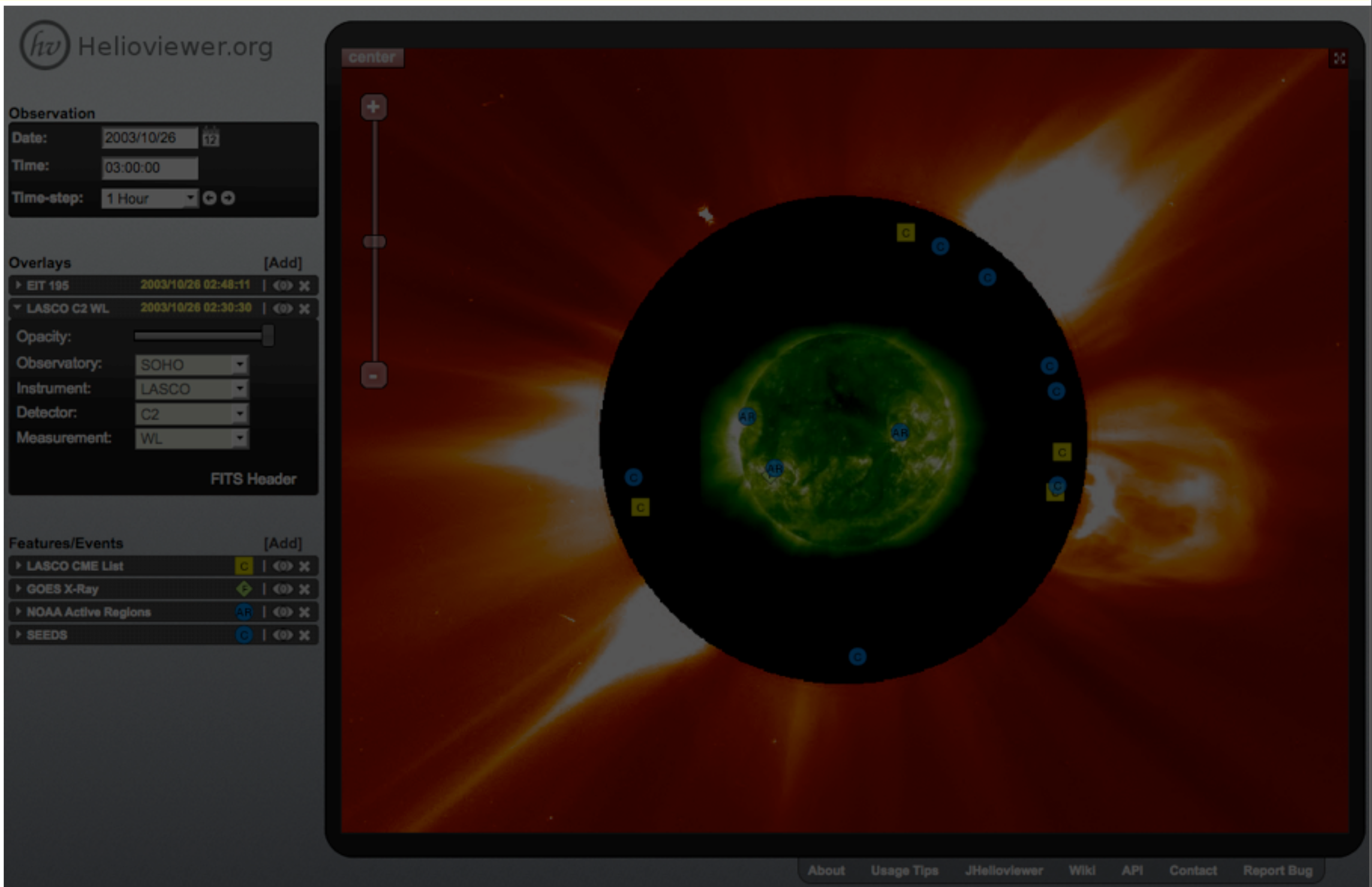

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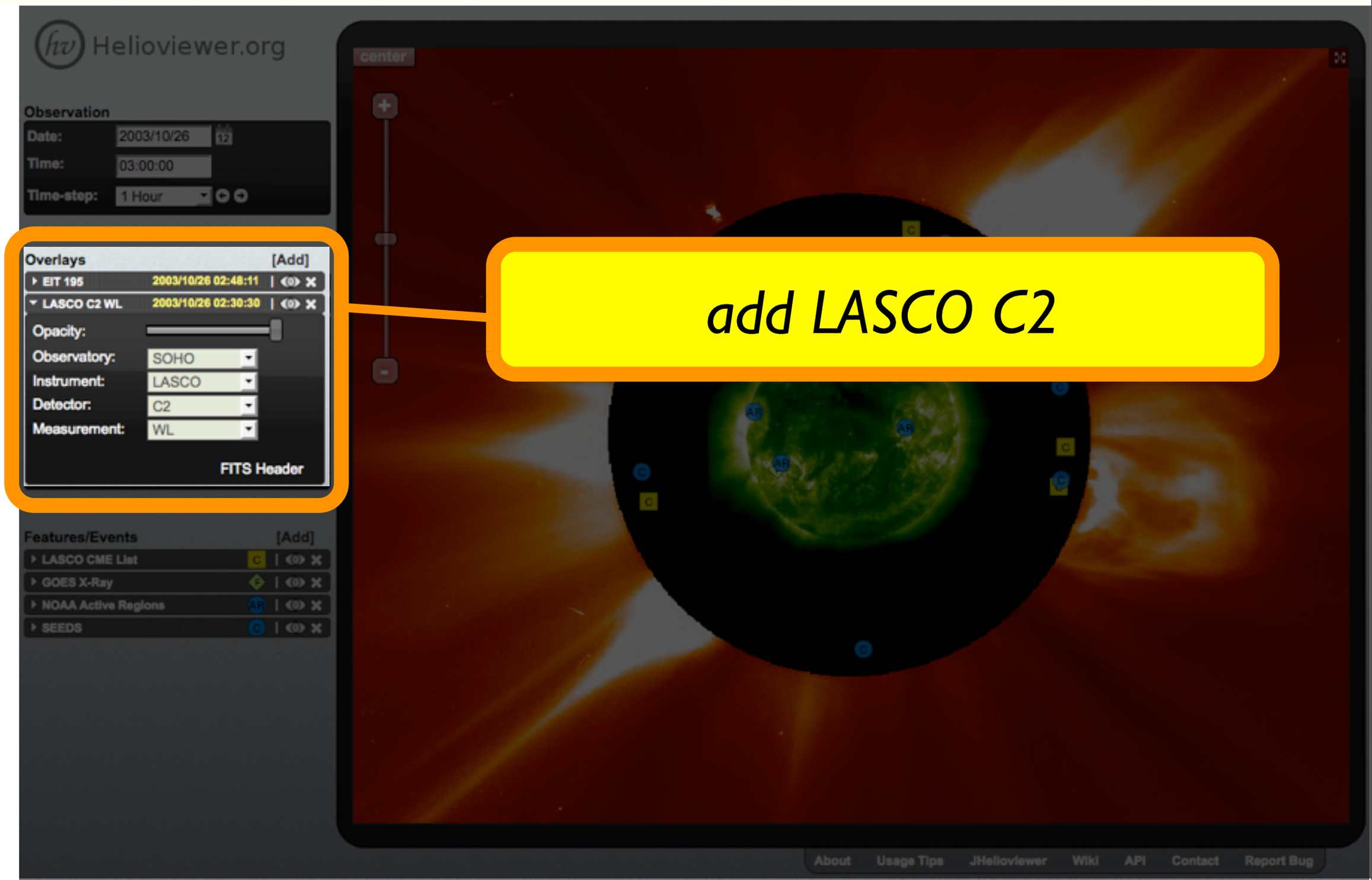

add LASCO C2

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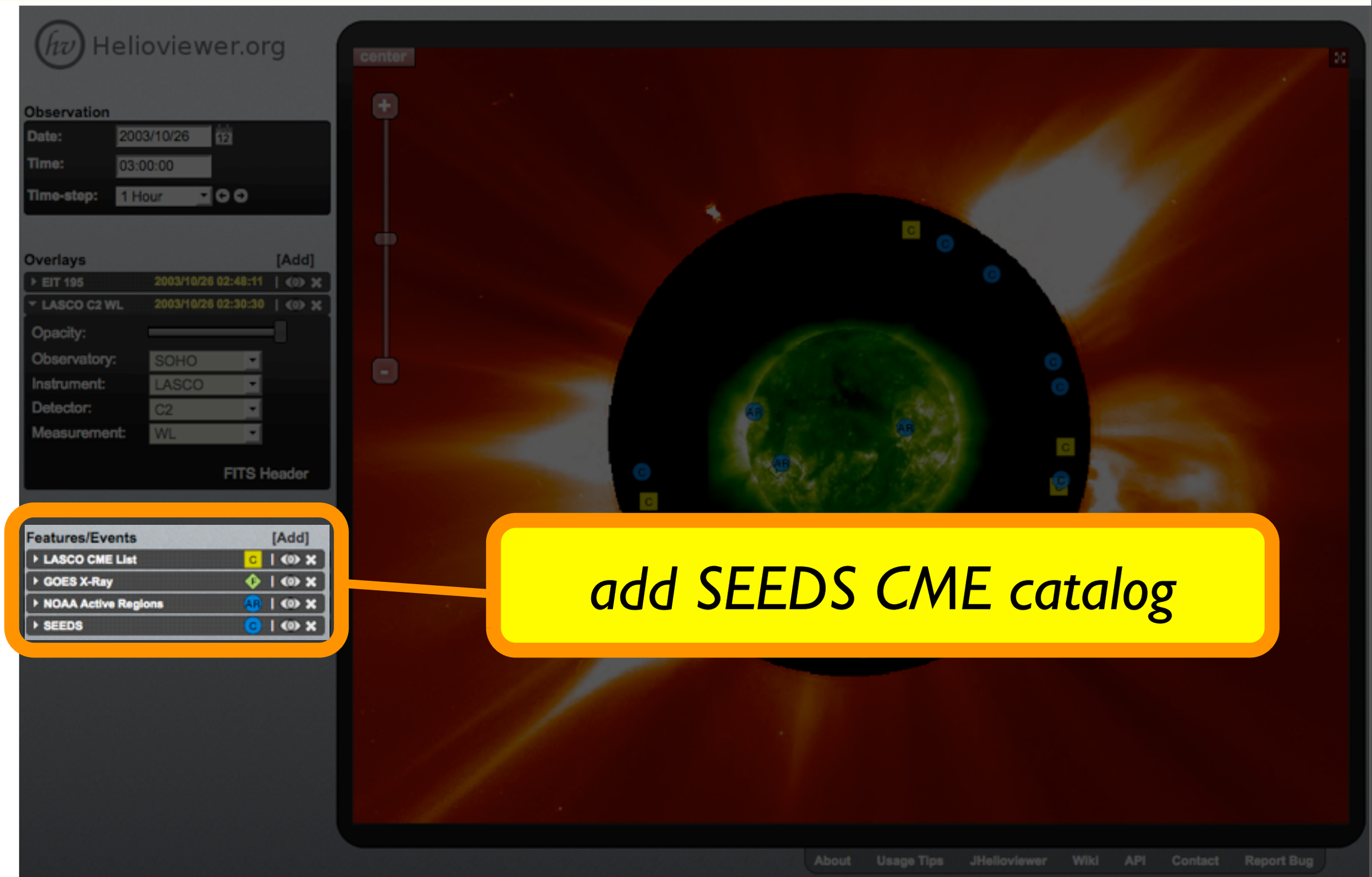

add SEEDS CME catalog

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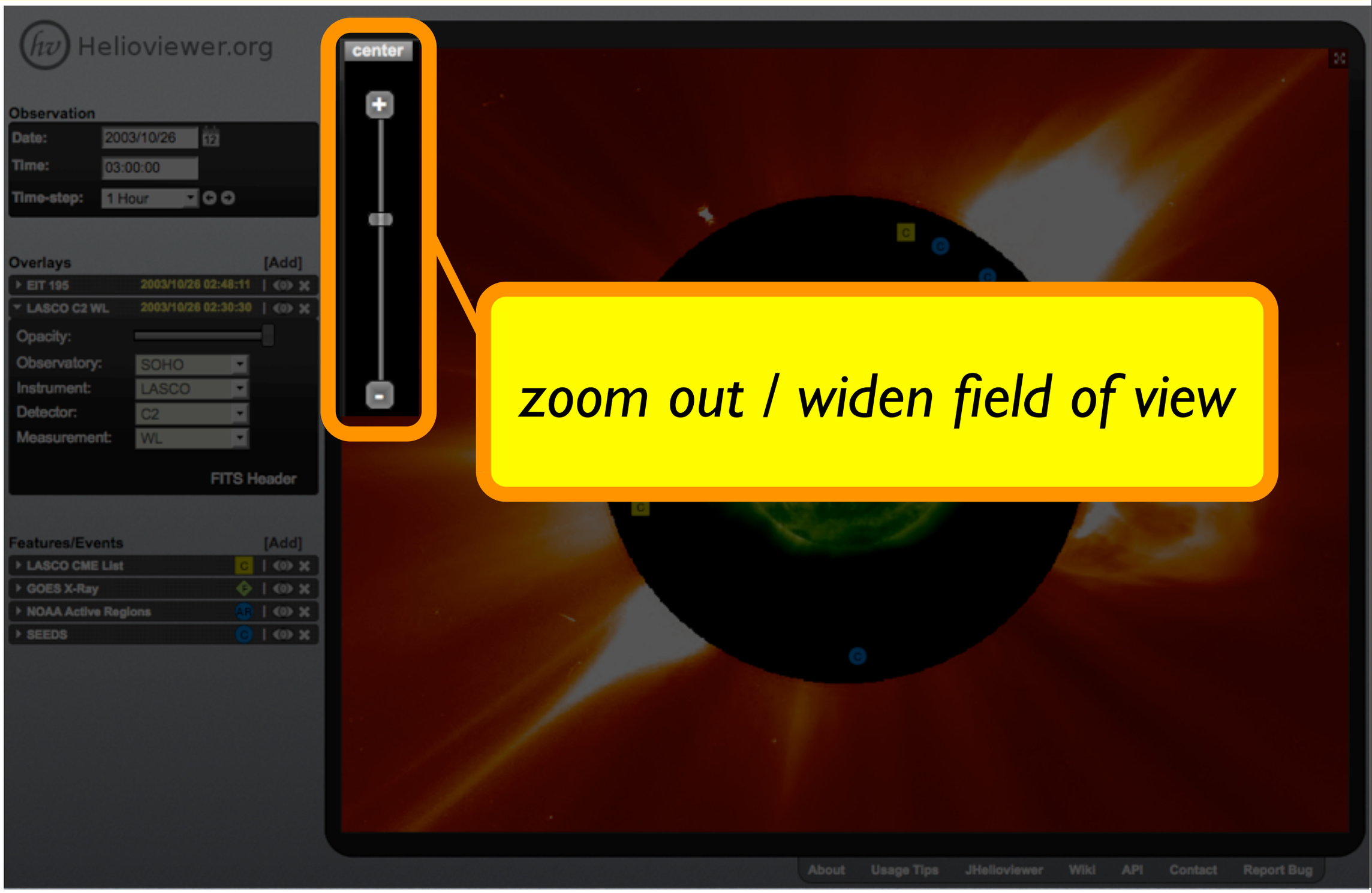

zoom out / widen field of view

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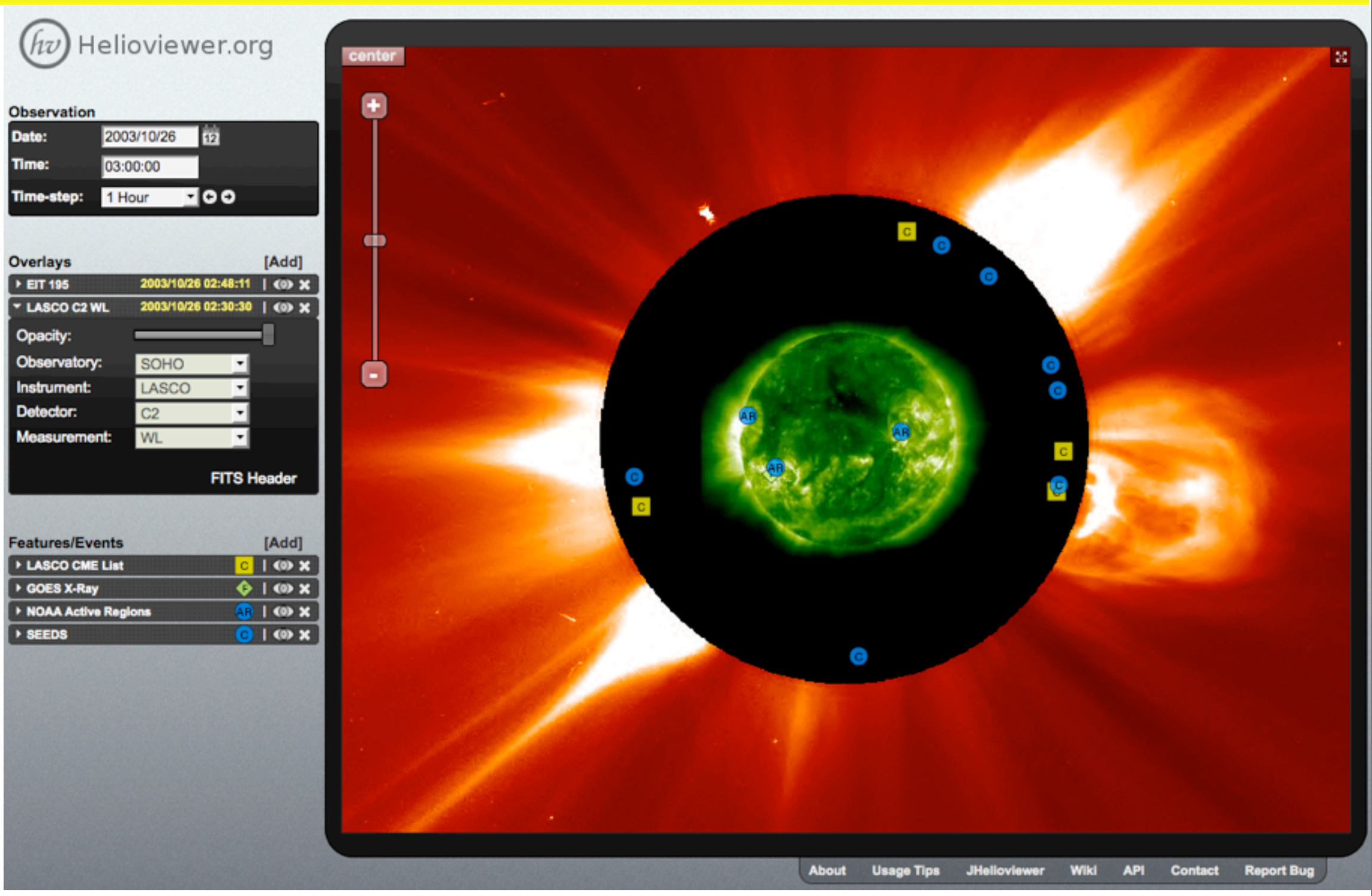

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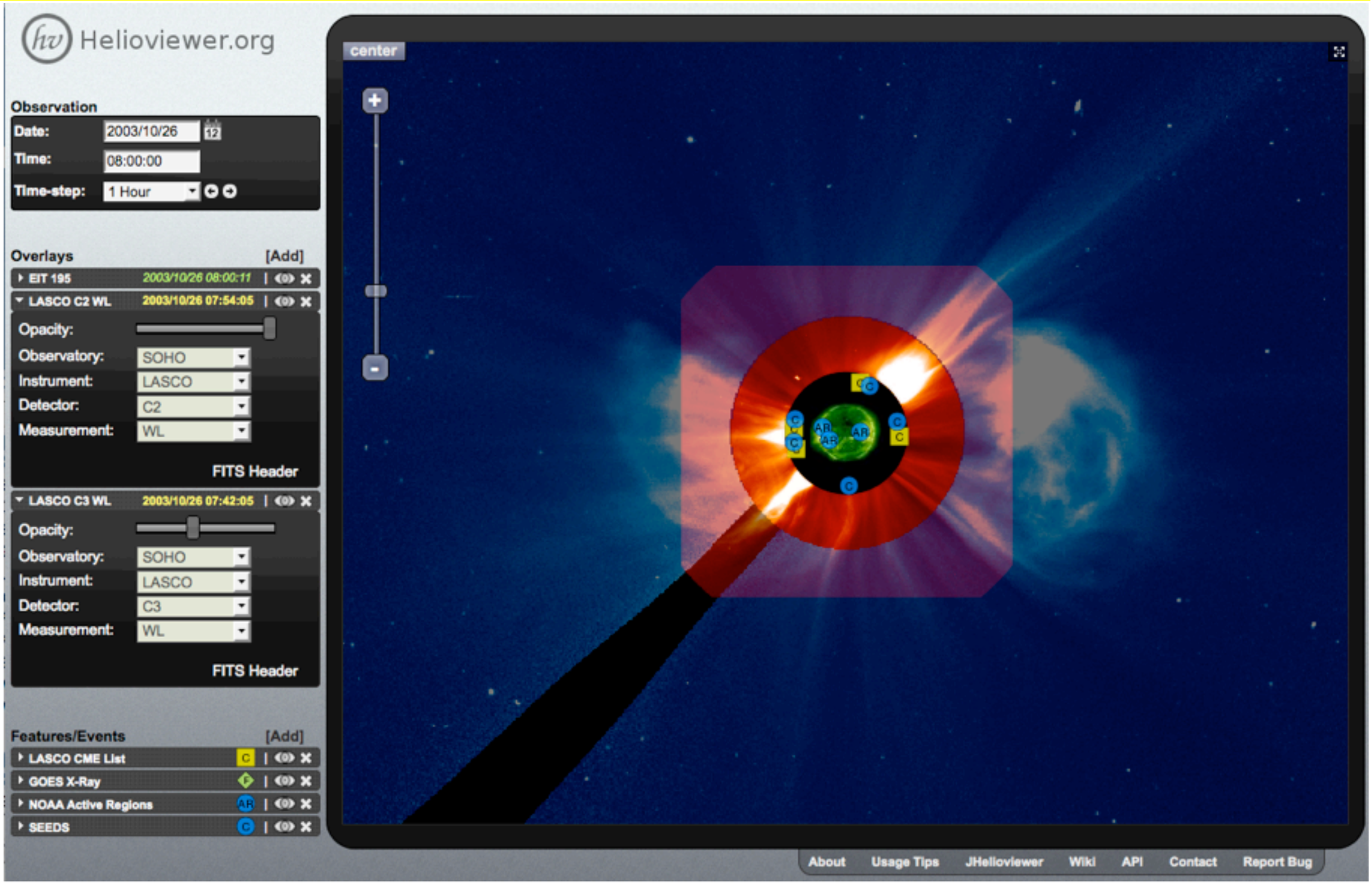

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add LASCO C3, vary layer opacity, zoom out

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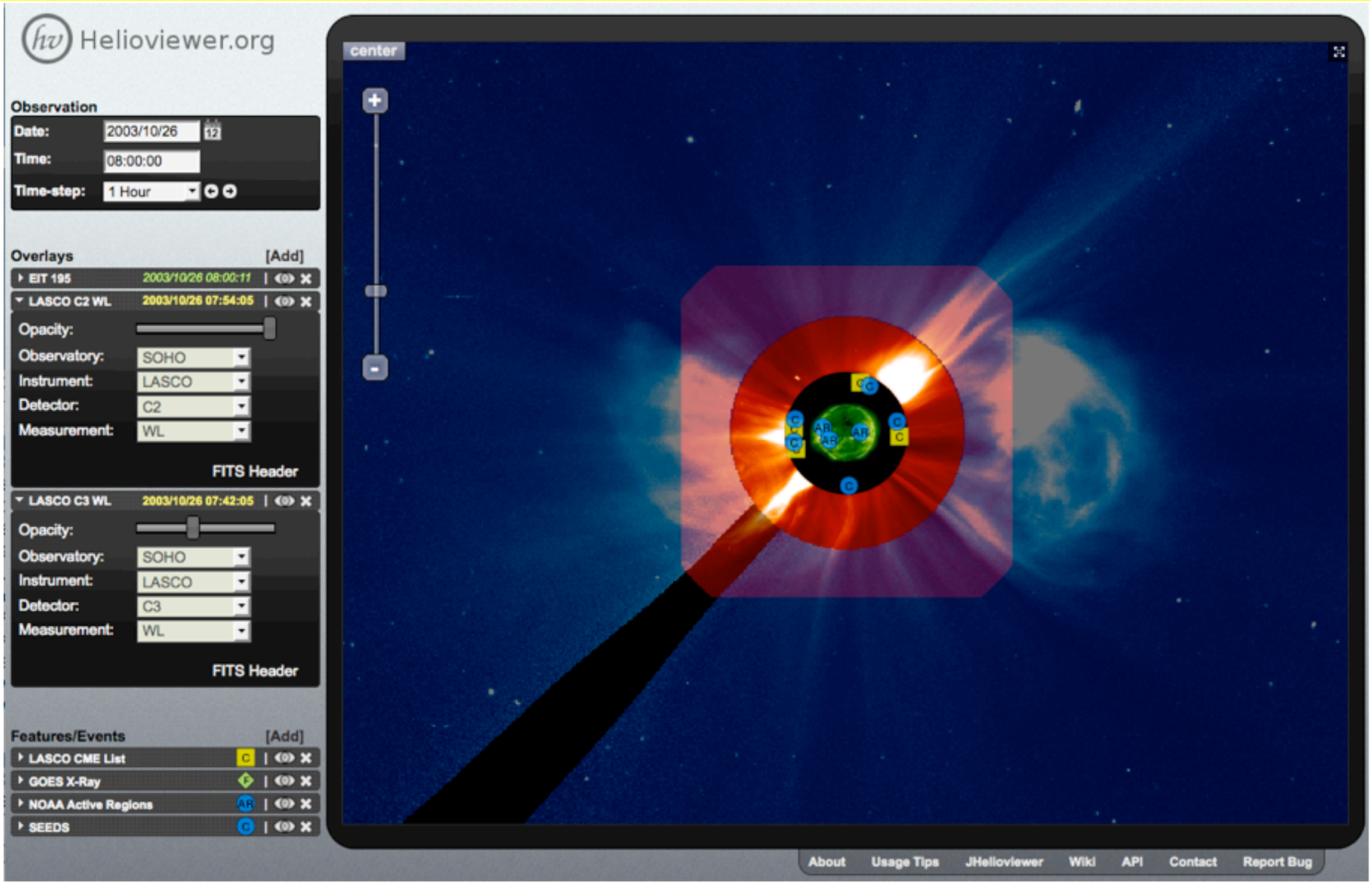

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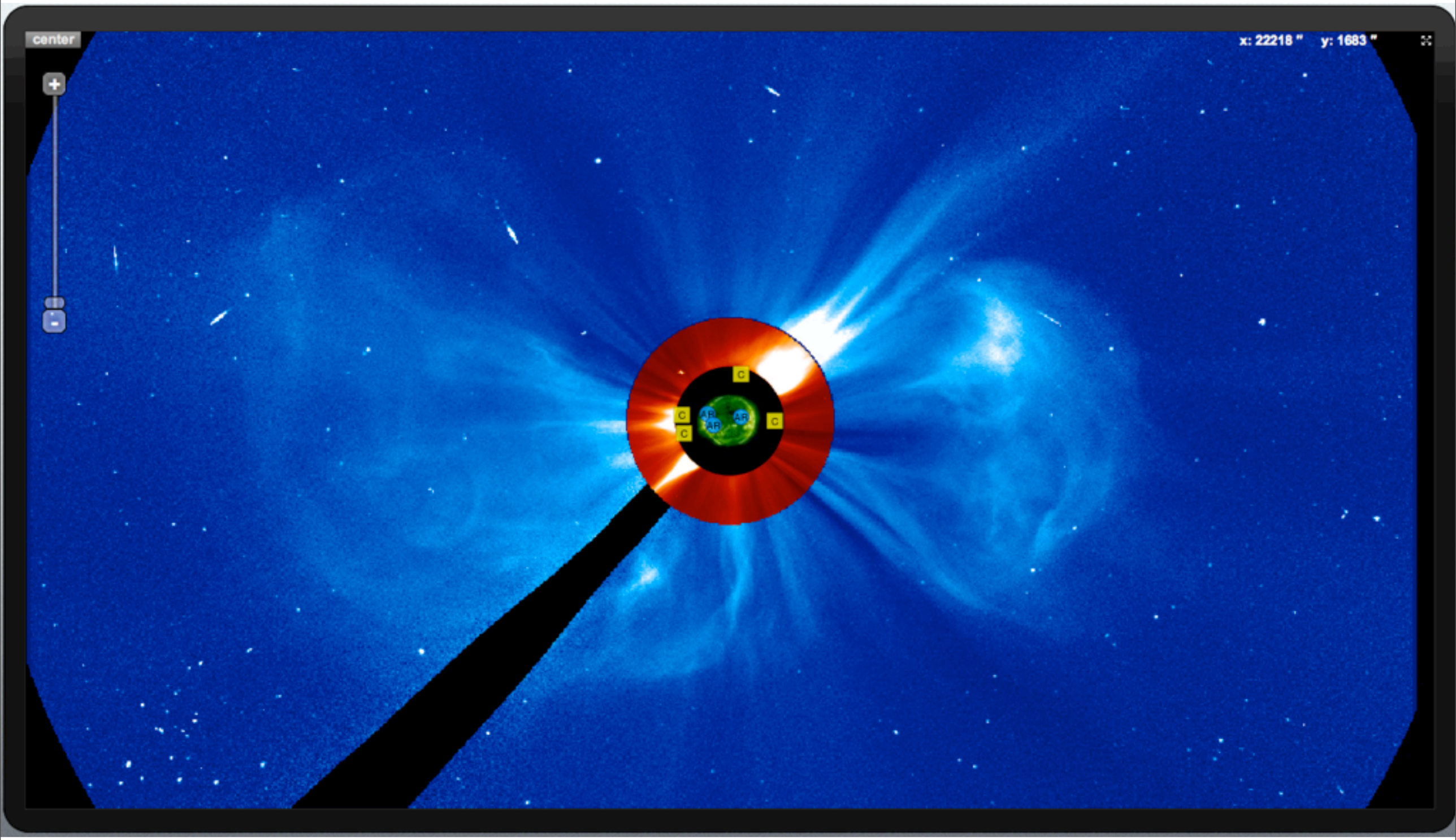

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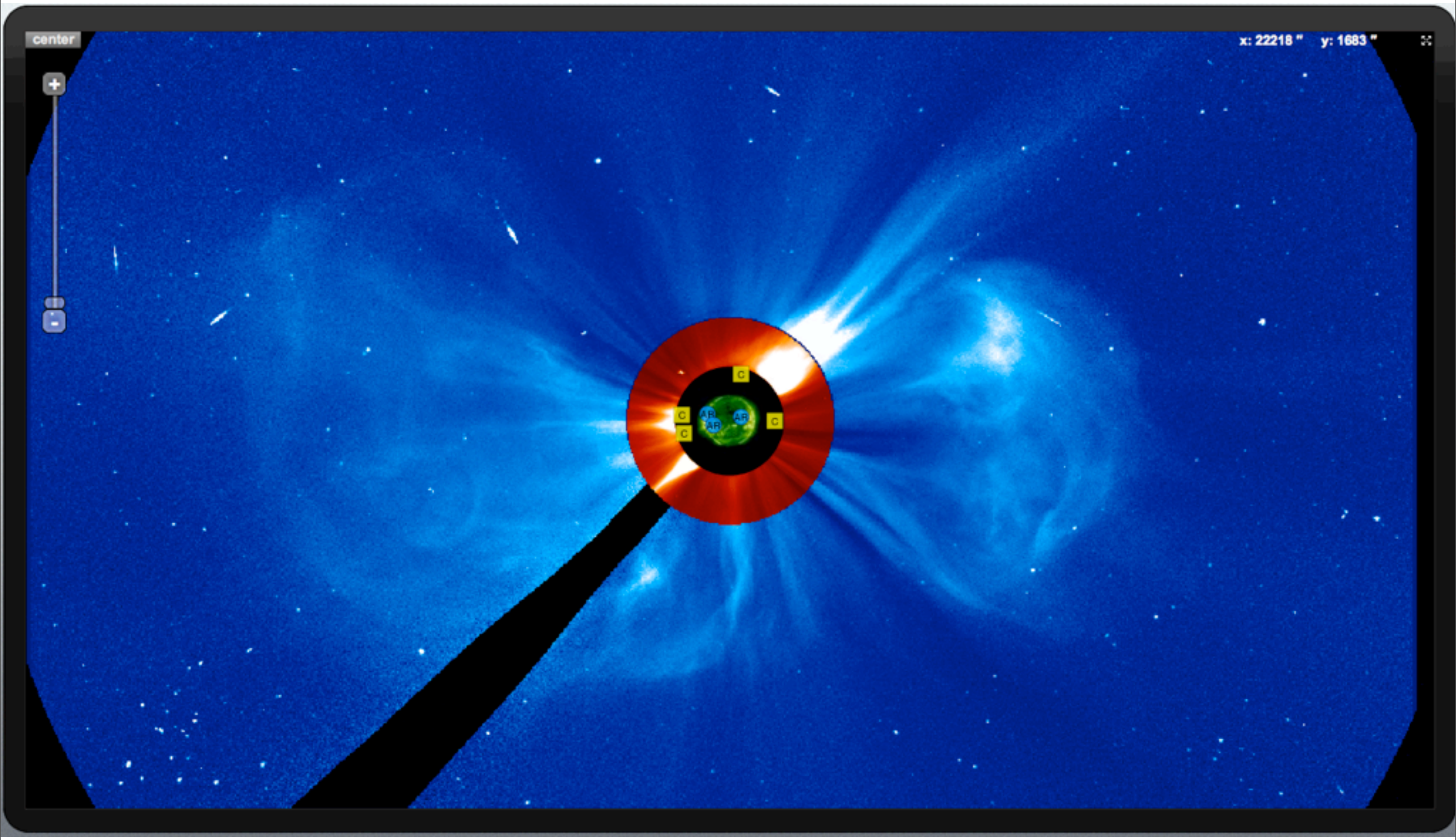

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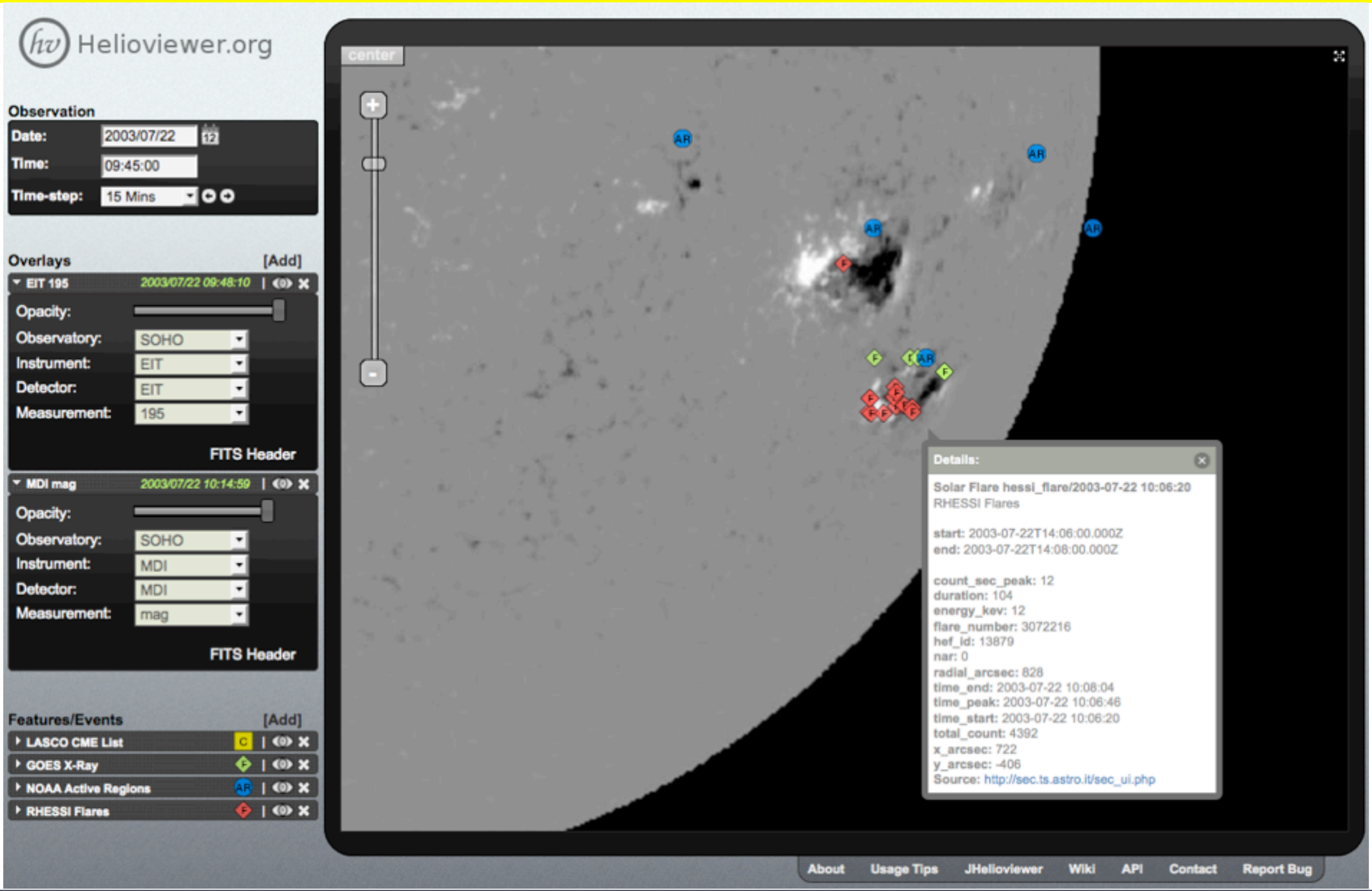

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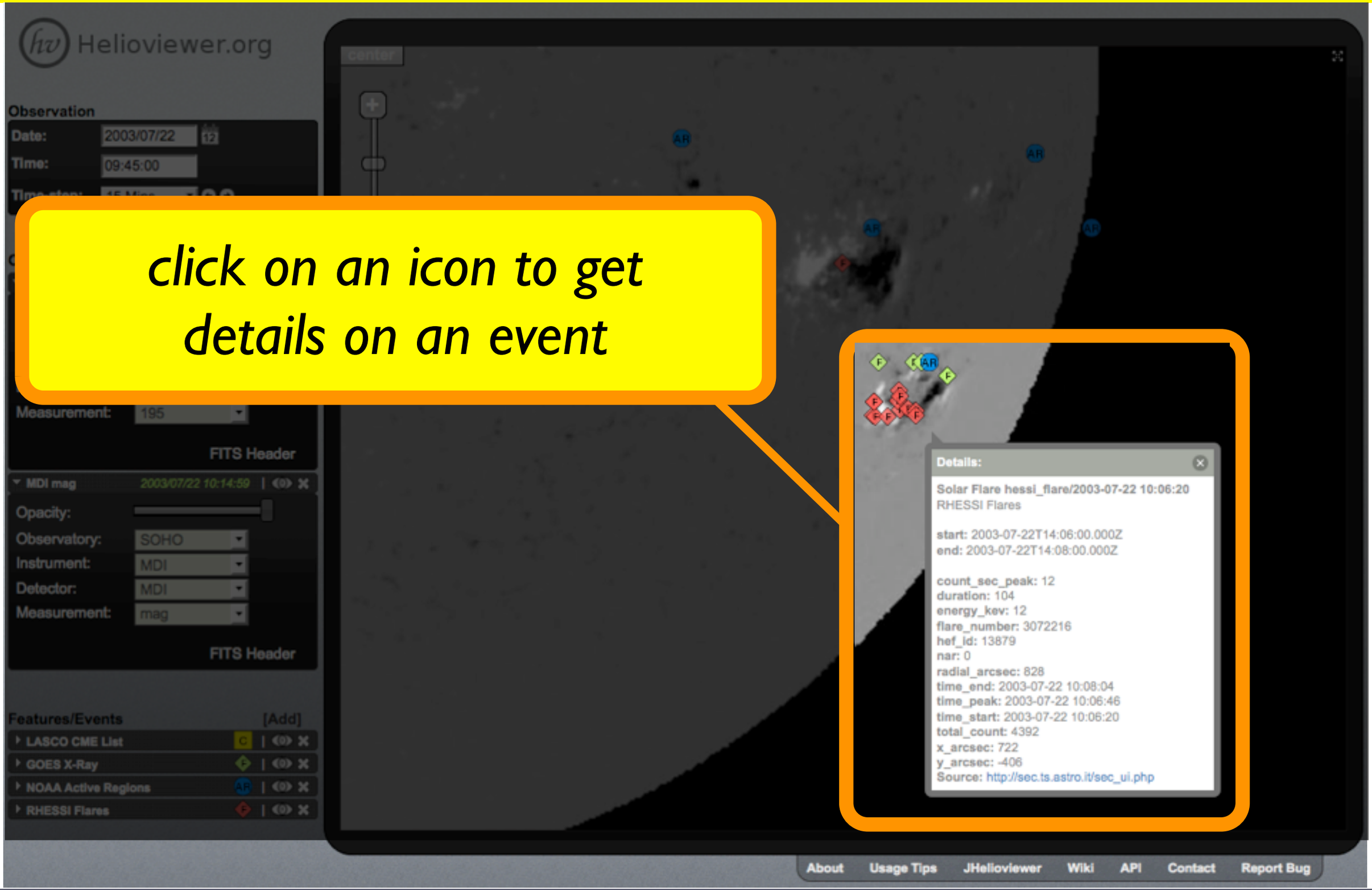

click on an icon to get details on an event

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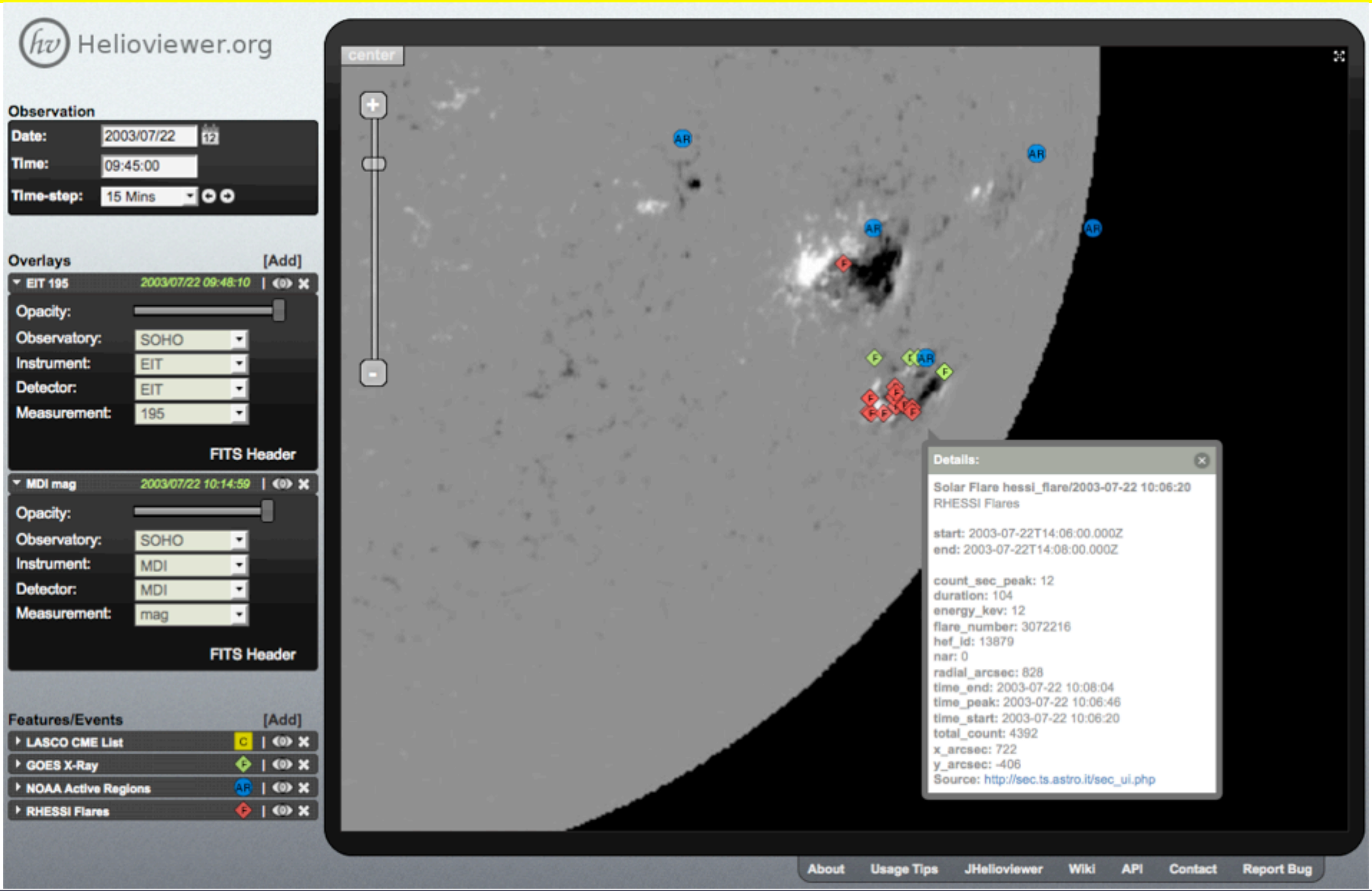

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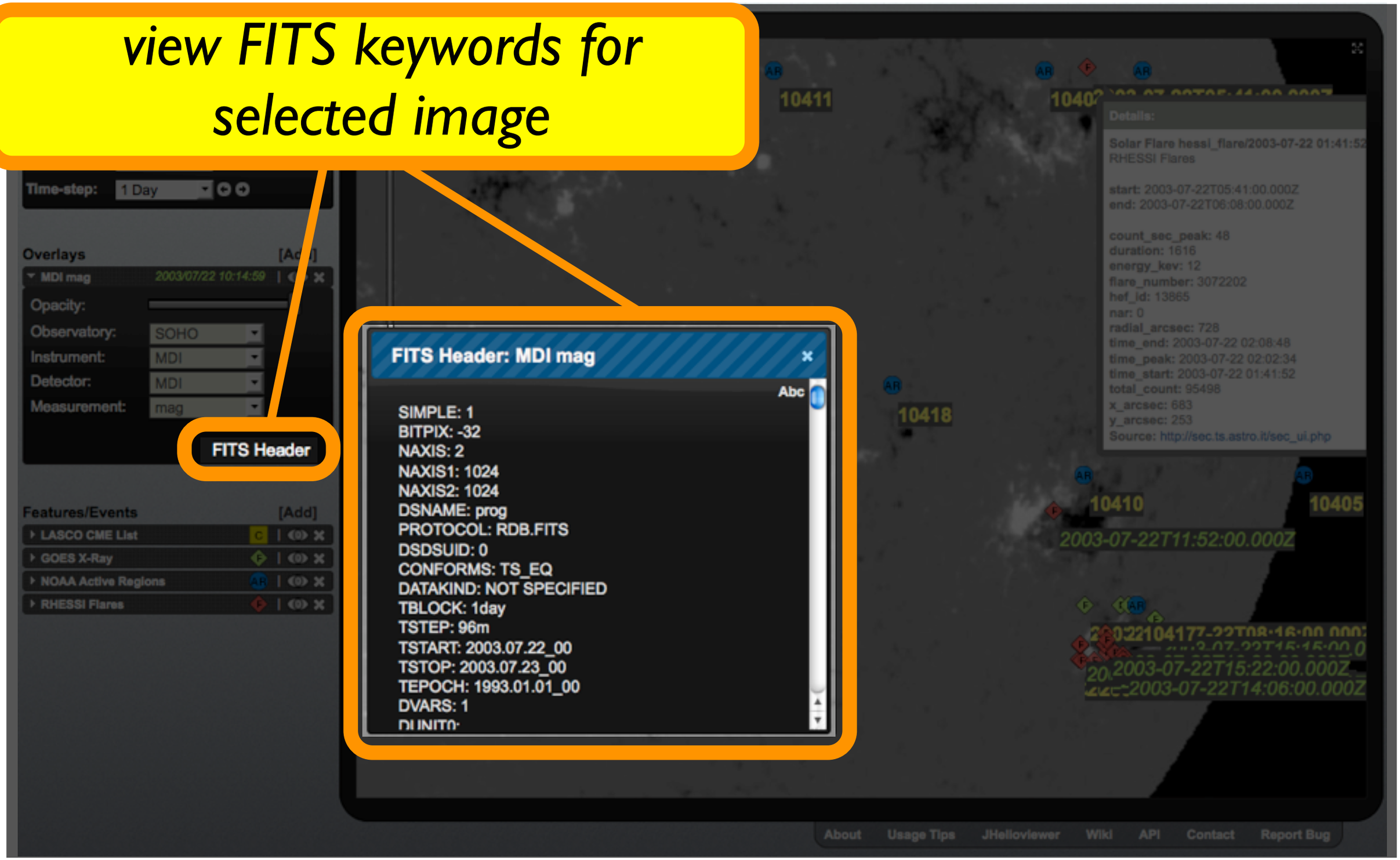
view FITS keywords for selected image



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press 'D' for quick details

www.helioviewer.org

Helioviewer.org

Observation
Date: 2003/07/22
Time: 09:45:00
Time-step: 1 Day

Overlays [Add]
MDI mag 2003/07/22 10:14:59
Opacity:
Observatory: SOHO
Instrument: MDI
Detector: MDI
Measurement: mag
FITS Header

Features/Events [Add]
LASCO CME List
GOES X-Ray
NOAA Active Regions
RHESSI Flares

FITS Header: MDI mag

SIMPLE: 1
BITPIX: -32
NAXIS: 2
NAXIS1: 1024
NAXIS2: 1024
DSNAME: prog
PROTOCOL: RDB.FITS
DSDSUID: 0
CONFORMS: TS_EQ
DATAKIND: NOT SPECIFIED
TBLOCK: 1day
TSTEP: 96m
TSTART: 2003.07.22_00
TSTOP: 2003.07.23_00
TEPOCH: 1993.01.01_00
DVARS: 1

Details:
Solar Flare hessi_flare/2003-07-22 01:41:52
RHESSI Flares
start: 2003-07-22T05:41:00.000Z
end: 2003-07-22T06:08:00.000Z
count_sec_peak: 48
duration: 1616
energy_kev: 12
flare_number: 3072202
hef_id: 13865
nar: 0
radial_arcsec: 728
time_end: 2003-07-22 02:08:48
time_peak: 2003-07-22 02:02:34
time_start: 2003-07-22 01:41:52
total_count: 95498
x_arcsec: 683
y_arcsec: 253
Source: http://sec.ts.astro.it/sec_ui.php

10411 10415 10418 10410 10405
2003-07-22T11:52:00.000Z
2003-07-22T15:22:00.000Z
2003-07-22T14:06:00.000Z

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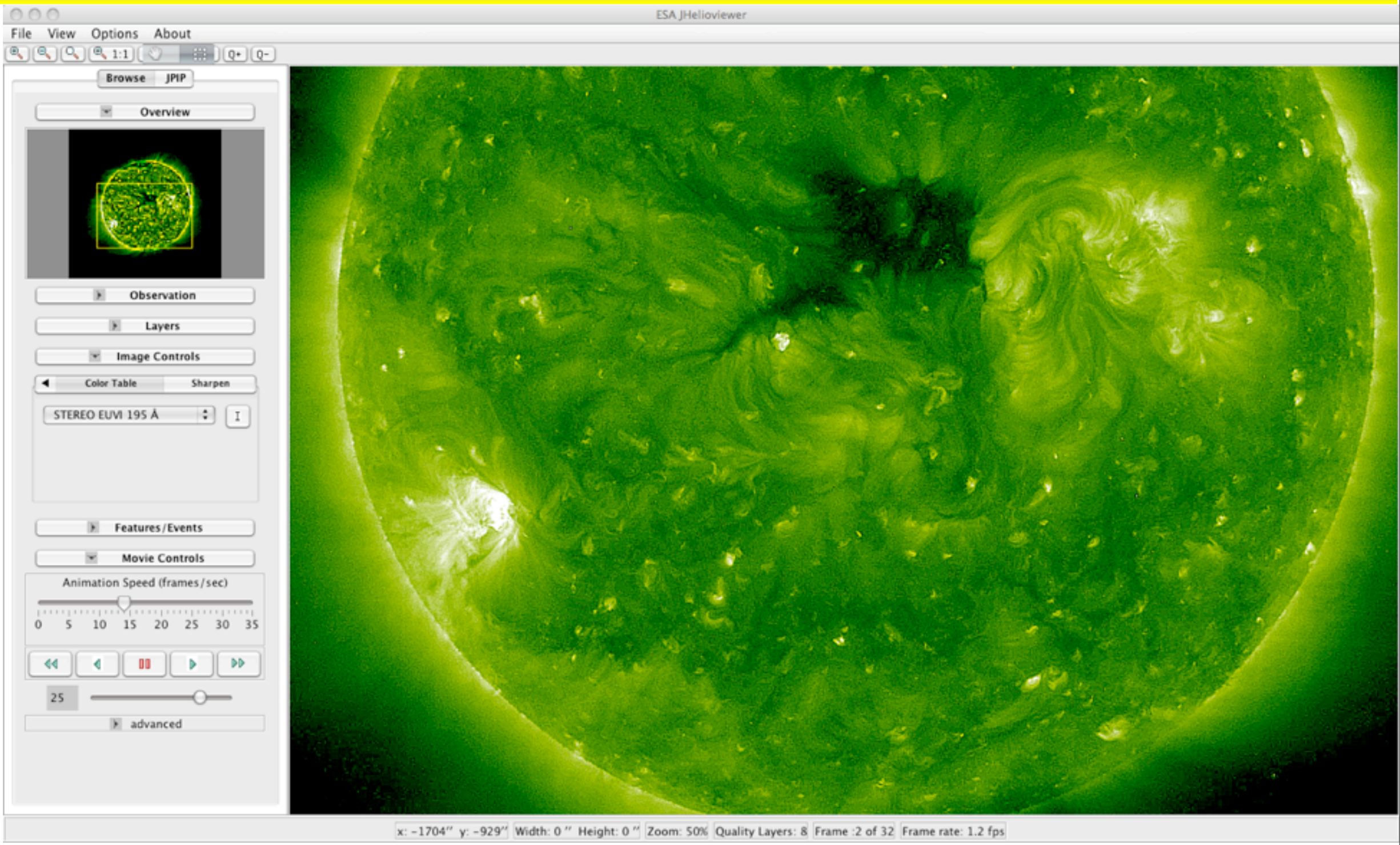
Jhelioviewer



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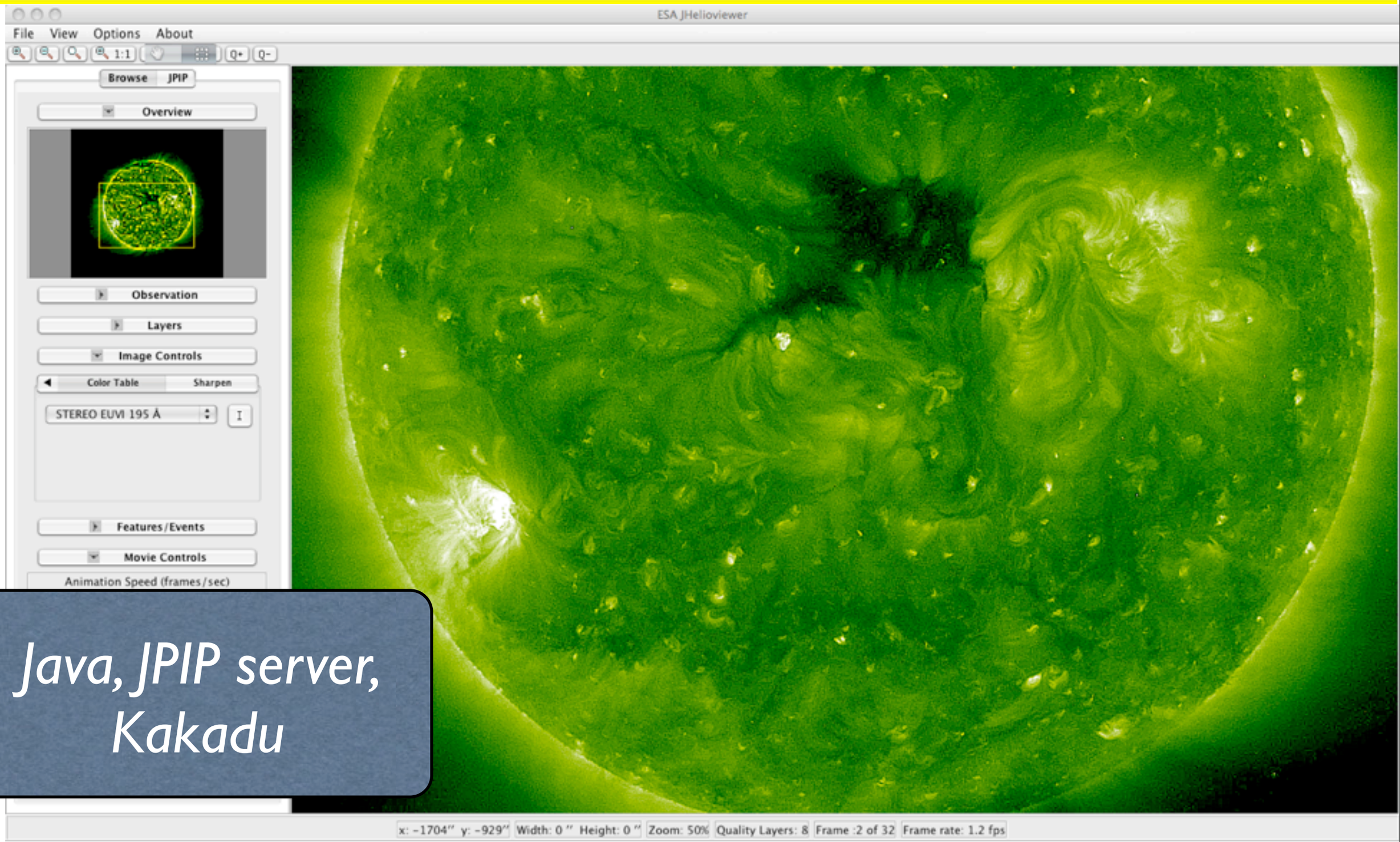
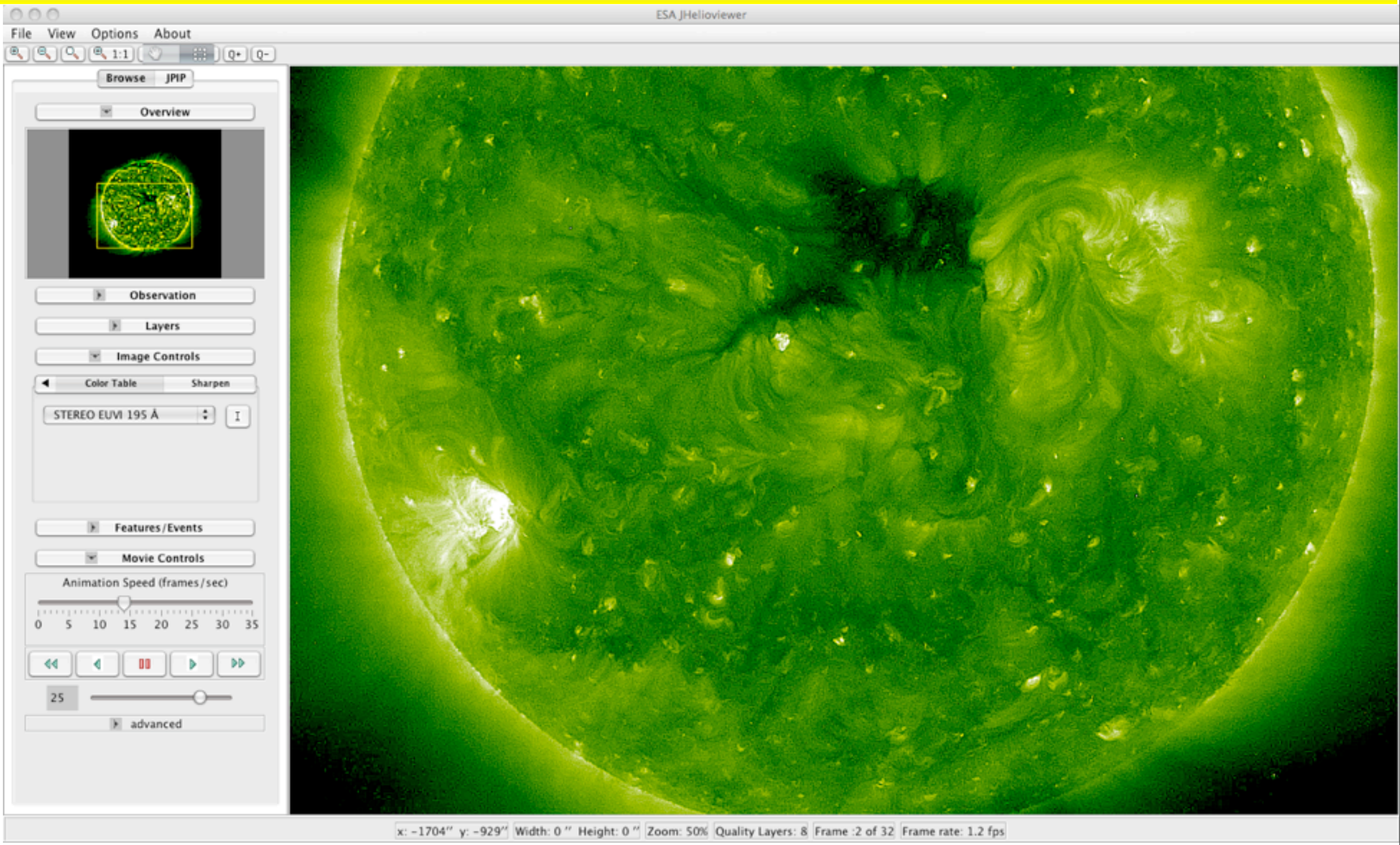


Java, JPIP server, Kakadu

Jhelioviewer



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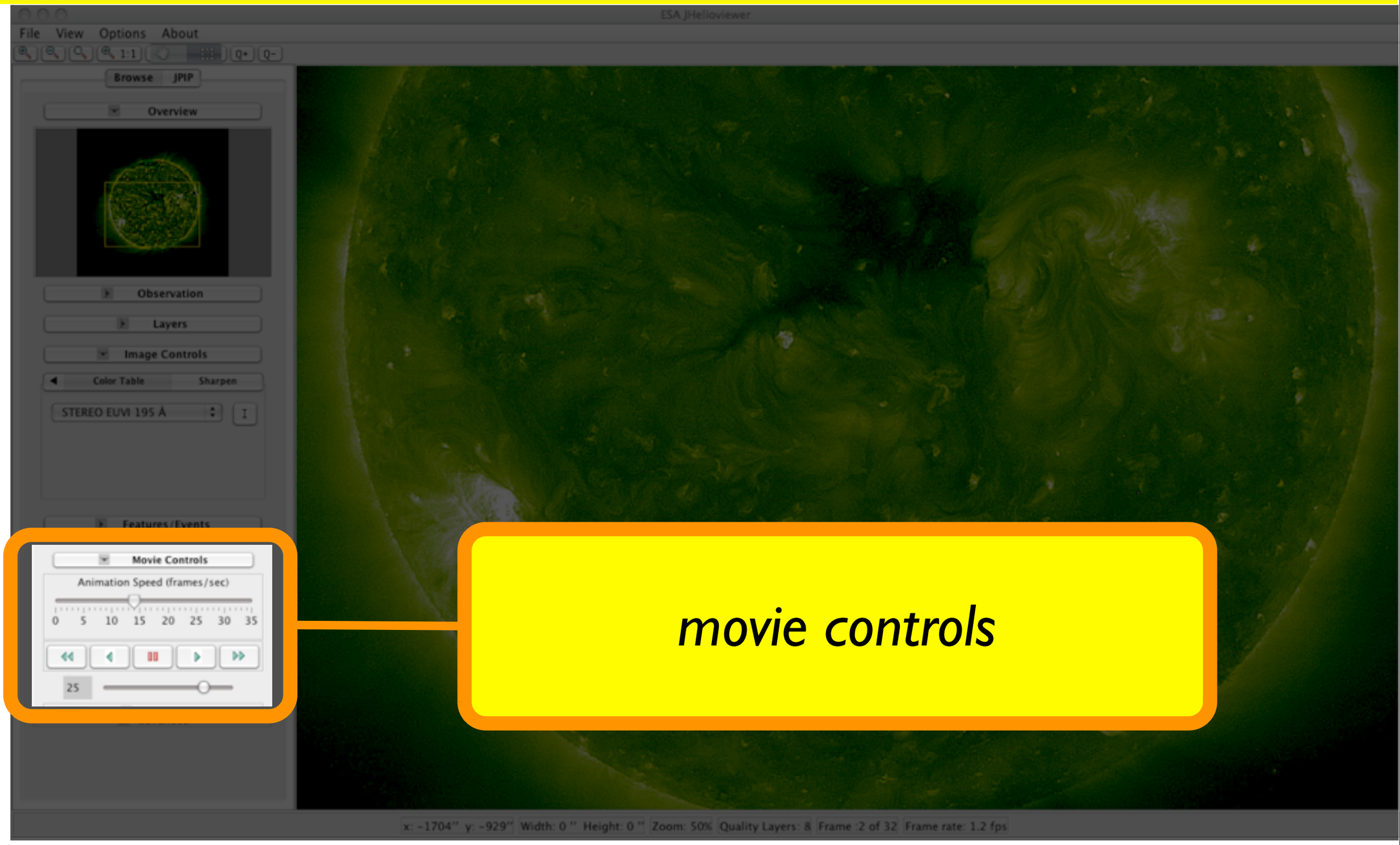

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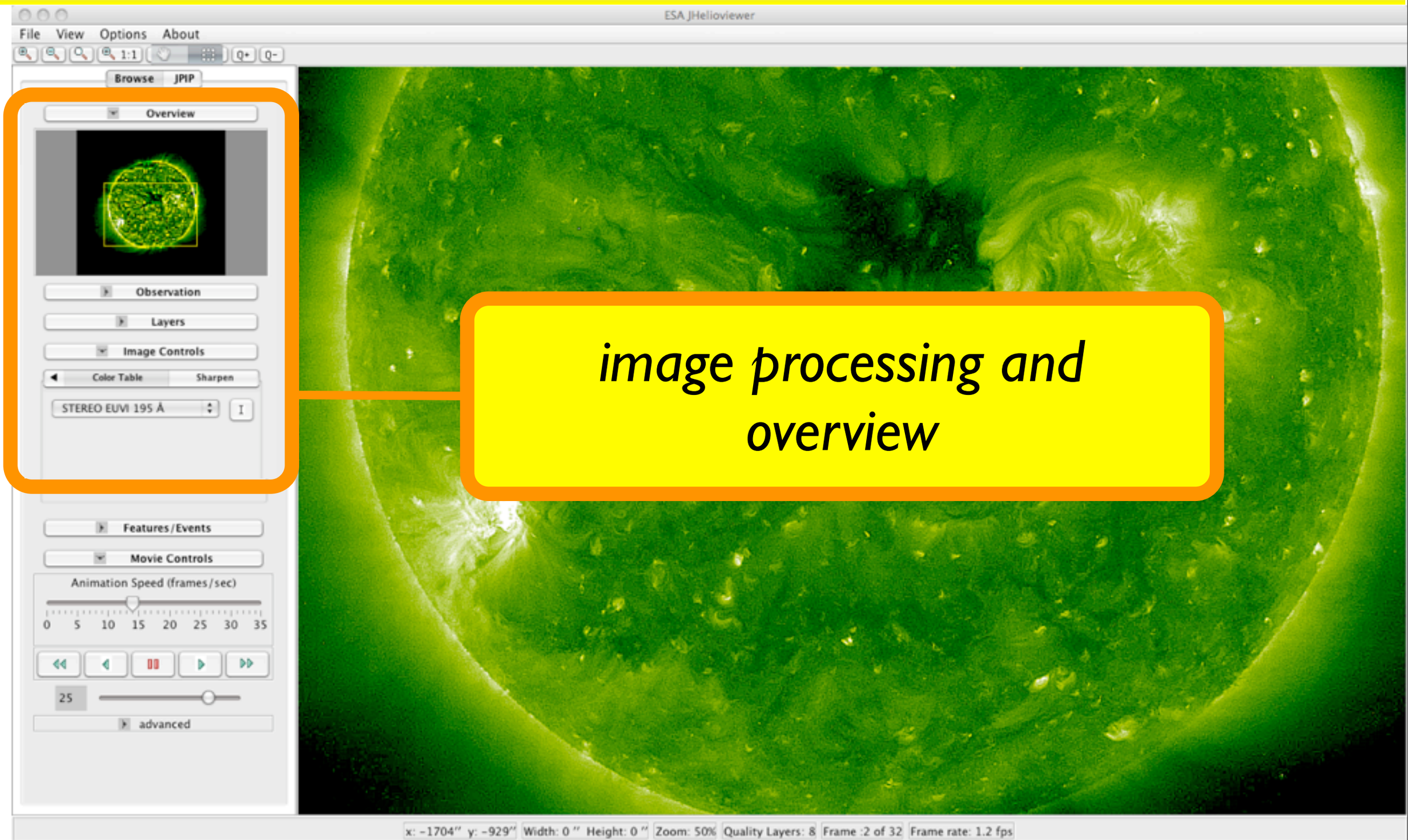

image processing and overview

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- social networking

Thank you!

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http://achilles.nascom.nasa.gov/~dmueller