

The Helioviewer Project



Browsing, Visualizing and Accessing Petabytes of Solar Data



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Abstract

SDO's unprecedented data volume poses an entirely new set of challenges with respect to data access, data browsing and searching for interesting data while avoiding the proverbial search for a "needle in a haystack". In order to fully exploit SDO's wealth of data and connect it to data from other solar missions, scientists need to be able to interactively browse and visualize many different data products spanning a large range of physical length and time scales. So far, all tools available to the scientific community either require downloading all potentially relevant data sets beforehand in their entirety or provide only movies with a fixed resolution and cadence. The Helioviewer Project offers a solution to these challenges by providing a suite of open-source tools¹ that are based on the new JPEG 2000 compression standard² and enable scientists and the general public alike to intuitively browse, visualize and access petabytes of image data remotely. All images from the SOHO mission are already available online, and SDO data will be added shortly.

Making SDO Data Browsable for Everyone, Everywhere



SDO's AIA instrument takes 16MP images in 10 channels, every 10 sec, 24/7 → >1 Petabyte of science data/year!

Challenges:

- Data access and distribution
- Search
- Visualization

Solution:

- With JPEG 2000: Can compress 16MP image to 1 MB at good visual quality for browsing
- Store all 10 channels at 30 sec cadence → 29 GB/day = 10.6 TB/year
- Can keep comprehensive set of browse data online for entire mission (science data: only few months)

Helioviewer Project

Applications:

- 1 Helioviewer.org
- 2 JHelioviewer

Server-Side Services:

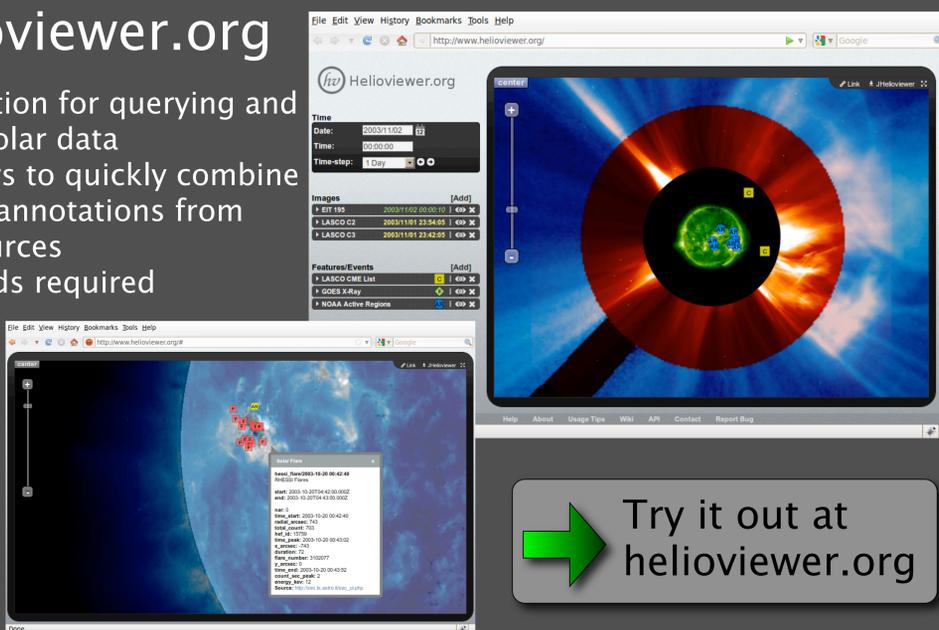
- 3 API, JPIP Server, Tile Server

Image Services:

- 4 JP2Gen

1 Helioviewer.org

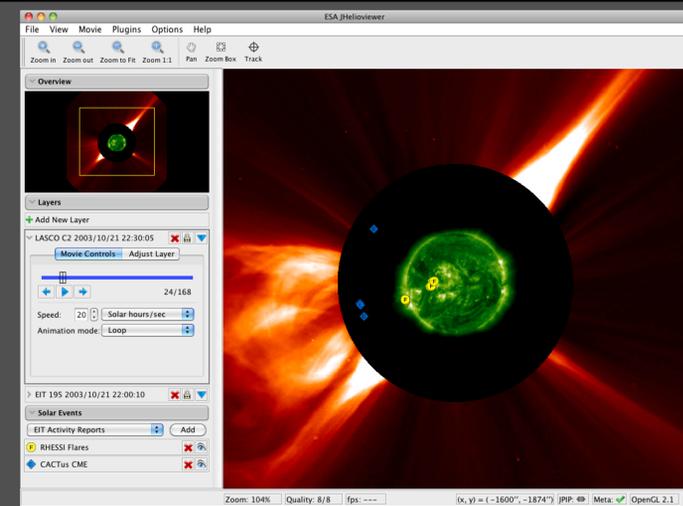
- Web application for querying and displaying solar data
- Enables users to quickly combine images and annotations from different sources
- No downloads required



Try it out at helioviewer.org

2 JHelioviewer

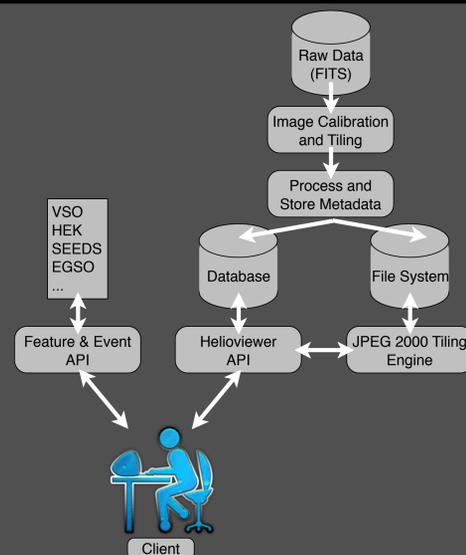
- Java/OpenGL application³
- Interactively stream and generate movies using JPIP (JPEG 2000 Interactive Protocol)
- Zoom, pan and overlay 16 MP movies
- Image processing in real time
- Query and display event catalogs
- Can be launched as a stand-alone application or from any web browser using Java Web Start



Download at jhelioviewer.org

3 Server-Side Services

- Application Programming Interface (API) available for interacting with and extending Helioviewer.org in your own applications
- Dynamic JPEG 2000 tiling for web application reduces bandwidth used by only displaying regions of interest
- Support for running in distributed mode with arbitrary number of data sources



4 JP2Gen: File Conversion to JPEG 2000

JP2Gen is a set of IDL/SolarSoft routines that convert FITS files into JPEG2000 files for use with the Helioviewer Project. Each supported instrument has its own software branch that can be used to write JPEG2000 files. The workflow for each branch is identical:



References

- ¹<https://launchpad.net/helioviewer>
- ²<http://www.jpeg.org/jpeg2000/>
- ³<http://www.jhelioviewer.org/paper.pdf>

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