JHelioviewer

A JPEG 2000 Solar Image Browser

B.W. Caplins[1], D.A.N. Müller[1], J. Ireland[2], G.Dimitoglou[1], B. Fleck[1]

[1]European Space Agency c/o NASA GSFC, [2]ADNET Systems c/o NASA GSFC, Greenbelt, MD, USA

Abstract

We present a novel solar data browser geared towards SDO's AIA data. It is based on the JPEG 2000 compression standard to enable highly efficient browsing in space and time. Our approach is both flexible, scalable and platform-independent. The random code stream access of the JPIP protocol minimizes data transfer and can encapsulate meta data as well a multiple spectral channels in one data stream.

What is JPEG 2000?

JPEG 2000 is a wavelet-based image compression standard. It was created by the Joint Photographic Experts Group[1] with the intention of superseding their original discrete cosine transform-based JPEG standard (created about 1991) and offers multiple advantages over other compression schemes.

Advantages of JPEG 2000

- Multiple resolution representation: Images at different resolutions are automatically created during the wavelet compression process
- Random code stream access and processing via the JPIP protocol: Huge images can be accessed while downloading only selected parts of the image
- Quality layers: Images are displayed at increasingly better quality as data transfer progresses
- Flexible file format: allows for handling of metadata and for remote access
- Superior compression performance
- Read/write routines built into IDL

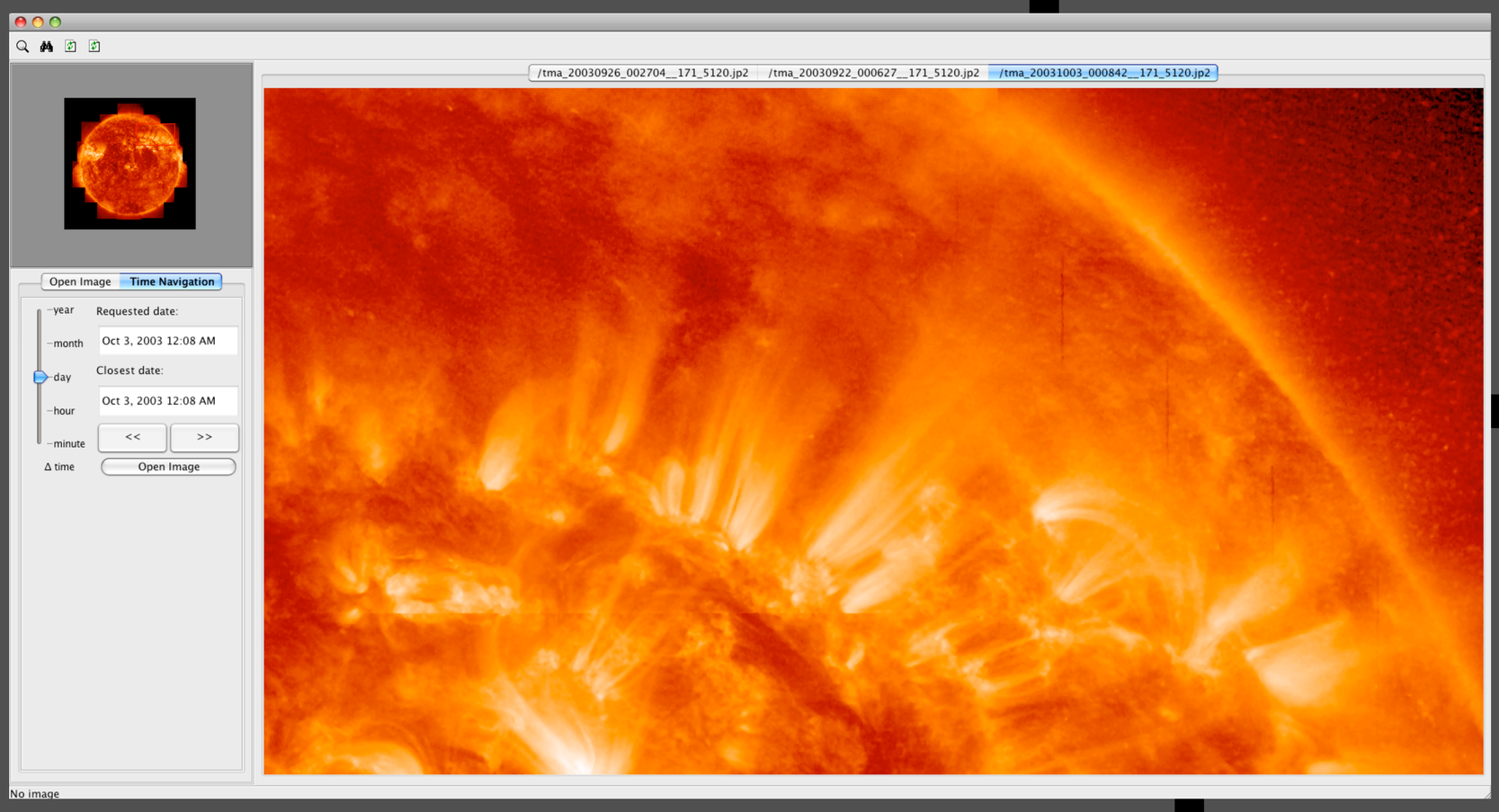
Challenges:

- JPEG 2000 is not yet fully supported by most web browsers, therefore JHelioviewer is encapsulated in a Java Web Start application

JHelioviewer Implementation

The JHelioviewer application is built using

- Kakadu Software[3] (C++ implementation of the JPEG 2000 standard, used under non-commercial license)
- Open-source J2KViewer[2]
- Java Web Start: JHelioviewer can be launched from web browser or as a stand-alone application.



Current Functionality:

- Efficient zooming & panning
- Selecting images by instrument and date
- Tabbed image browsing
- Display FITS header
- Cross-platform: runs on OS X, Linux, Windows XP

Future Work:

- link to image data bases & knowledge base
- multi-spectral data stream (all SDO AIA channels in one)
- image overlays and annotations
- image processing
- use Motion JPEG 2000 to store image sequences
- bridge gap between Java application and web browser-based application (possibly by tiling images on-the-fly)

Complementarity to Helioviewer.org

- The Helioviewer project currently has two branches: The tile-based web browser application (see poster of Ireland et al.) and the JPEG 2000-based approach shown here
  - Both branches will have the same interface to data bases
- For accessing the huge amount of data generated by AIA, the overhead associated with tiling the entire data set (increased data volume and complexity of data base) is a serious challenge for which the JPEG 2000-based approach offers a potential solution.

References

[1]http://www.jpeg.org/jpeg2000/
[2]http://dltj.org/arcticle/gsoc-jpip/
[3]http://www.kakadusoftware.com

Contact

Daniel Müller, dmueller@esa.nascom.nasa.gov