

## **Web-Based Tools For Exploration of ADC Data Holdings and NASA Data Archives**

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**Abstract.** The NASA Astrophysics Data Facility has developed several new tools to facilitate the browsing and visualization of astronomical catalog and journal table data at the Astronomical Data Center (ADC), and to find associated observational data at various data archives. The ADC Viewer allows users to select, cull, and manipulate ADC catalogs and journal tables, and display them in a plotting tool called Catseye. IMPReSS is a tool that displays aperture silhouettes within a specified sky region of a variety of space-based missions, and then links directly to the archived data held at external sites. All three tools are interoperable with other astronomical resources.

### **1. Introduction**

The Astronomical Data Center (ADC) at the Goddard Space Flight Center (GSFC) holds the largest computer readable collection of catalogs, observing logs, and journal tables in the Western Hemisphere. The scientific content of these holdings is very heterogeneous, ranging from astrometric data on stars to a variety of data on quasars and clusters of galaxies. Together with the CDS in Strasbourg, we maintain and expand our collections and make them available to the world community, scientists and laymen alike. A suite of tools available at the ADC facilitates the browsing and visualization of the collections, and allows researchers to refine and enhance their scientific objectives.

### **2. Tools**

Users can access three independent but linked tools for browsing astronomical tables and observing logs. The Viewer access catalogs and journal tables and allows selection and display of table subsets. CatsEye plots 2-D scatterplots of fields from Viewer tables. IMPReSS plots observation “footprints” of space-based missions on a region of the sky and links directly to the archived data.

### **2.1. Viewer**

The Viewer is a Perl-based web interface that allows users to select, cull, sort, save, and download over 2500 catalogs and over 1800 journal tables. Currently, only standardized ASCII tables (the bulk of the ADC holdings) are available through the tool. Through the top page, users can specify a particular catalog, search the ADC, browse the ADC's holdings, or directly access their workspace (described below).

After selecting a table to browse, the user selects the fields to view, and can constrain those fields by numerical range (or regular expression for string fields). The requested table subset is then displayed, and automatically saved in a personal work area ("workspace") identified by a cookie. If the user accepts the cookie (containing only a unique identifier), the workspace is stored on the server for access up to 5 days after last use and can be directly accessed anytime during that period. The user can name, view, download, or delete multiple tables in their workspace. Tables are saved as formatted ASCII, and are downloaded by request in the same format by the user. The Perl code is modularized for easy maintenance and modification.

### **2.2. CatsEye**

CatsEye (shown in Fig. 1) is a Perl- and IDL-based web tool that plots selected fields from Viewer-produced tables in the user's workspace, allowing them to visualize and select catalog data. Users select tables and fields therein to plot as X vs. Y. Overplotting of multiple tables is allowed.

The user's plot selections are processed by Perl CGI scripts and passed to IDL routines, which read in the tables and produce plots, which are translated to GIFs and displayed via HTML. Users can rescale plots as desired and click on points within the plot to access the corresponding full catalog record from the table. These records link to both IMPReSS (discussed below) and NED, provided the record contains spatial coordinates.

### **2.3. IMPReSS**

IMPReSS (shown in Fig. 1) is a graphical interface to astronomical observing logs that presents the user with plane-of-the-sky outlines of pointed observations obtained by space-based telescopes. It searches for NASA missions that have observed within a user-selected region of the sky and time period. Once the user selects the missions they are interested in, IMPReSS displays the color-coded aperture footprints (the fields-of-view, or FOV) on the sky, overlaying multiple observations where necessary. IMPReSS also displays an observing-log-type list of all observations which have met the criteria, and will deliver the user directly to the location of observational data offered by the appropriate archival data center.

IMPReSS uses Perl for the CGI and IDL for observation data searching and display. Observation logs for HST-PC, -WFC, & -WFPC-2, EUVE, IUE, and all available missions from HEASARC are all stored in a simple IDL database that is kept active in an IDL server mode. This enables a search through potentially millions of observations in just seconds. Links to the data are provided through the standard archive access methods offered by each data center.

Taken together, these tools offer a continuous sequence by which users can browse and visualize a catalog and acquire specific data products of interest from the distributed data archives. They can be tremendously useful both in choosing multi-wavelength data for further analysis and in judging what astronomical objects warrant further observation at particular wavelengths.

### 3. Interoperability

Interoperability with other astronomical data centers and resources figures heavily in the functionality of the suite of tools described here.

The ADC External Query (AEQ) allows a user to access Viewer output through single HTTP GET requests. It uses all the same input and calculation routines of the Viewer, and simply outputs delimited ASCII metadata and data in a predetermined format easily parsed by machine, avoiding all the interactivity of a typical Viewer session. AEQ is intended for institutional access, in which output may be customized or better integrated into other software interfaces. Specific details about the interface and the required metadata formats (which differ for every catalog) are needed to use this interface, and may be acquired through the ADC.

CatsEye, while presently able to plot only Viewer output, uses a simple standardized input table, and we intend to allow external file upload from users in the future, where they can provide a correctly formatted table and produce scatterplots of their own data over the web with ease. CatsEye also provides links to NED for any objects selected when clicking a point on the plot (provided coordinates are available in the table).

IMPreSS offers direct access to the data holdings of various distributed archives centers, and periodically automatically updates any modified observation logs.

IMPreSS and the Viewer are included in the GLU database used by Astrobrowse, allowing automatic acquisition by Astrobrowse agents of the required metadata and query format. IMPReSS, a tool that accepts positional queries, is automatically accessed during any Astrobrowse request.

### 4. Referenced Web Sites

ADC: <http://adc.gsfc.nasa.gov/>

Viewer: <http://tarantella.gsfc.nasa.gov/viewer/>

CatsEye: [http://tarantella.gsfc.nasa.gov/catseye/cat\\_frames.pl](http://tarantella.gsfc.nasa.gov/catseye/cat_frames.pl)

IMPreSS: <http://tarantella.gsfc.nasa.gov/impress/>

AEQ: <http://tarantella.gsfc.nasa.gov/viewer/AEQDoc.html>

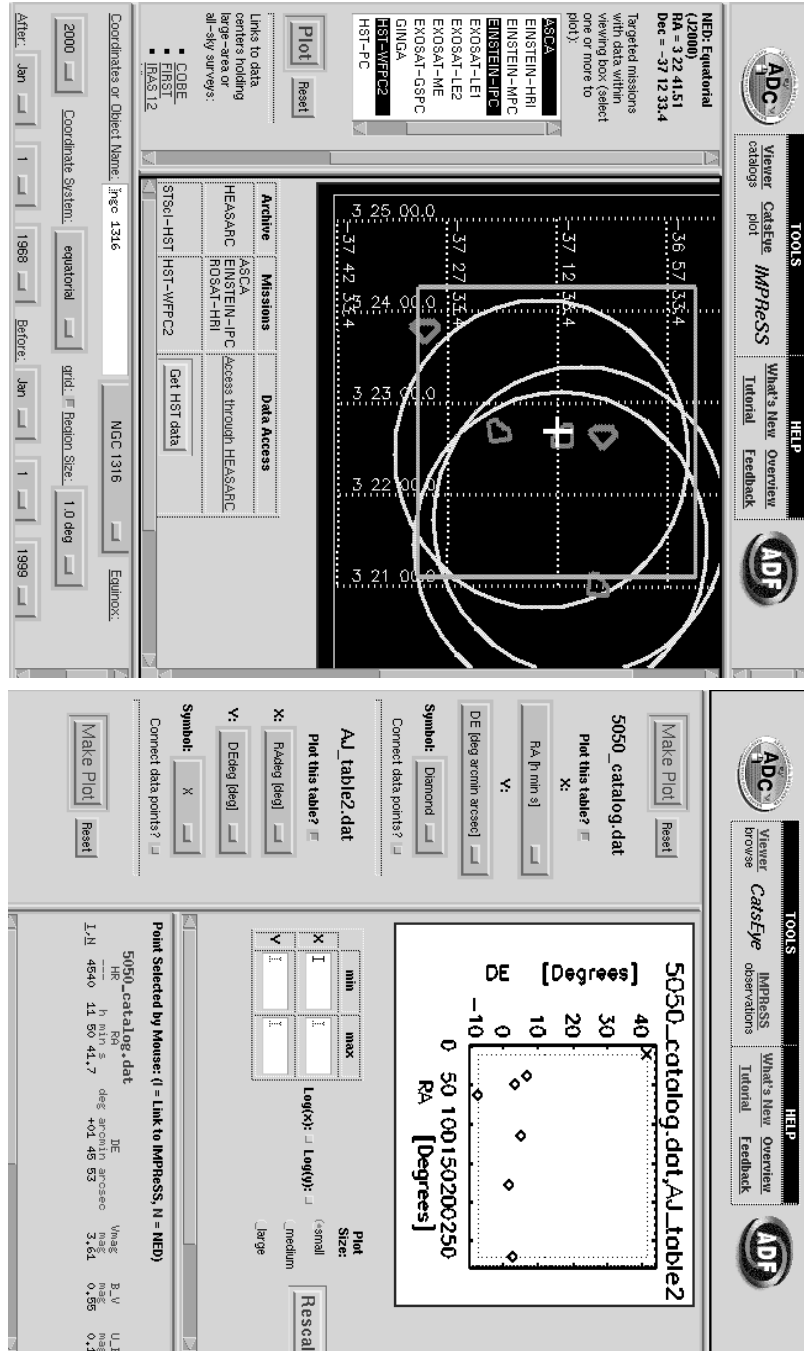


Figure 1. CatsEye (*bottom*) and IMPReSS (*top*) examples. In CatsEye, fields to plot are chosen on the left, the plot is displayed at upper right, and the catalog records of clicked points at bottom right. In IMPReSS, the sky region is chosen at bottom, the available missions at upper left, and the requested sky map and links to archived data at upper right.