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New NED XML/VOtable Services and Client Interface Applications

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Abstract.
The NASA/IPAC Extragalactic Database (NED) provides data and cross-identifications for over 7 million extragalactic objects fused from thousands of survey catalogs and journal articles. The data cover all frequencies from radio through gamma rays and include positions, redshifts, photometry and spectral energy distributions (SEDs), sizes, and images. NED services have traditionally supplied data in HTML format for connections from Web browsers, and a custom ASCII data structure for connections by remote computer programs written in the C programming language. We describe new services that provide responses from NED queries in XML documents compliant with the international virtual observatory VOtable protocol. The XML/VOtable services support cone searches, all-sky searches based on object attributes (survey names, cross-IDs, redshifts, flux densities), and requests for detailed object data. Initial services have been inserted into the NVO registry, and others will follow soon. The first client application is a Style Sheet specification for rendering NED VOtable query results in Web browsers that support XML. The second prototype application is a Java applet that allows users to compare multiple SEDs. The new XML/VOtable output mode will also simplify the integration of data from NED into visualization and analysis packages, software agents, and other virtual observatory applications. We show an example SED from NED plotted using VOPlot.
The NED website is: `http://nedwww.ipac.caltech.edu`.

1. Goals

- To simplify access to NED data from client computer programs.
- Follow NVO protocols by providing the output in XML VOTable format
- Simplify the integration of data from NED into visualization and analysis packages, software agents, and other virtual observatory applications.

2. Example Query

NED queries can be performed from the NED Object Search form, which can be found off the NED front page: click on "Objects" and then "By Name". A sample query is as follows for position 142.2167 10.80306 EQ and radius of 0.1 degrees: `http://nedwww.ipac.caltech.edu/cgi-bin/nph-NEDobjsearch`. A sample output VOTable document tree is shown in Figure 1. This NED resource

Figure 1. Document Tree

has been validated using the cone search validator at `http:/nvo.ncsa.uiuc.edu/VO/services/csvalidate.html`.

3. Query Results

Presentation of NED SED results for radio galaxy 3C 279 is displayed by the VOTable Style Sheet available through DataScope[1]. Figure 2 shows 3C 279 within DataScope. The VOTable output from Figure 2 from NED is plotted using VOPlot in Figure 3.

NED data in VOTable format can also be converted to a simple ASCII file as comma separated values (CSV).

[1] `http:/skyview.gsfc.nasa.gov/cgi-bin/tam/vot/datascope/init.pl`

The NASA/IPAC Extragalactic Database

VOTable for resource NED_search_photo_data near 187.706,12.391

See also:

Metadata -- Registry information describing service.
Raw VOTable -- Cached information at DataScope server.
-- http://skyview.gsfc.nasa.gov/tempspace/vot/187.706000_12.391000_.25/NED_search_photo_data_1.xml
VOPlot -- Plot data with VOPlot
VOStat -- Analyze data with VOStat
Directly invoke service again -- XML result will not be cached.

Resource: Results from query to NASA/IPAC Extragalactic Database (NED).

Info Elements (for all tables in this resource)	
Info. Key	**Info Value**
QUERY_STATUS	OK

PhotometricData for 3C 279 Published and Homogenized [Frequency, Flux Density] Units

count	bandpass	PHOT_measurement	PHOT_uncertainty	units	frequency	NED_PHOT_measurement	NED_PHOT_uncertainty	NED_PHOT_units	refcode
ID_NUMBER	VOX:BandPass_ID	PHOT	PHOT_UNCERTAINTY	PHOT_UNITS	FREQUENCY	NED_PHOT_MEASUREMENT	NED_PHOT_UNCERTAINTY	NED_PHOT_UNITS	REFER_BIBCODE
1	EGRET 4-10 GeV	1.8E-11	+/-1.2E-11	Jy	1.48E+24	1.80E-11	+/-1.20E-11	Jy	1996ApJ...461..698H
2	EGRET 2-4 GeV	9.6E-11	+/-2.5E-11	Jy	6.70E+23	9.60E-11	+/-2.50E-11	Jy	1996ApJ...461..698H
3	EGRET (0.1-5 GeV)	2.3103E-10	+/-8.3300E-12	Jy	6.17E+23	2.31E-10	+/-8.33E-12	Jy	1995ApJS..101..259T
4	EGRET 1-2 GeV	1.08E-10	+/-0.25E-10	Jy	3.35E+23	1.08E-10	+/-2.50E-11	Jy	1996ApJ...461..698H
5	EGRET 0.5-1 GeV	3.1E-10	+/-0.4E-10	Jy	1.67E+23	3.10E-10	+/-4.00E-11	Jy	1996ApJ...461..698H
6	EGRET 300-500 MeV	5.6E-10	+/-0.6E-10	Jy	9.25E+22	5.60E-10	+/-6.00E-11	Jy	1996ApJ...461..698H
7	EGRET 150-300 MeV	7.9E-10	+/-0.7E-10	Jy	5.02E+22	7.90E-10	+/-7.00E-11	Jy	1996ApJ...461..698H
8	EGRET 100-150 MeV	1.19E-9	+/-0.13E-9	Jy	2.94E+22	1.19E-09	+/-1.30E-10	Jy	1996ApJ...461..698H

Figure 2. Radio Galaxy 3C 279 DataScope

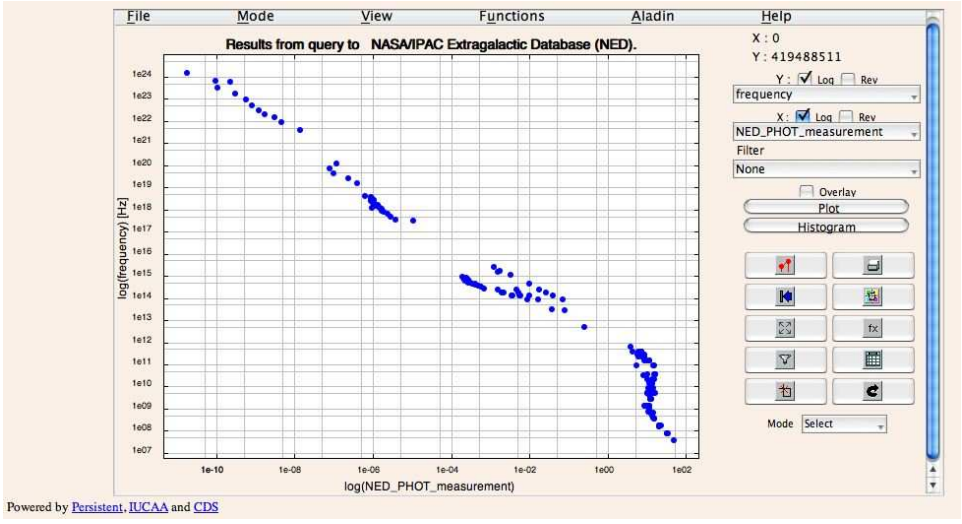

Figure 3. VOPlot of Radio Galaxy 3C 279 using VOTable results

4. NED Images

50,000 FITS compliant NED images can now be queried by position and areal coverage using the NVO Simple Image Access Protocol (SIAP). Access to these images can be found through the web-based http portal and through the NVO SIAP services. The front page is displayed in Figure 4. FITS image search results can be downloaded to disk or sent to On-line Science Information System (OASIS - The Infrared Science Archive's data visualization tool) for viewing.

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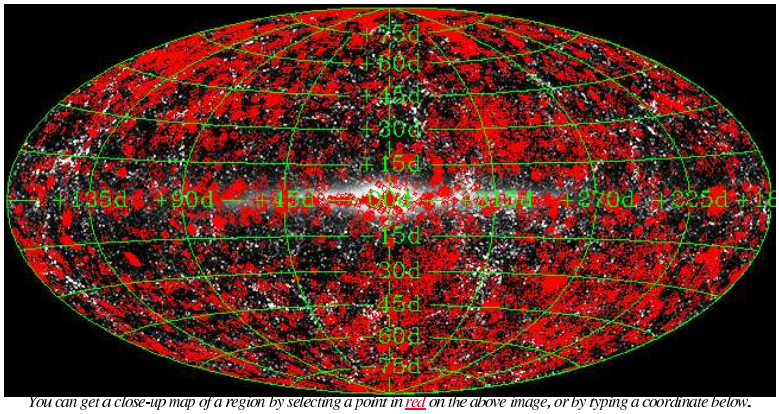
NASA/IPAC EXTRAGALACTIC DATABASE

Help | NED Home
| NED Help | IRSA Home

NED Image Data Atlas



You can get a close-up map of a region by selecting a point in red on the above image, or by typing a coordinate below.

The NASA/IPAC Extragalactic Database (NED) is built around a master list of extragalactic objects for which cross identifications of object names and positions are established using data published in journal articles and survey catalogs covering all wavelengths. Detailed photometry, positions, and redshift data are assimilated, entered with uncertainties when available, and linked to bibliographic references, abstracts and online literature. NED also maintains an image archive that currently contains over 1.9 million images, maps and links to external images. NED's image archive focuses on unique FITS images acquired from authors of journal articles, but also includes cut-outs from very large sky surveys such as 2MASS and the Digitized Sky Survey. NED currently contains data for over 7.5 million objects, and the content is continually being updated. Revised versions of the public database are released every few months.

Images in NED are represented above as overlays in red on the 2MASS all-sky image above. Either type in a coordinate or click on any red region to get a close-up of the area; the size of the search region is adjustable. Please note that the above all-sky grid is in Galactic coordinates, however, the default coordinate search is done using Equatorial J2000, unless specified otherwise within the coordinate input string. This service is a collaborative project between the NED group and the Infrared Science Archive (IRSA) group at the Infrared Processsing and Analysis Center (IPAC).

Searching for NED images is done using **Atlas**. Click here for more information and instructions on using Atlas

Coordinate/Object:

Size (deg): [maximum 12.5] 2.0 Images must cover coordinate

Submit Reset

Coordinate Examples: 10.68469 +41.26904 eq | 00h 42m 44.33s +41d 16m 08.5s Equ J2000 | 121.17432

Figure 4. Front page to search NED images using position and areal coverage. The same service can also be used through the NVO, using SIAP.