VizieR photometry output

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Introduction

Data access URL

User interface : http://vizier.u-strasbg.fr/vizier/sed/

Service (VOTable) : http://vizier.u-strasbg.fr/viz-bin/sed?-c=.....

Calendar :

- Nov,2009 : beginning of the development (F.Ochsenbein)
- 2010 : note Photometry DM serialization on VOTable(sebastien Derriere)
- 2011 : first version online (VOTable output)
- 2013 : the VizieR photometry widget

What is the photometry VizieR output ?

Understanding photometry in VizieR

- Photometry computed arround a position from different catalogues
- Primarily built to provide an homogeneous photometry output from VizieR tables.
- Consists in finding information that enables to compute photometry in homogenized unit(Jy)
  - get filter+system when described in the literature

    OR
  - assign a similar filter picked from a reference filter+system list
    ex : catalogue *2016ApJ...819...53W*
    *(*Literature) Michigan/Magellan (M2FS) system → (VizieR) SLOAN system

Photometry is **not the SED of an object** but the photometry of observations taken in a small area (default radius ~5arcsec)

Photometry meta-data assigned **can't be taken as provenance** !

Metadata

The VizieR reference filters/system table

Filters+systems are gathered into Metadata tables (METAfitlers) which contain the needed information :

- Identification
- flux (Fmag),
- effective wavelength(λ), effective width (dλ)
- magnitude type (AB or Vega)

photid	fltrid	famid	ucdid	system	filter	lambda0 um	dlambda um	freq0 GHz	dfreq GHz	Fmag0 Jy	voname
280	1	0	929	Gemini/NIRI	Y	1.021	0.0944	2.936e+05	2.714e+04	2.082e+03	Gemini/NIRI.Y-G0241w
280	2	0	929	Gemini/NIRI	J	1.246	0.1578	2.406e+05	3.048e+04	1.555e+03	Gemini/NIRI.J-G0202w
280	3	0	928	Gemini/NIRI	H	1.633	0.2813	1.836e+05	3.163e+04	1.029e+03	Gemini/NIRI.H-G0203w
280	4	0	928	Gemini/NIRI	H-K	1.771	0.5751	1.693e+05	5.498e+04	8.341e+02	Gemini/NIRI.HKnotch-G0236w
280	5	0	927	Gemini/NIRI	K	2.2	0.3142	1.363e+05	1.946e+04	6.400e+02	Gemini/NIRI.K-G0204w
280	6	0	927	Gemini/NIRI	Ks	2.153	0.2948	1.393e+05	1.907e+04	6.650e+02	Gemini/NIRI.Kshort-G0205w
280	7	0	927	Gemini/NIRI	K'	2.106	0.3305	1.423e+05	2.233e+04	6.889e+02	Gemini/NIRI.Kprime-G0206w
280	8	0	926	Gemini/NIRI	L'	3.732	0.6836	8.033e+04	1.471e+04	2.481e+02	Gemini/NIRI.Lprime-G0207w
280	9	0	925	Gemini/NIRI	M'	4.667	0.2402	6.424e+04	3307	1.657e+02	Gemini/NIRI.Mprime-G0208w
280	10	0	929	Gemini/NIRI	Jc-1.065	1.071	0.0064	2.798e+05	1671	1.962e+03	Gemini/NIRI.Jcont1065-G0239
280	11	0	929	Gemini/NIRI	HeI	1.089	0.0174	2.752e+05	4395	1.803e+03	Gemini/NIRI.HeI-G0234w
280	12	0	929	Gemini/NIRI	PaG	1.1	0.0169	2.726e+05	4188	1.787e+03	Gemini/NIRI.PaGamma-G0240w
280	13	0	929	Gemini/NIRI	Jc-1.207	1.204	0.0185	2.491e+05	3828	1.664e+03	Gemini/NIRI.Jcont1207-G0232w

Today :

- Photometry available for 3,445 catalogues
- 2,525 filters available in a reference table (METAfilter)
- 387 different filters used

Metadata & serialization

Simple serialization of structured metadata

IVOA note : *"Providing Photometric Data Measurements Description in VOTables" (S.Derriere)*

Datamodel resulting of the VizieR METAdata, mapped on VOTable
→ The VOTable schema is based on group, UCD and Utypes

URL http://vizier.u-strasbg.fr/viz-bin/sed?-c=*position*&-c.rs=*radius*

```
<RESOURCE ID="VizieR_S529590828" name="VizieR(2016-10-12T12:33:48)">
   ....
  <TABLE ID="VizieR_0" name="allVizieR">
    ....
   <GROUP ID="gsed" name="_sed" ucd="phot" utype="spec:PhotometryPoint">
     <FIELDref ref="sed_freq" utype="photdm:PhotometryFilter.SpectralAxis.Coverage.Location.Value"/>
     <FIELDref ref="sed_flux" utype="spec:PhotometryPoint"/>
     <FIELDref ref="sed_eflux" utype="spec:PhotometryPointError"/>
     <FIELDref ref="sed_filter" utype="photdm:PhotometryFilter.identifier"/>
   </GROUP>
   <FIELD name="_RAJ2000" ucd="pos.eq.ra" ref="J2000" datatype="double" unit="deg" ... />
   <FIELD name="_DEJ2000" ucd="pos.eq.dec" ref="J2000" datatype="double"  unit="deg" ... />
   <FIELD name="_tabname" ucd="meta.table" datatype="char" .../>
   <FIELD name="_ID" ucd="meta.id" datatype="char".../>.
   <FIELD ID="sed_freq" name="_sed_freq" ucd="em.freq" unit="GHz" datatype="double" … />
   <FIELD ID="sed_flux" name="_sed_flux" ucd="phot.flux.density" unit="Jy" datatype="float"  … />
   <FIELD ID="sed_eflux" name="_sed_eflux" ucd="stat.error;phot.flux.density" unit="Jy" datatype="float"  …/>
   <FIELD ID="sed_filter" name="_sed_filter" ucd="meta.id;instr.filter" datatype="char"  …/>
   <DATA/>
```

Metadata & DataModel

Comparison with SpectralDM

18 fields are mandatory in Spectral DM gatered into the class :

- Curation : Spectrum.Curation ✗
- Identification : Spectrum.DataID ✓
- Target object : Spectrum.Target ✗
- Characterization : Spectrum.Char ✗
- Flux and spectral : Spectrum.Data ✓

Note :

- METAdata Curation are easy to assign
- Target object could be assign as FIELD but not as PARAM (i.e. VizieR photometry definition)
- Characterization metadata aren't available in VizieR (Arches or Ned return empty values)

Metadata assignments

Integration into the VizieR pipeline

Photometry is completeley integrated in the VizieR pipeline
→ Done by CDS documentalists & supervised by astronomers

Documentalists search the instrument, system & filters in the article. The presence of the filter origin depends on the paper (in section (2) for ApJ journals)

Assignment processing

- A partial automatized detection which uses the columns descriptions
  → results in UCD1 assignment and column text description
- Monochromatic point assignment :
  Automatized Flux column detection when unit is Jy and frequency is known.
  → ex : photoSystem:filterName :=1.4Ghz (radio)
- this is also possible to assign manually a filter or to skip an automatized detection

In all cases, documentalists used the reference table.

Metadata assignments

Example of known-filter detection : *catalogue 2016ApJ...822...49J*

THE ASTROPHYSICAL JOURNAL AAS IOP

STAR FORMATION IN W3—AFGL 333: YOUNG STELLAR CONTENT, PROPERTIES, AND ROLES OF EXTERNAL FEEDBACK

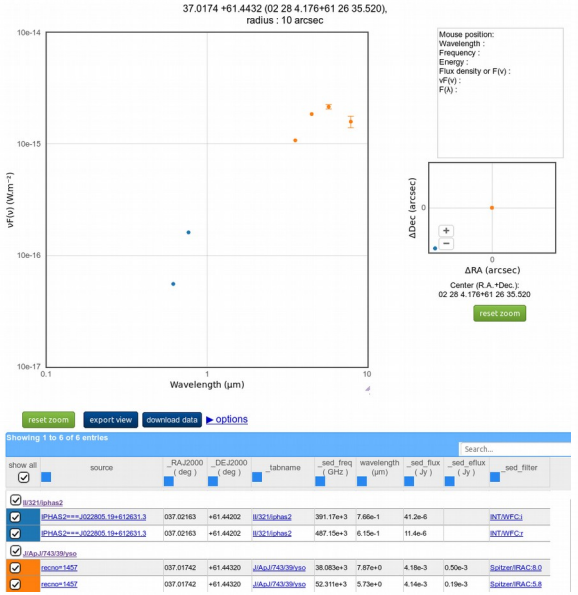
2. OBSERVATIONS AND POINT SOURCE CATALOGS

2.1. NEWFIRM NIR Imaging and Photometry

We obtained NIR observations of AFGL 333 in JHK_s bands using the National Optical Astronomical Observatory (NOAO) Extremely Wide Field InfraRed Imager (NEWFIRM; Probst et al. 2004) camera on the 4 m Mayal telescope at Kitt Peak National Observatory (KPNO) on 2009 December 6. The NEWFIRM camera contains 4 InSb 2048 × 2048 pixel arrays arranged in a 2 × 2 pattern with a

Byte-by-byte Description of file: table3.dat

Bytes	Format	Units	Label	Explanations
1- 7	F7.4	deg	RAdeg	Right Ascension in decimal degrees (J2000)
9- 16	F8.4	deg	DEdeg	Declination in decimal degrees (J2000)
18- 22	F5.2	mag	Jmag	[6.1/21.5]? The NOAO/NEWFIRM J band magnitude
24- 28	F5.2	mag	Hmag	[5.3/20]? The NOAO/NEWFIRM H band magnitude
30- 34	F5.2	mag	Ksmag	[5.1/18]? The NOAO/NEWFIRM K_s band magnitude
36- 40	F5.2	mag	3.6mag	[3.7/17.6]? Spitzer/IRAC 3.6um band magnitude
42- 46	F5.2	mag	4.5mag	[3.9/17.1]? Spitzer/IRAC 4.5um band magnitude
48- 52	F5.2	mag	5.8mag	[3.6/14.8]? Spitzer/IRAC 5.8um band magnitude
54- 58	F5.2	mag	8.0mag	[4.6/14]? Spitzer/IRAC 8.0um band magnitude
60- 63	F4.2	mag	24mag	[1/9.4]? Spitzer/MIPS 24um band magnitude
65- 69	A5	---	---	[class]
70- 83	A14	---	Class	Classification (99 sources "I", 713 class "II", and 8908 "III/field star")



Metadata assignments

Example of known-filter assignment : *catalogue 2015AJ....150..176C*

THE ASTRONOMICAL JOURNAL

WIDE FIELD NEAR-INFRARED PHOTOMETRY OF 12 GALACTIC GLOBULAR CLUSTERS: OBSERVATIONS VERSUS MODELS ON THE RED GIANT BRANCH

Roger E. Cohen[1], Maren Hempel[2], Francesco Mauro[3], Douglas Geisler[1], Javier Alonso-Garcia[3,4], and Karen Kinemuchi[5]

Published 2015 November 17 •

2. OBSERVATIONAL DATA

2.1. Observations and Pre-processing

Observations of our 12 target clusters were obtained with the Infrared Side Port Imager (ISPI) mounted on the 4 m Blanco telescope at Cerro Tololo Inter-American Observatory. The HAWAII-2 2048 × 2048 pixel detector has 0.″305 pixel^{-1}, giving a field of view 10.25 arcmin per side. Imaging

astrometric rms (<0.″2), isolated (lacking neighbors within 4 mag inside a 2.″5 radius, corresponding to a contaminating flux of <2.5%) and be bright enough to remain unaffected by crowding in 2MASS (see below). To calculate transformations from the instrumental magnitudes in our PSF catalogs to the 2MASS photometric system, we employed classical linear transformation equations of the form $m - M = a + b(J - K_S)$, where m and M denote instrumental and standard magnitudes respectively. We solve for the coefficients a and b using least squares fitting, but employing weighting factors to downweight discrepant data points in lieu of a sigma clip[8] (Mauro et

The filter given is not used in VizieR.
The article stipulates a transformation into 2MASS system

Byte-by-byte Description of file: table3.dat

Bytes	Format	Units	Label	Explanations
1- 3	A3	---	---	[NGC]
5- 8	I4	---	NGC	NGC number of cluster
10- 19	F10.6	deg	RAdeg	Right Ascension in decimal degrees (J2000)
21- 30	F10.6	deg	DEdeg	Declination in decimal degrees (J2000)
32- 38	F7.4	mag	Jmag	The J band magnitude in 2MASS photometric system
40- 45	F6.4	mag	e_Jmag	The 1σ uncertainty in Jmag
47- 53	F7.4	mag	Ksmag	The Ks band magnitude in 2MASS photometric system
55- 60	F6.4	mag	e_Ksmag	The 1σ uncertainty in Ksmag

Metadata assignments

Example of similar assignment : *catalogue 2016ApJ...819...53W*

THE ASTROPHYSICAL JOURNAL

MAGELLAN/M2FS SPECTROSCOPY OF TUCANA 2 AND GRUS 1*

Matthew G. Walker[1], Mario Mateo[2], Edward W. Olszewski[3], Sergey Koposov[4], Vasily Belokurov[4], Prashin Jethwa[4], David L. Nidever[2,5], Vincent Bonnivard[6], John I. Bailey III[2], Eric F. Bell[2] Show full author list

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The Astrophysical Journal, Volume 819, Number 1

2. OBSERVATIONS AND DATA REDUCTION

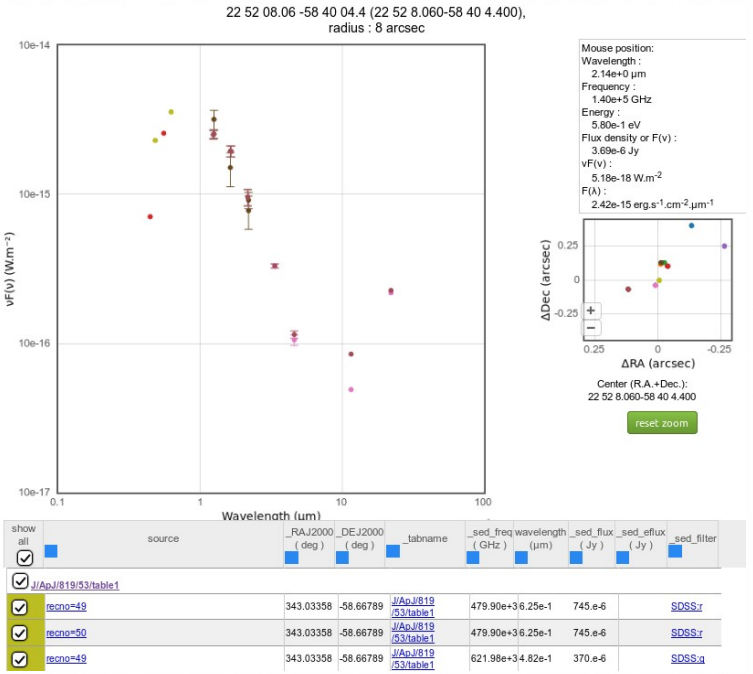
We observed Tuc 2 and Gru 1 with the Michigan/*Magellan* Fiber System (M2FS; Mateo et al. 2012) at the 6.5 m *Magellan*/Clay telescope at Las Campanas Observatory, Chile, on the nights of July 17 (Tuc 2) and July 18 (Gru 1) 2015. We obtained repeat observations of the Tuc 2 field on 2015

The filter is not in the reference table.
→ choose SLOAN:g and SLOAN:r

Byte-by-byte Description of file: table1.dat

Bytes	Format	Units	Label	Explanations
1- 4	A4	---	Gal	Dwarf galaxy ("Gru1" or "Tuc2")
5	A1	---	---	[-]
6- 8	I03	---	Seq	[1/137] Target Identifier (1)
10- 11	I2	h	RAh	[22] Hour of Right Ascension (J2000)
13- 14	I2	min	RAm	[50/58] Minute of Right Ascension (J2000)
16- 20	F5.2	s	RAs	Second of Right Ascension (J2000)
22	A1	---	DE-	[-] Sign of the Declination (J2000)
23- 24	I2	deg	DEd	[49/58] Degree of Declination (J2000)
26- 27	I2	arcmin	DEm	Arcminute of Declination (J2000)
29- 32	F4.1	arcsec	DEs	Arcsecond of Declination (J2000)
34- 38	F5.2	mag	gmag	[17/22.5] g band AB magnitude (1)
40- 44	F5.2	mag	rmag	[15.8/22.3] r band AB magnitude (1)
46- 53	F8.3	d	HJD	Heliocentric Julian date; HJD-2450000

Filter choosen doesn't appear in the column description



Photometry statistics

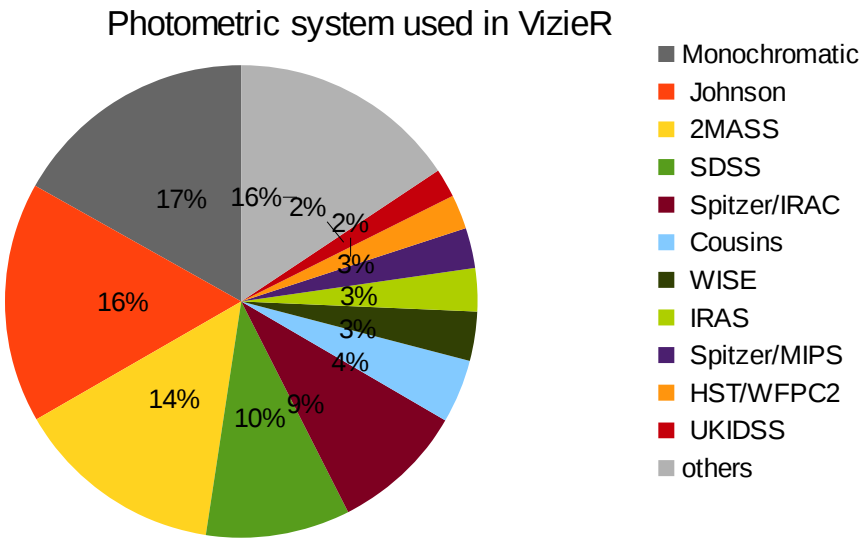
Service (VOTable) :
http://vizier.u-strasbg.fr/viz-bin/sed?-c=.....

Statistics usage

~ 740 queries per days

~90 % queries coming from Aladin

Top 10 of the filters the most used in VizieR



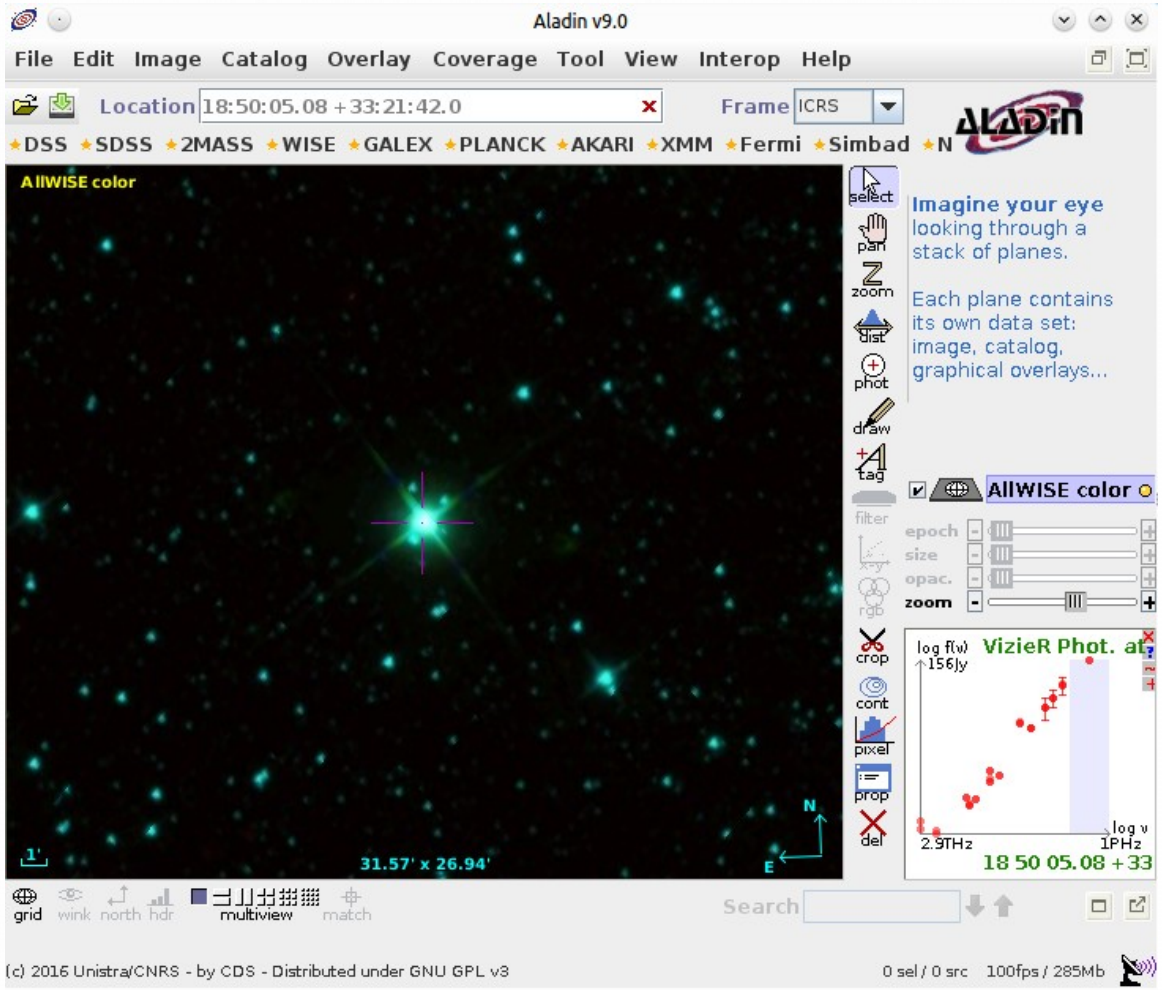
Monochromatic	2831
Johnson	2760
2MASS	2398
SDSS	1656
Spitzer/IRAC	1532
Cousins	731
WISE	564
IRAS	497
Spitzer/MIPS	461
HST/WFPC2	396
UKIDSS	329
others	2629

Photometry viewer

VizieR photometry viewer

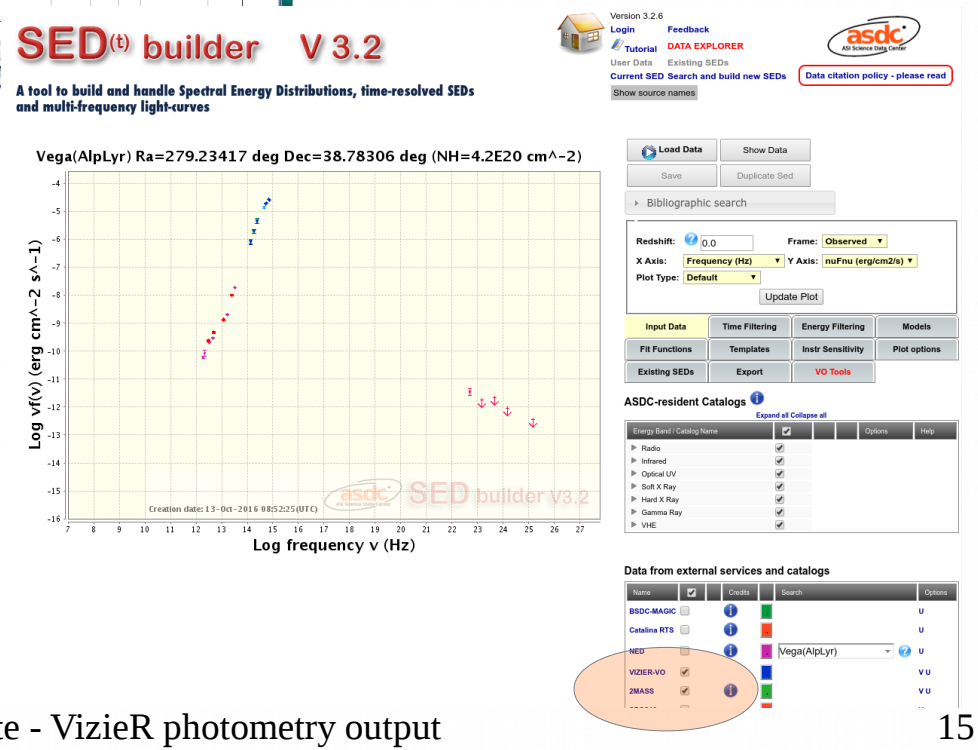
Photometry output

Aladin photometry viewer



Photometry output

Iris



ASDC photometry viewer

http://tools.asdc.asi.it/SED/

Photometry output

Conclusion

- A service used, ready for science (some citations in ADS)
- A simple VOTable output, adapted for VizieR
- An important work done by documenatlist