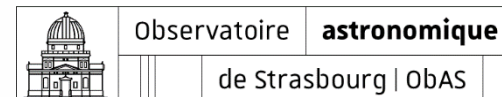




Does Aladin require DM?

Interop meeting – 13-17 May 2019

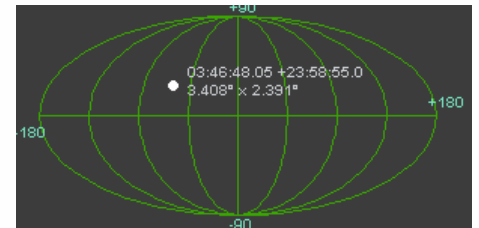
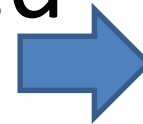
Pierre Fernique



□ The key data in catalogs for Aladin

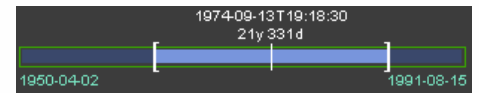
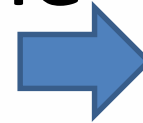
1. Aladin is Space oriented

=> it requires **RA,DEC**



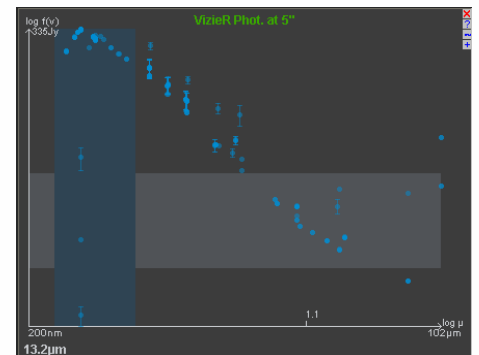
2. It also manipulates Time

=> it required **JD**



3. It may display SED

=> it requires **Flux & frequency**



□ Other key data

- Aladin must also recognize:
 - **Links** associated to a row or to a column value
 - **FoV** associated to a row

RA DE JD Link Link FoV Link Link

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓

RAJ2000	DEJ2000	OBSERVATIO...	id	access	FoV	DATASET	PREVIEW	INSTRUME	OPT_ELE	DETECTO
217.27611	-62.72529	2000-05-08...	u67fb204r_drz	Display	FoV	Full metainfo	Preview	WFPC2	F450W	WFC
217.27611	-62.72529	2000-05-08...	u67fb205r_drz	Display	FoV	Full metainfo	Preview	WFPC2	F450W	WFC
217.27611	-62.72529	2000-05-08...	u67fb206r_drz	Display	FoV	Full metainfo	Preview	WFPC2	F450W	WFC
217.27394	-62.72373	2000-05-09...	u67fb304r_drz	Display	FoV	Full metainfo	Preview	WFPC2	F450W	WFC
217.27394	-62.72373	2000-05-09...	u67fb305r_drz	Display	FoV	Full metainfo	Preview	WFPC2	F450W	WFC
217.27394	-62.72373	2000-05-09...	u67fb306r_drz	Display	FoV	Full metainfo	Preview	WFPC2	F450W	WFC

□ Position & Time

Aladin uses **COOSYS** and now **TIMESYS** to find associated columns

```

Catalog information
http://vizier.u-strasbg.fr/viz-bin/votable?-source=I%2F259%2Ftyc2&-c=03+46+58.9
VOTable format
.Table I/259/tyc2
-assuming Time column 17 (proba=90.0%)
-assuming RADEC in degrees column 1 for RA and 2 for DEC
-Proper motion fields found column 11 for PMRA and 12 for PMDEC
  [RA=0 (proba=100.0%) DE=1 (proba=100.0%) PMRA=10 (proba=90.0%) PMDEC=11 (
-Coordinate system references found:
  ID="J2000" => eq_FK5 Eq=J2000
  => RA/DEC coordinate conversion not required: ref="J2000" => FK5(J2000.0)
-No time system reference found... TCB/BARYCENTER
-found CSV DATA (field sep=Tab record sep=\n)
-Found 3 lines CVS header with dash separator
-Ref time system: format=YEARS unit=yr timescale=TCB reposition=BARYCENTER
  
```

CDS/I/259/tyc2

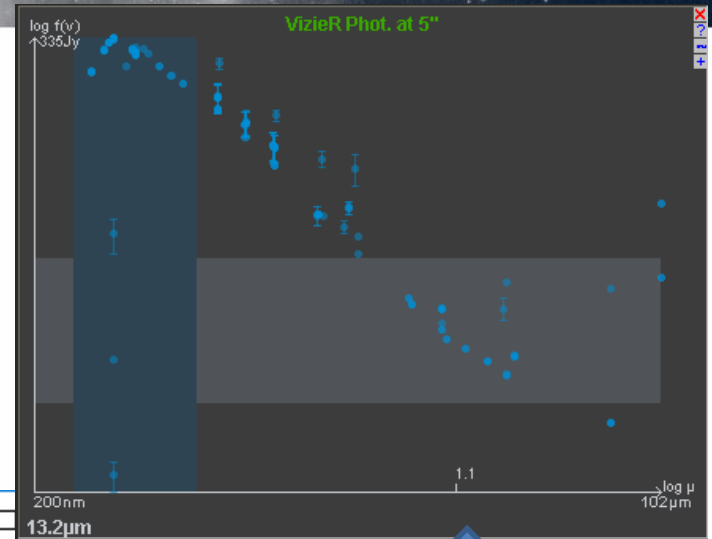
	Visible	Coo	Name	Description		
1	<input type="checkbox"/>	RA	RAJ2000	Right ascension (FK5, B...		
2	<input type="checkbox"/>	DE	DEJ2000	Dedination (FK5, Equin...		
3	<input checked="" type="checkbox"/>		_r	Distance from center (...		
4	<input checked="" type="checkbox"/>		recno	Record number assigne...		
5	<input checked="" type="checkbox"/>		TYC1	[1,9537]? += TYC1 from...		
6	<input checked="" type="checkbox"/>		TYC2	[1,12121] TYC2 from TYC or GSC (1)	short	meta.id.part;meta....
7	<input checked="" type="checkbox"/>		TYC3	[1,3] TYC3 from TYC (1)	unsignedByte	meta.id.part;meta....
8	<input checked="" type="checkbox"/>		pflag	[PX] mean position flag (2)	char	meta.code
9	<input checked="" type="checkbox"/>		RAmdeg	[]? Mean Right Asc, ICRS, epoch=J...	deg	double pos.eq.ra
10	<input checked="" type="checkbox"/>		DEmdeg	[]? Mean Dec, ICRS, at epoch=J20...	deg	double pos.eq.dec
11	<input checked="" type="checkbox"/>	PMRA	pmRA	[-4418.0,6544.2]? prop. mot. in RA...	mas/yr	float pos.pm;pos.eq.ra
12	<input checked="" type="checkbox"/>	PMDE	pmDE	[-5774.3,10277.3]? prop. mot. in Dec	mas/yr	float pos.pm;pos.eq.dec
13	<input checked="" type="checkbox"/>		e_Rmdeg	[3,183]? s.e. RA*cos(dec),at mean ...	mas	short stat.error
14	<input checked="" type="checkbox"/>		e_DEmdeg	[1,184]? s.e. of Dec at mean epoch ...	mas	short stat.error
15	<input checked="" type="checkbox"/>		_pmRA	[0.2,11.5]? s.e. prop mot in RA*cos...	mas/yr	float stat.error
16	<input checked="" type="checkbox"/>		_pmDE	[0.2,10.3]? s.e. of proper motion in ...	mas/yr	float stat.error
17	<input checked="" type="checkbox"/>	YEARS	EpRAm	[1915.95,1992.53]? mean epoch of ...	yr	float time.epoch
18	<input checked="" type="checkbox"/>		EpDEm	[1911.94,1992.01]? mean epoch of ...	yr	float time.epoch
19	<input checked="" type="checkbox"/>		Num	[2.36]? Number of positions used [N...	short	meta.id

Otherwise, it uses **heuristic rules** based:

- Column name
- UCD
- Unit
- Utype
- Relative position of the column

Flux & Frequency

- Aladin recognizes SED VOTable by GROUP and utype
=> based on [IVOA note 2011](#) – « *Providing Photometric Data measurements Description in VOTables* »



Catalog information

VOTable format
.Table allVizieR
-SED system found:
.frequency col #41
.flux col #51
.fluxError col #61
.SEDid col #71
-assuming RADEC in degrees column 1 for RA and 2 for DEC
[RA=0 (proba=90.0%) DF=1 (proba=90.1%) PMRA=-1 (proba=0.0%) PMDEC=-1 (proba=0.0%)
-Coordinate system refer
ID="J2000" => eq_FK5
ID="B1900" => eq_FK4
=> RA/DEC coordinate

_RAJ2000	_DEJ2000	_tabname	_ID	_sed_freq	_sed_f... Δ	_sed_e...	_sed_filter
56.871154	24.105136	I/270/cp...	recno=5863	2940.6	7.27		IRAS:100
56.871054	24.104888	II/338/c...	recno=29644	2940.6	7.27		IRAS:100
56.871152	24.105136	J/AZh/88...	recno=20	59601	10.5		Johnson:M
56.871153	24.105136	II/346/j...	recno=51016	59601	13.7		Johnson:M
56.87088	24.105289	I/342/f3	recno=8523277	674900	14.4	3.9	Johnson:B
56.871	24.1054	V/114/ns	recno=9798	68918	16.1	1.5	MSX:B2

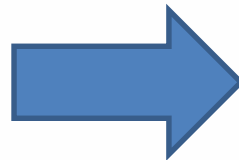
Blue arrows point from the 'frequency' and 'flux' columns in the VOTable format section to the corresponding columns in the table above. A large blue arrow points from the table to the SED plot in the top right.

□ The good and the bad

- **It works !**
- For Pos & Time, it does the job even with **FITS, CSV, IPAC, ASCII sexttractor**, ... tables
- **Unit** is required, and **UCD** helps a lot
- It may have ambiguities :
 - Multiple instances without MAIN UCD
 - PMRA is already multiplied or not by $\cos(d)$?
- Limitations:
 - **Ref** COOSYS, TIMESYS mechanism should be **multiple**
 - Requires **xxxSYS** (ex: do we need ENERGYSYS ?)
 - **Links** and **FoV** are badly supported (no IVOA consensus, standard inconsistencies)
=> except in OBSxxx or EPNxxx (thanks to utypes and/or name convention)

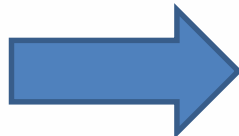
□ Concretely Aladin requires...

Dedicated
GROUP/flagging
method



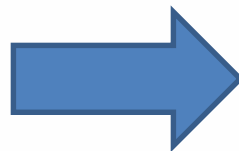
```
<xxxSYS ID=n attribut=... />  
<FIELD ref=n ...>  
<FIELD ref=n ...>
```

Alternate
GROUP/flagging
method



```
<GROUP *type>  
  <FIELDref ref=n1>  
  <FIELDref ref=n2>  
</GROUP>  
<FIELD ID=n1>  
<FIELD ID=n2>
```

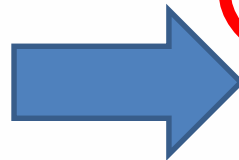
Basic flagging
method



```
<FIELD *type...>
```

□ Where is the DM ?

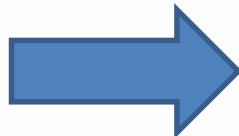
Dedicated
GROUP/flagging
method



```
<xxxSYS ID=n attribute=... />  
<FIELD ref=n ...>  
<FIELD ref=n ...>
```

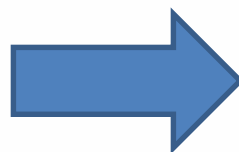


Alternate
GROUP/flagging
method



```
<GROUP *type>  
  <FIELDref ref=n1>  
  <FIELDref ref=n2>  
</GROUP>  
<FIELD ID=n1>  
<FIELD ID=n2>
```

Basic flagging
method



```
<FIELD *type...>
```


□ Does Aladin require DM?



What does it mean ?

- **DMs serialized** in the data: **no**.
- **DMs as reference documents** describing some data meaning and logic : **yes**, obviously
- A way to recognize and possibly to group some columns based on the knowledge in the DMs documents: **yes definitively !**

□ VOTable ok ! And FITS ?

- TOPcat solution is perfect
(dedicated HDU for the VOTable header)
- Already supported by Aladin beta

=> should be standardized by IVOA ?

=> Just described in VOTable 1.5 ?