

# Photometry data in the VO

## Photometry data in the VO

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# Motivation

- More photometry in the VO: great!
  - Building and plotting SED's.
  - Analyzing those SED's..
- Photometry usually in catalogues.
  - as magnitudes.
  - not so useful.
- Problems:
  - What those magnitudes mean?
  - How to convert them to fluxes?
  - How to compare them with spectra?

# Some use cases

- Properly characterization of photometric values (understanding them)
- Building a SED and plotting it
- Using synthetic photometry to prepare observations (exposure time...)
- Estimate physical properties of an object by comparing observed photometry to theoretical models.

# Motivation: VOSA

At the Spanish VO we have developed VOSA, a tool that

- Reads user photometry tables.
- Queries VO photometry catalogs to improve/complete the observed SED.
- Fits observed data with synthetic photometry derived from VO-compliant theoretical spectra and estimate physical parameters for the objects.
- etc
- Bayo et al, 2008 A&A 429,277B

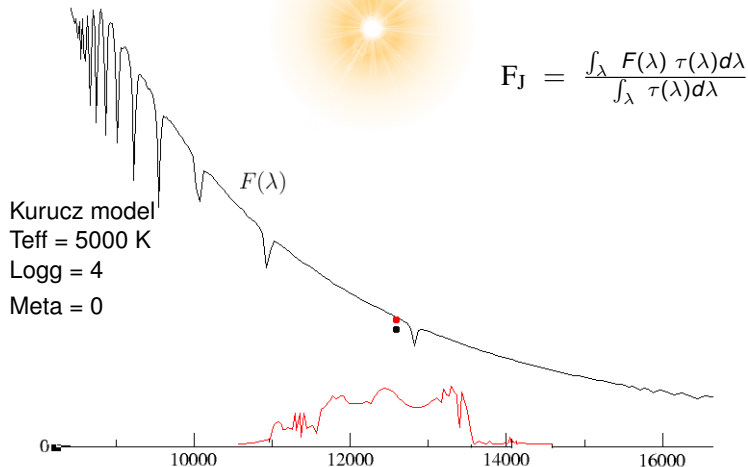
<http://svo.laeff.inta.es/theory/vosa>  
talk on theory session.

# What is needed

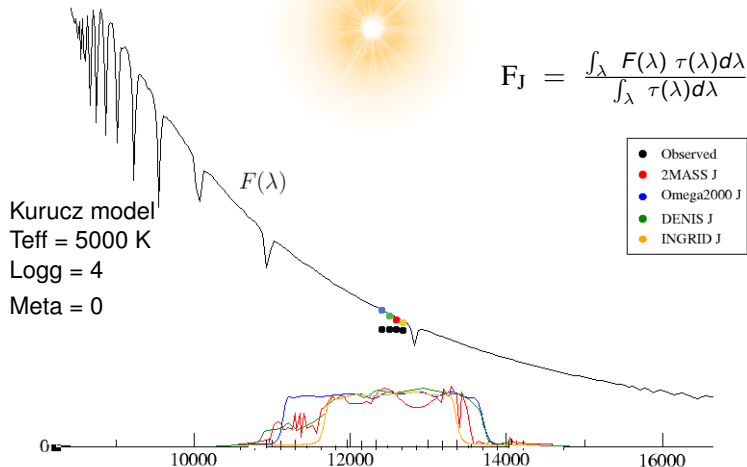
- To build a SED and, at least, plot it, we need
  - the magnitude
  - the zero point
  - a relevant  $\lambda$  ( $\lambda_{eff}, \lambda_{mean} \dots$ )
- To understand the value we need more info
  - instrument, facility...
  - filter width
- To be able to compare with spectra or theoretical models
  - filter transmission curve

(observed photometry must not be compared to spectra but to synthetic photometry!)

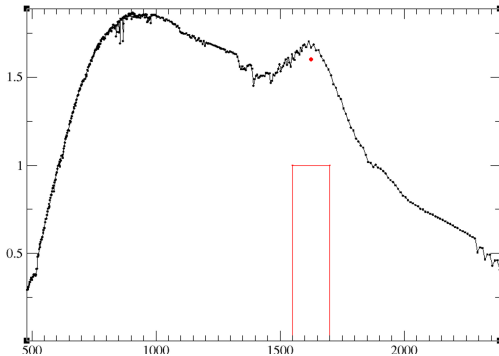
# Synthetic photometry



# Synthetic photometry



# Synthetic photometry



In some cases good fit does not mean that the photometric point is on the spectrum

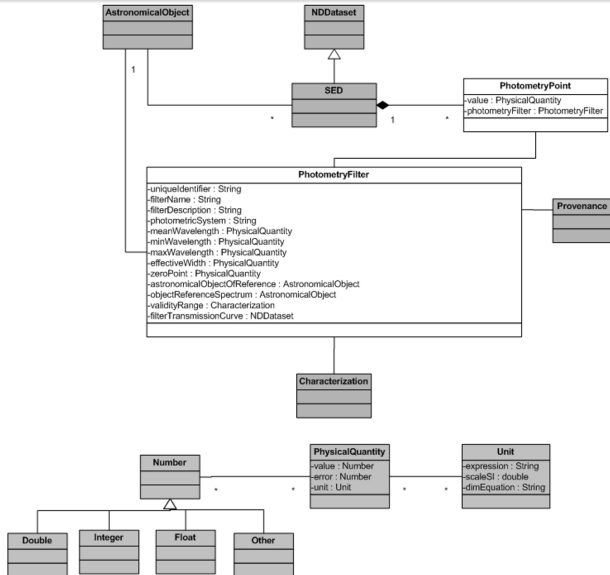


# What is needed

An observed magnitude should be given together with

- all the relevant information needed to understand it.
  - Filter name
  - Zero point
  - Relevant  $\lambda$  ( $\lambda_{\text{eff}}$ ,  $\lambda_{\text{mean}}$ ,  $\lambda_0$ , ...)
  - Filter transmission curve
  - Filter width (effective width, FWHM...)
  - ...
- or: a way to obtain that information.
  - **A Unique filter ID so that all the information can be obtained somewhere else.**
- or: a combination of both

# Photometry/Filter Data model



# Activities (SVO+ESAVO)

- 5 SSAP services for photometry
  - 4 TSAP for synthetic photometry for different models
  - 1 pure SSAP for IUE photometry
  - Registered in EuroVO registry (SVO)
  - VOSpec (ESAVO)) adapted to consume these services
- Filter Profile Service
  - Client implemented by ESAVO and integrated in VOSpec
- 1 ConeSearch service for IUE photometry

# Activities

- S3 service to fit observed photometry with theoretical data.
  - Used by VOSA
  - inputs: observed photometry + model param ranges
  - Best fit model
  - Physical parameters

# SSAP IUE photometry

```

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<PARAM name="Contact" utype="ssa:Curation.Contact" datatype="char" arraysize="" value="Enrique Solano"/>
<PARAM name="Email" utype="ssa:Curation.ContactEmail" datatype="char" arraysize="" value="esm@laeff.inta.es"/>
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```

# SSAP synthetic photometry

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  <PARAM name="Email" utype="ssa:Curation.ContactEmail" datatype="char" arraysize="" value="esm@laeff.inta.es"/>
  <PARAM name="SpectralAxisName" utype="ssa:Char.SpectralAxis.name" datatype="char" arraysize="" value="wavelength"/>
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# IUE photometry ConeSearch

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# IUE photometry ConeSearch

```

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```



# Filter profile service

```

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  <INFO name="QUERY STATUS" value="OK"/>
  -<RESOURCE type="results">
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</VOTABLE>

```

Find: nobel Previous Next Highlight all Match case Reached end of page, continued from top

# Filter Profile Service



## Filter Database Interface

An experiment about filter standardization in the VO framework



VO Service Browse Search New Filter

Autob sva.laeff LogOut

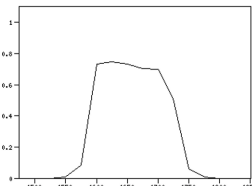
Groups	CAHA	FilterId	$\lambda_{\text{mean}}$	$\lambda_{\text{eff}}$	$\lambda_{\text{min}}$	$\lambda_{\text{max}}$	$\Delta_{\text{eff}}$	$F_0$ (Jy)	Ph.System	Facility	Instrument	Short. Descrip	
ZMASS	BUSCA	CAHA/BUSCA.b	4058.3	4550	4775	107.2	4235.1	Stromgren	CAHA	BUSCA	BUSCA b	edit	
CAHA	Omega2000	CAHA/BUSCA.u	3571.7		3200	3900	190.4	1398.5	Stromgren	CAHA	BUSCA	BUSCA u	edit
CFHT		CAHA/BUSCA.v	4123.5		3975	4275	115.1	4198.5	Stromgren	CAHA	BUSCA	BUSCA v	edit
DENIS		CAHA/BUSCA.y	5488.5		5275	5650	101.0	3608.8	Stromgren	CAHA	BUSCA	BUSCA y	edit

Generic:  
Hipparcos  
INT  
IRAS  
SLOAN  
Spitzer  
TYCHO  
WHT

### CAHA/BUSCA.b

Filter ID: CAHA/BUSCA.b  
 Phot.Sys.: Stromgren  
 Obs. facility: CAHA  
 Instrument: BUSCA  
 $\lambda_{\text{mean}}$ : 4058.2684934 Å  
 $\lambda_{\text{eff}}$ : 0 Å  
 $\lambda_{\text{min}}$ : 4550 Å  
 $\lambda_{\text{max}}$ : 4775 Å  
 $\Delta_{\text{eff}}$ : 107.242605556 Å  
 Zero point: 4235.14069518 Jy  
 Short descrip.: BUSCA b  
 Reference:

Transmission curve



# Filter Profile Service

Groups	CAHA	FilterId	$\lambda_{\text{mean}}$	$\lambda_{\text{eff}}$	$\lambda_{\text{min}}$	$\lambda_{\text{max}}$	$\Delta_{\text{eff}}$	$F_0$ (Jy)	Ph. System	Facility	Instrument	Short. Descrip.	
2MASS	BUSCA	CAHA/BUSCA.b	4658.3	4550	4775	107.2	4235.1	Stromgren	CAHA	BUSCA	BUSCA b	BUSCA b	edt
CAHA	Omega2000	CAHA/BUSCA.u	3571.7	3200	3900	190.4	1398.5	Stromgren	CAHA	BUSCA	BUSCA u	BUSCA u	edt
CFHT		CAHA/BUSCA.v	4123.5	3975	4275	115.1	4196.5	Stromgren	CAHA	BUSCA	BUSCA v	BUSCA v	edt
DENIS		CAHA/BUSCA.y	5488.5	5275	5650	101.0	3006.8	Stromgren	CAHA	BUSCA	BUSCA y	BUSCA y	edt

Generic:	
Hipparcos	
INT	
IRAS	
SLOAN	
Spitzer	
TYCHO	
WHT	

Filter ID:	<input type="text" value="CAHA/BUSCA.b"/>
Short descrip.:	<input type="text" value="BUSCA b"/>
Transmission curve:	<input type="text" value="Examiner..."/> (select a file)
Phot. Sys.:	<input type="text" value="Stromgren"/> (select a previously defined value or define a new one)
Obs. facility:	<input type="text" value="CAHA"/> (select a previously defined value or define a new one)
Instrument:	<input type="text" value="BUSCA"/> (select a previously defined value or define a new one)
$\lambda_{\text{mean}}$ :	<input type="text" value="4658.26846"/> (Angstrom) (let empty so that it is calculated from the transmission curve)
$\lambda_{\text{eff}}$ :	<input type="text" value="0"/> (Angstrom) (let empty so that it is calculated from the transmission curve and the Vega spectrum)
$\lambda_{\text{min}}$ :	<input type="text" value="4550"/> (Angstrom) (let empty so that it is calculated from the transmission curve)
$\lambda_{\text{max}}$ :	<input type="text" value="4775"/> (Angstrom) (let empty so that it is calculated from the transmission curve)
Width <sub>eff</sub> :	<input type="text" value="107.2426055"/> (Angstrom) (let empty so that it is calculated from the transmission curve)
Zen. point:	<input type="text" value="4235.140695"/> (Jy) (let empty so that it is calculated from the transmission curve and the Vega spectrum)
Valid from:	<input type="text" value="----"/> to <input type="text" value="----"/>
Version:	This is version <input type="text" value="---"/> of filter: <input type="text" value="---"/>
Based on:	<input type="text" value="Generic/Stromgren.b"/> standard filter
Reference URL:	<input type="text"/>
Reference Text:	<input type="text"/>
Description:	<input type="text"/>

# Conclusions

- Flexible approach.
- A lot of photometry can be integrated in the VO with little work
- Inputs from photometry providers are important (CDS, ESO...?)

THANK YOU!