SVO-tools for handling photometry

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ASOCIADO AL NASA ASTROBIOLOGY PROGRAM

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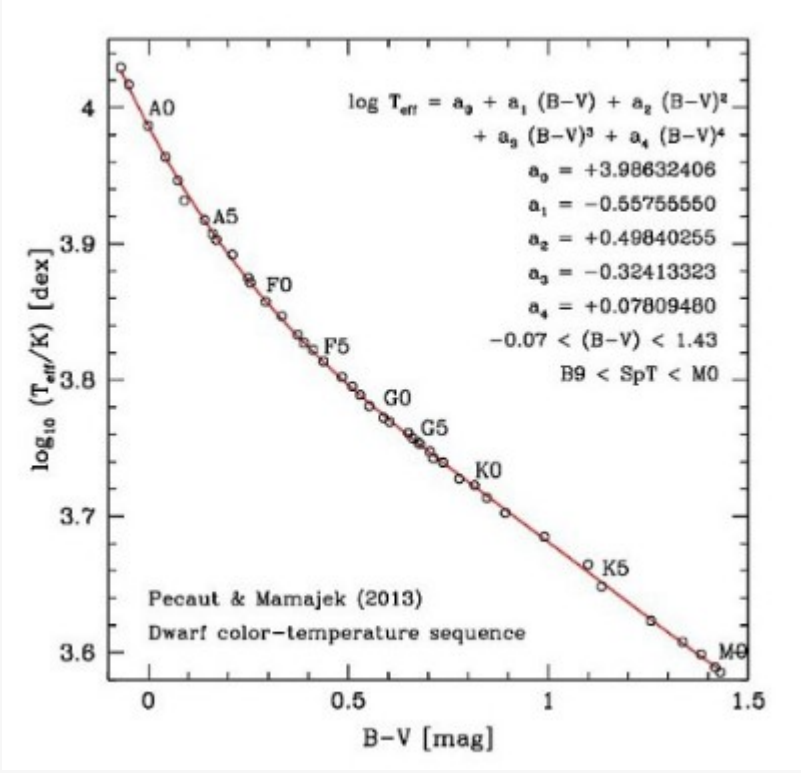
CSIC INTA

Some basics

- **Astronomical photometry** refers to measuring the apparent brightness of an astrophysical object.
- **A photometric system** can be defined as a set of filters at different wavelengths with a well-characterised response to the incident radiation.

A colour is related to the difference in brightness at two different wavelength.

By comparing information at different wavelengths using colours, it is possible to **estimate physical parameters.**

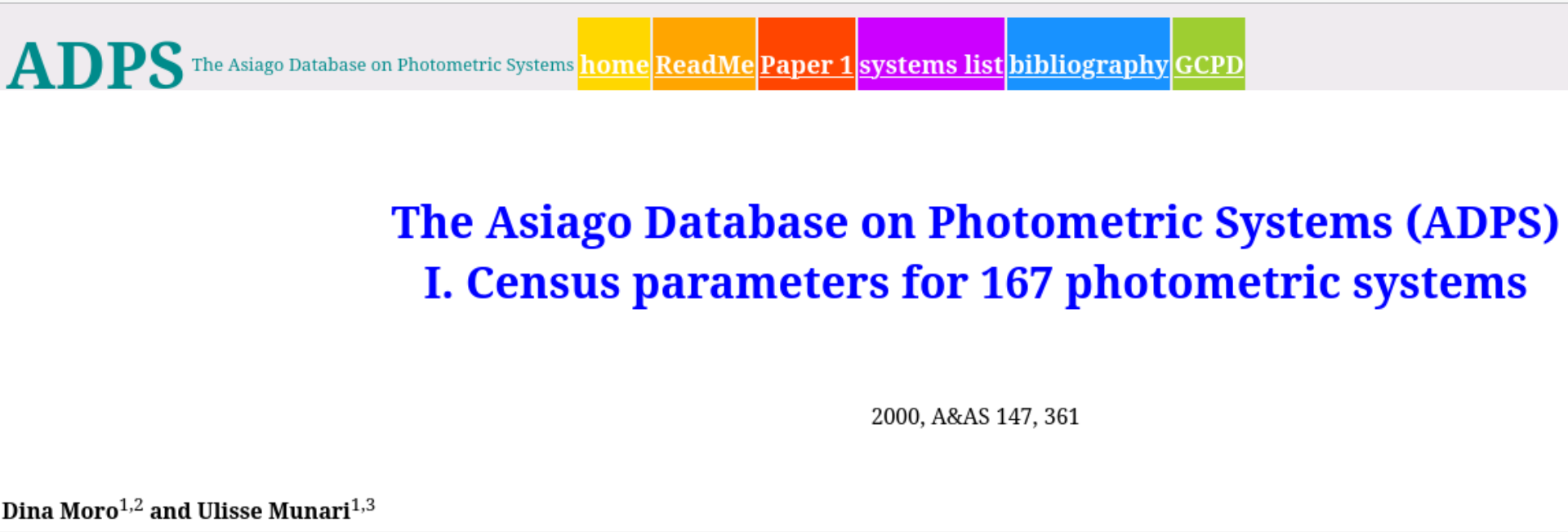


Some basics

- Since the beginning of the 21st century, large-area, multi-filter surveys have provided photometric information for millions of astronomical objects. → **photometric information for many objects in many filters**

Some basics

- **The first big compilation**



- **Problem:** The information provided by the different photometric systems was quite heterogeneous.

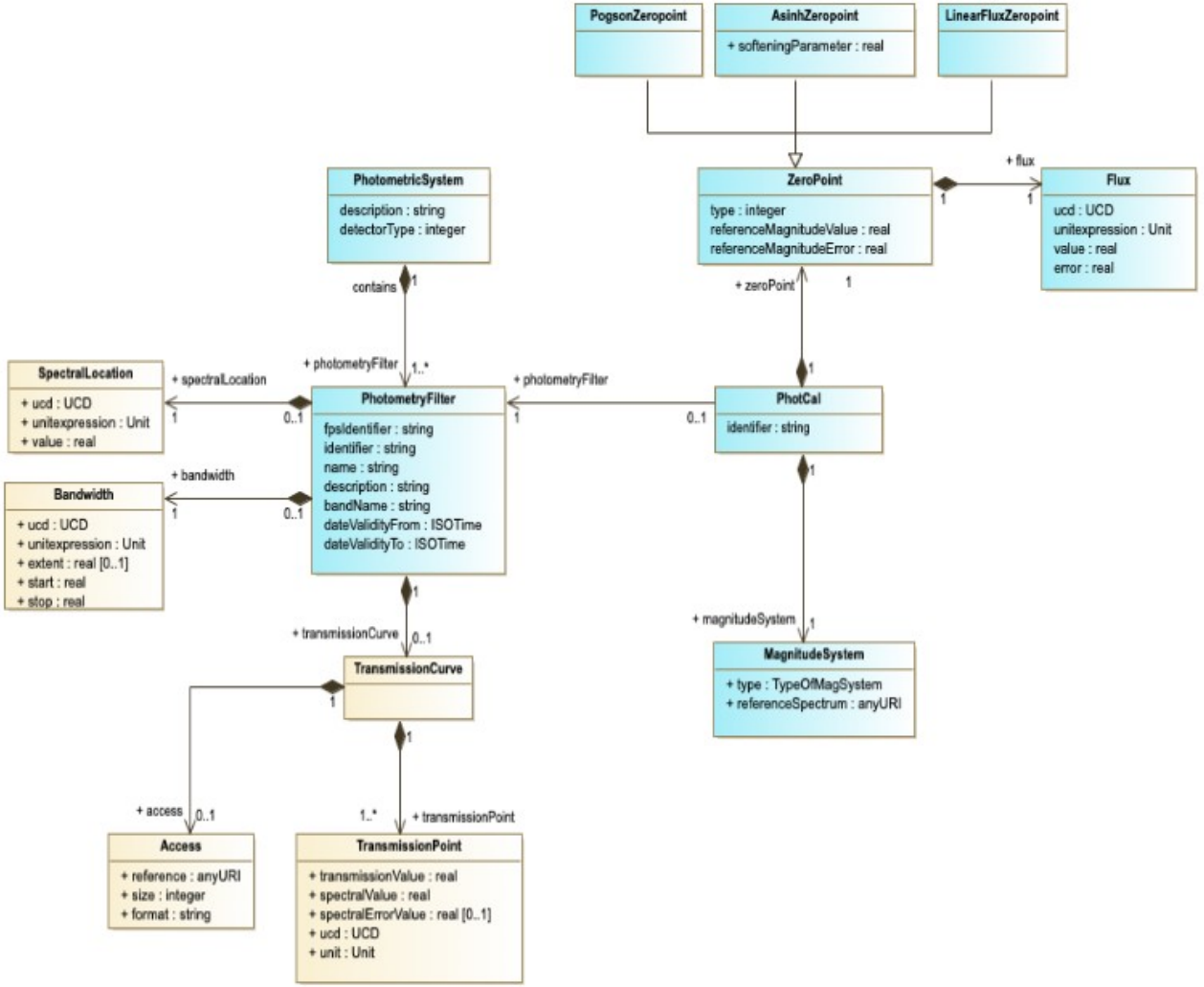
Some basics

International Virtual Observatory Alliance

IVOA Photometry Data Model

Version 1.1

IVOA Recommendation 2022-11-01



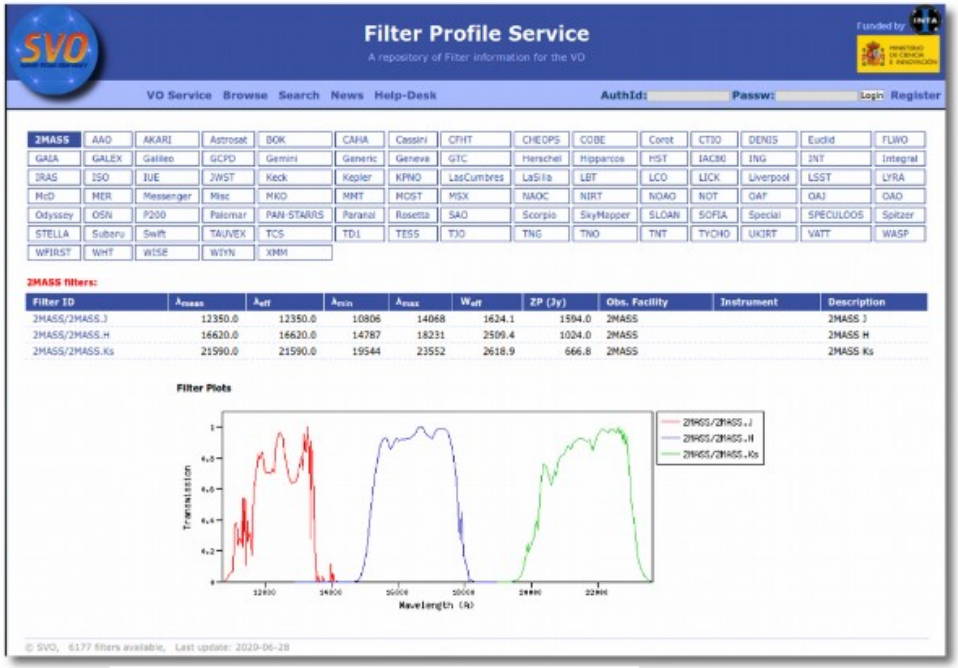
The SVO Filter Profile Service

- **In operation since 2008**

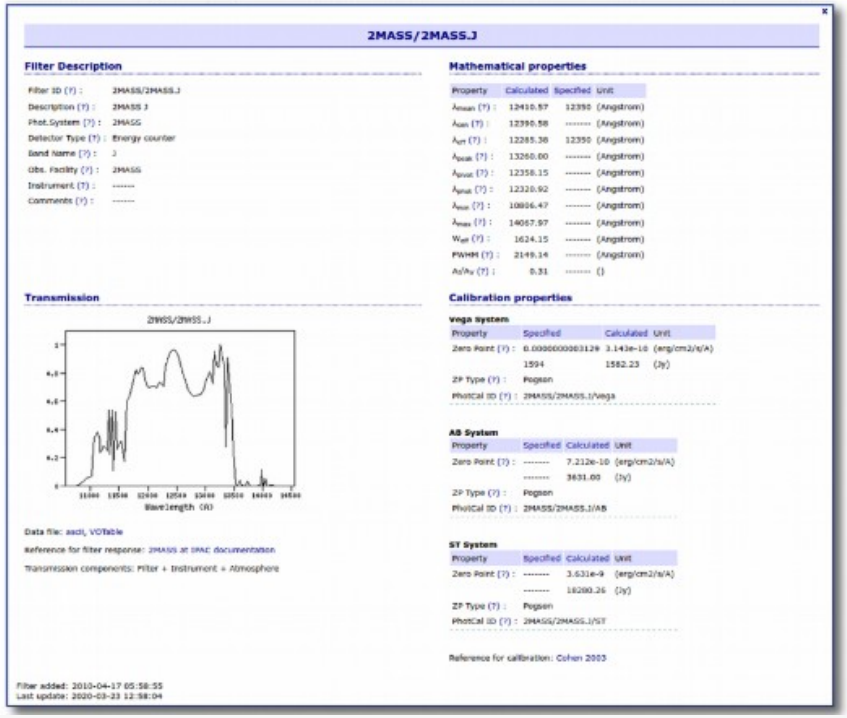
The SVO Filter Profile Service

Web access

http://svo2.cab.inta-csic.es/theory/fps/



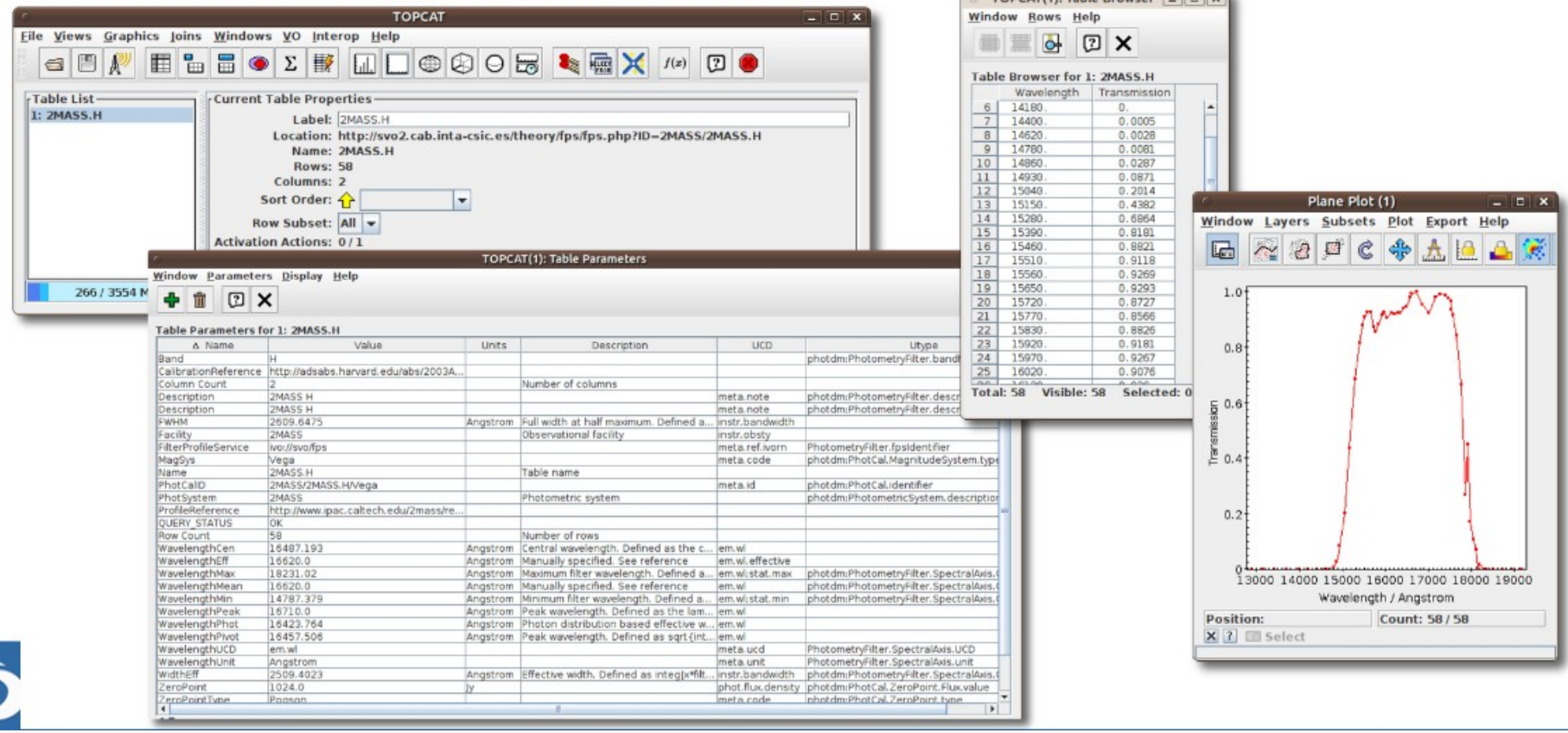
- Transmission curves,
- Mathematical properties,
- Reference wavelengths,
- Zero points, etc.



The SVO Filter Profile Service

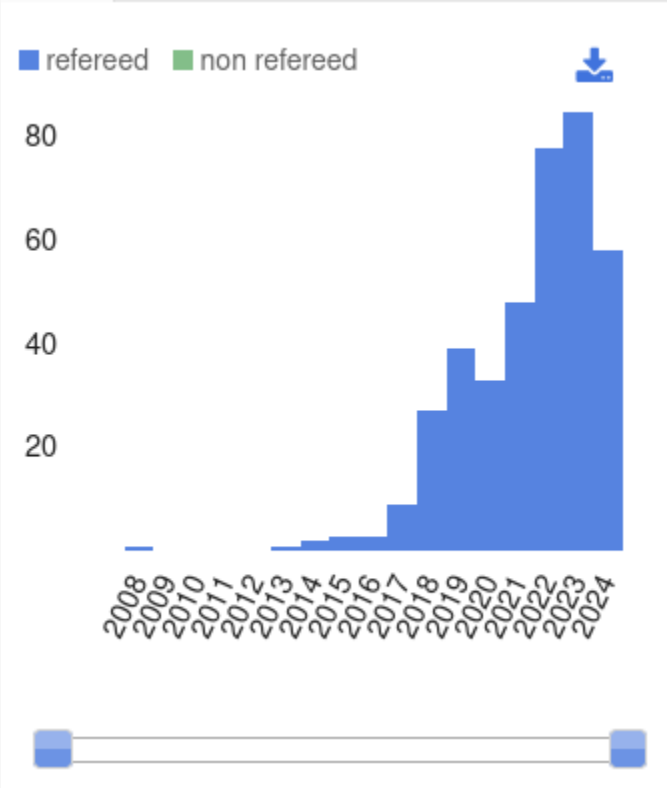
VO access

http://svo2.cab.inta-csic.es/theory/fps/fps.php?ID=2MASS/2MASS.H

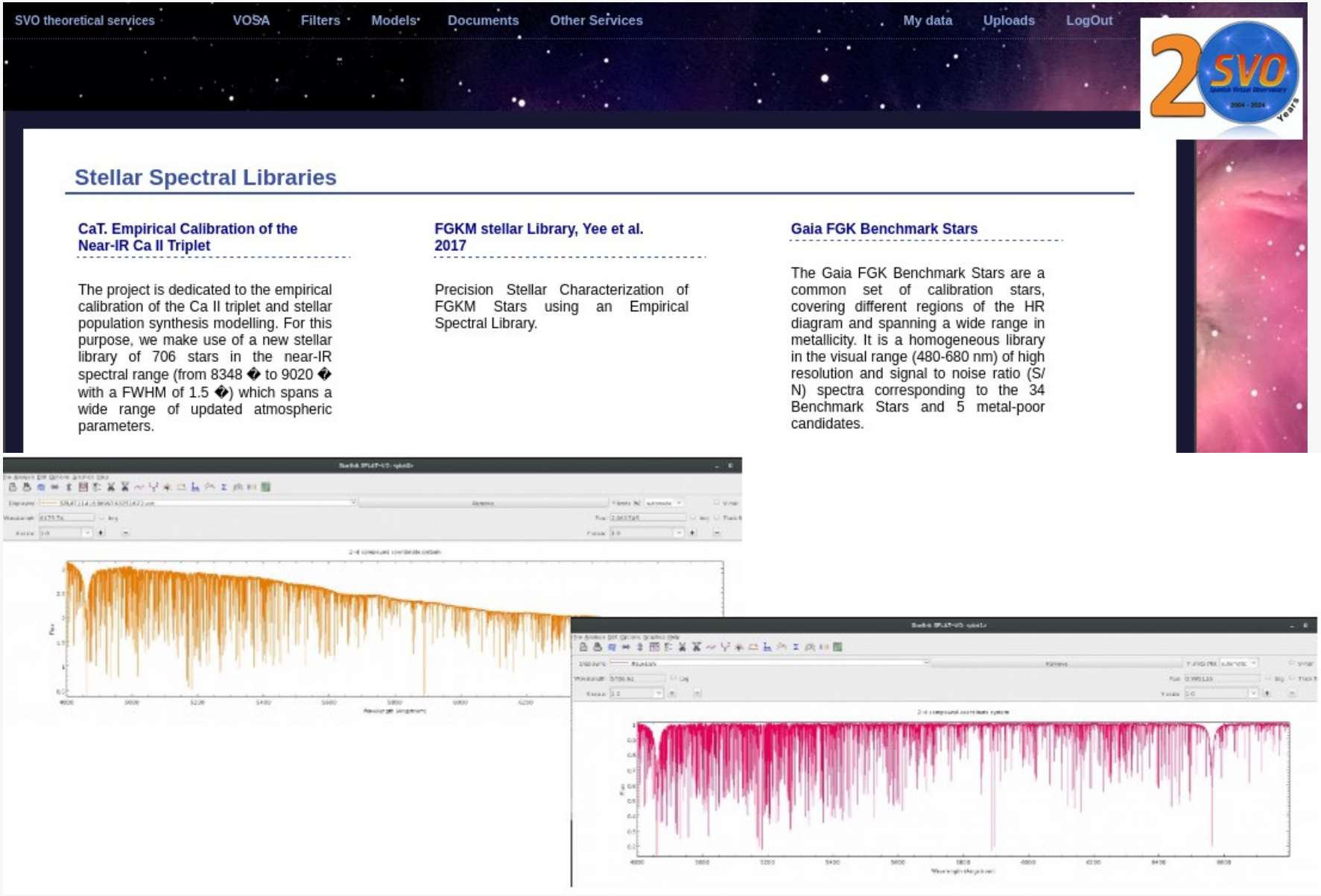


The SVO Filter Profile Service

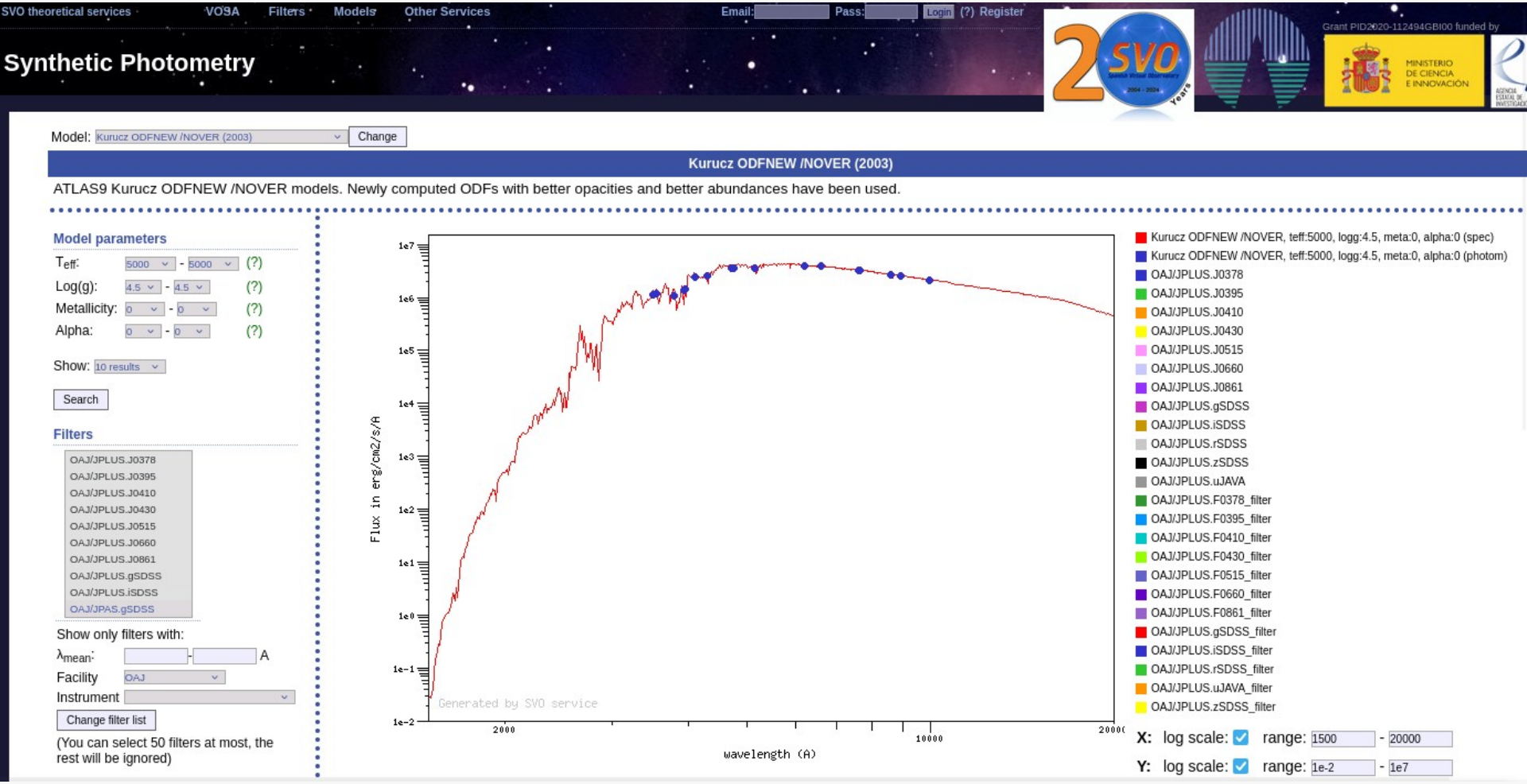
- FPS contains the largest public collection of filters available to the community.
  - Astronomy (7905)
  - Planetary science (616)
  - Earth Obs. (2452)



SVO applications making use of FPS



SVO applications making use of FPS



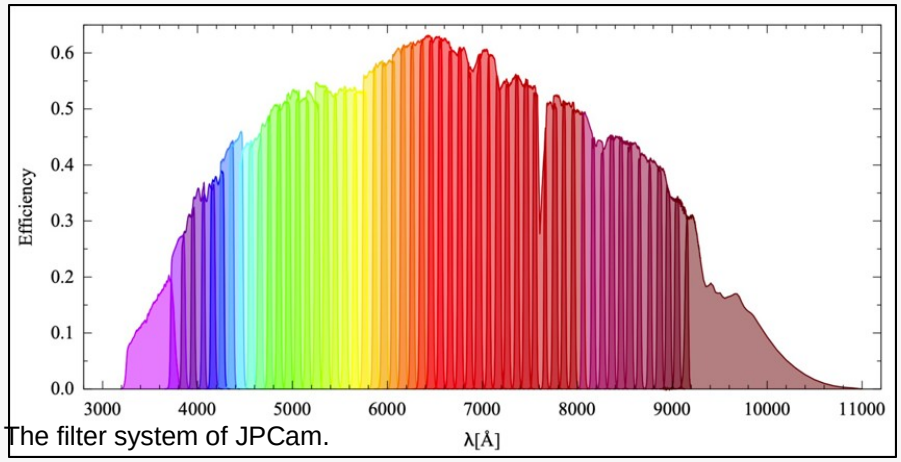
SVO applications making use of FPS

A&A, 689, A93 (2024)
https://doi.org/10.1051/0004-6361/202449998

Astronomy & Astrophysics

Photometric segregation of dwarf and giant FGK stars using the SVO Filter Profile Service and photometric tools

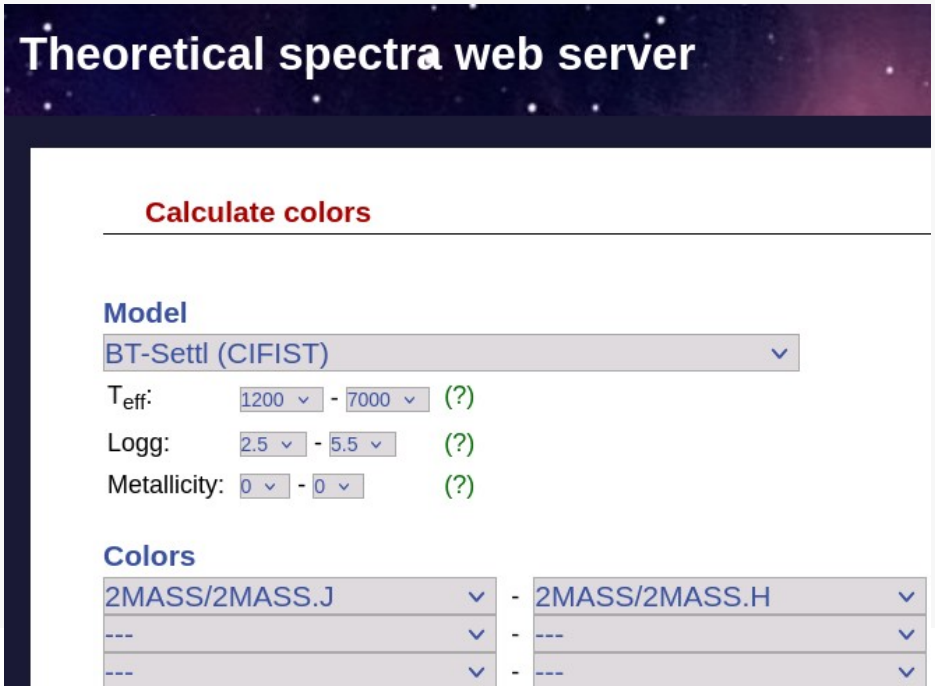
Carlos Rodrigo[1,⋆], Patricia Cruz[1], John F. Aguilar[2,3], Alba Aller[4], Enrique Solano[1], Maria Cruz Gálvez-Ortiz[1], Francisco Jiménez-Esteban[1], Pedro Mas-Buitrago[1], Amelia Bayo[5], Miriam Cortés-Contreras[6], Raquel Murillo-Ojeda[1], Silvia Bonoli[7,8], Javier Cenarro[8], Renato Dupke[9],



The filter system of JPCam.

< 50 filter → 15 filters → 105 colours → 5460 colour combinations.

SVO applications making use of FPS



Download VOTable

Download CSV

Direct URL for VOTable:
http://svo2.cab.inta-csic.es//theory/newov2/colors.php?model=bt-settl-cifist &color[1]=2MASS/2MASS.J,2MASS/2MASS.H &restri[teff]=1200/7000 &restri[logg]=2.5/5.5 &restri[meta]=0/0

Direct URL for CSV:
http://svo2.cab.inta-csic.es//theory/newov2/colors.php?model=bt-settl-cifist &color[1]=2MASS/2MASS.J,2MASS/2MASS.H &restri[teff]=1200/7000 &restri[logg]=2.5/5.5 &restri[meta]=0/0 &format=csv

SVO applications making use of FPS

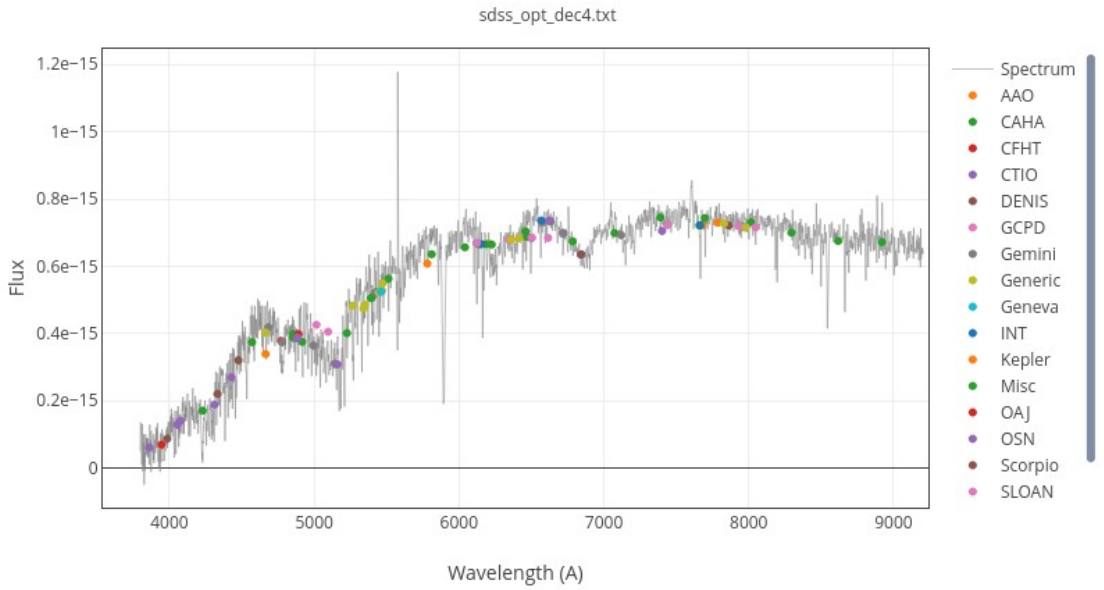
SpecPhot

Your collections Upload new collection Help

Collection: sdss_opt_dec4.txt Spectrum: Full collection Go

Send table to SAMP Hub

Filter	λ	Flux
AAO/AAO.aao90	4664.98	3.394248e-16
AAO/AAO.aao23	5416.22	5.191478e-16
AAO/AAO.aao91	6208.99	6.669996e-16
AAO/AAO.aao46	6358.40	6.806724e-16
AAO/AAO.aao24	6499.55	6.845242e-16
AAO/AAO.aao92	7680.78	7.226463e-16
AAO/AAO.aao47	7784.64	7.300226e-16
CAHA/ALHAMBRA.F427W	4230.27	1.711250e-16
CAHA/ALHAMBRA.F458W	4571.24	3.748070e-16
CAHA/BUSCA.Hbn	4853.41	3.990099e-16
CAHA/LAICA.SDSS_g	4855.59	3.882855e-16
CAHA/ALHAMBRA.F489W	4917.34	3.758881e-16
CAHA/ALHAMBRA.F520W	5226.09	4.009534e-16
CAHA/LAICA.Johnson_V	5428.81	5.231630e-16
CAHA/ALHAMBRA.F551W	5512.77	5.636919e-16
CAHA/ALHAMBRA.F582W	5811.48	6.355001e-16
CAHA/ALHAMBRA.F613W	6133.31	6.653991e-16
CAHA/LAICA.SDSS_r	6186.46	6.659410e-16
CAHA/BUSCA.Red	6225.67	6.644391e-16
CAHA/ALHAMBRA.F644W	6460.00	7.042320e-16
CAHA/LAICA.Johnson_R	6467.52	6.869977e-16
CAHA/ALHAMBRA.F675W	6784.44	6.739390e-16



SVO applications making use of FPS

SpecPhot

Your collections Upload new collection Help

Collection: xpsample.specphot **Spectrum:** xpsample.specphot Go

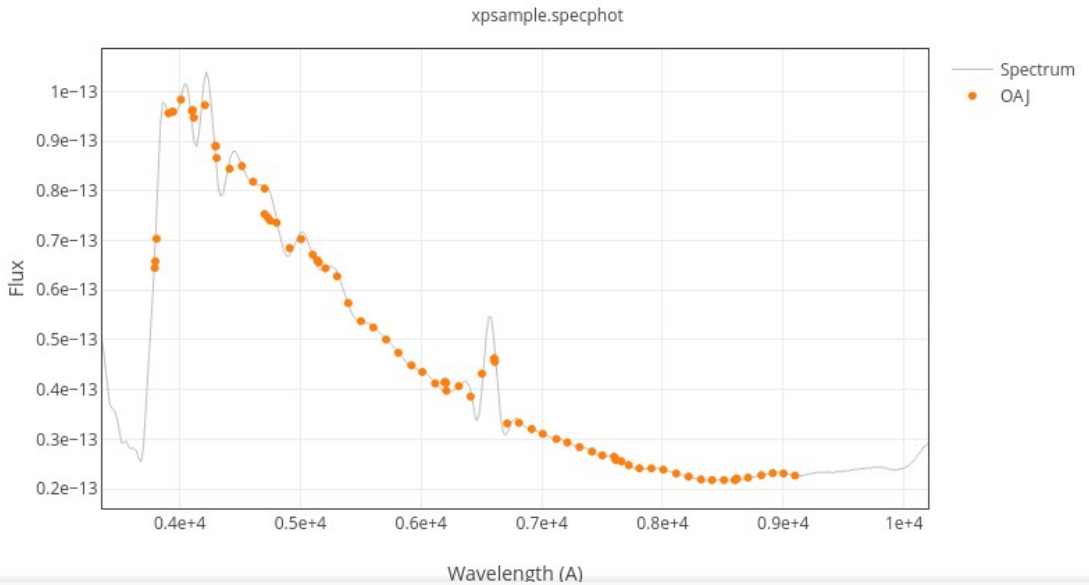
This is the photometry calculated for this spectrum.

If you want to recalculate it for this spectrum and these or different filters, just Recalculate it.

Otherwise, you can also download these data as an ASCII file, a VOTable file, or generate a VOSA file with these data

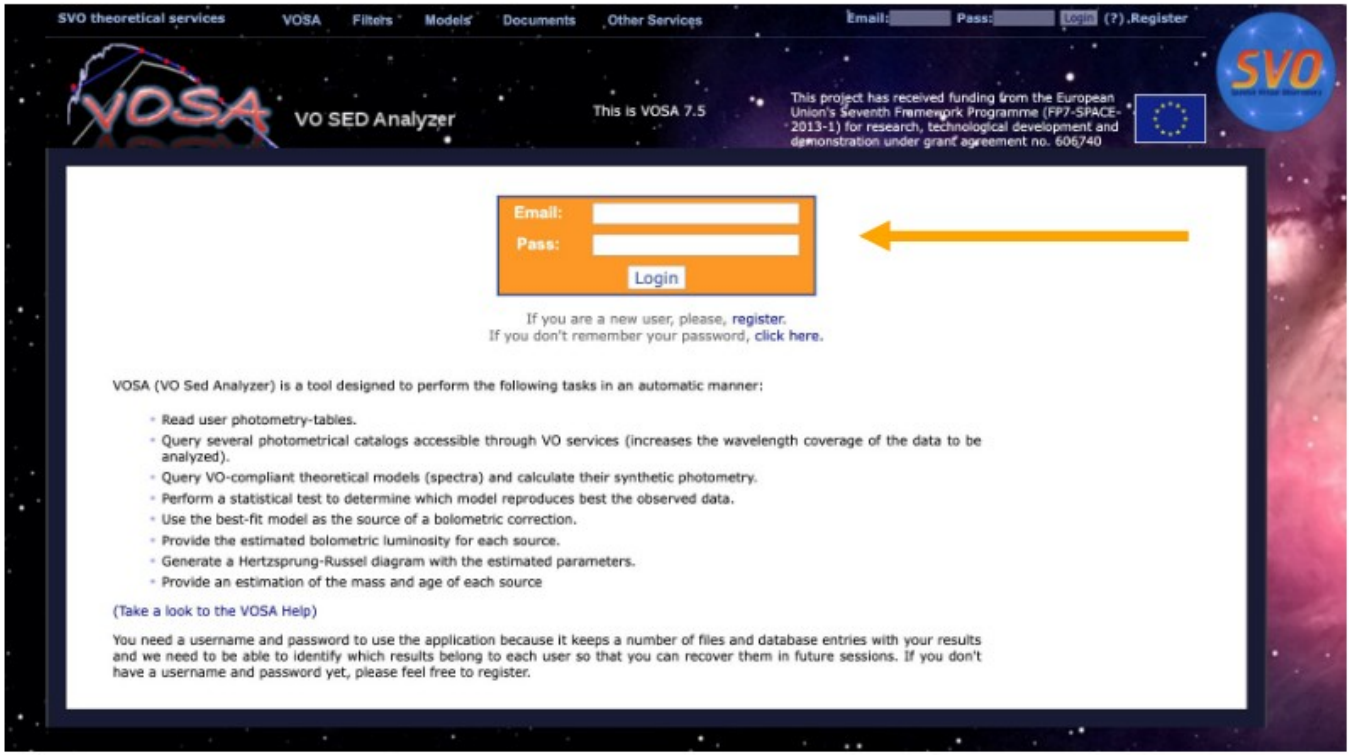
Send table to SAMP Hub

Filter	λ	Flux
OAJ/JPLUS.J0378	3793.43	6.450167e-14
OAJ/JPLUS.F0378_filter	3797.78	6.579922e-14
OAJ/JPAS.J0378	3808.73	7.037102e-14
OAJ/JPAS.J0390	3906.57	9.560405e-14
OAJ/JPLUS.J0395	3938.56	9.587757e-14
OAJ/JPLUS.F0395_filter	3946.00	9.591309e-14
OAJ/JPAS.J0400	4010.69	9.831019e-14
OAJ/JPLUS.F0410_filter	4101.72	9.608740e-14
OAJ/JPLUS.J0410	4108.03	9.623272e-14
OAJ/JPAS.J0410	4117.40	9.471964e-14
OAJ/JPAS.J0420	4209.55	9.720905e-14
OAJ/JPLUS.F0430_filter	4297.01	8.906084e-14
OAJ/JPLUS.J0430	4298.44	8.893230e-14
OAJ/JPAS.J0430	4306.32	8.655595e-14
OAJ/JPAS.J0440	4413.40	8.441734e-14
OAJ/JPAS.J0450	4514.44	8.500201e-14
OAJ/JPAS.J0460	4608.54	8.185387e-14
OAJ/JPLUS.gSDSS_filter	4703.39	7.530752e-14
OAJ/JPAS.J0470	4704.39	8.041419e-14



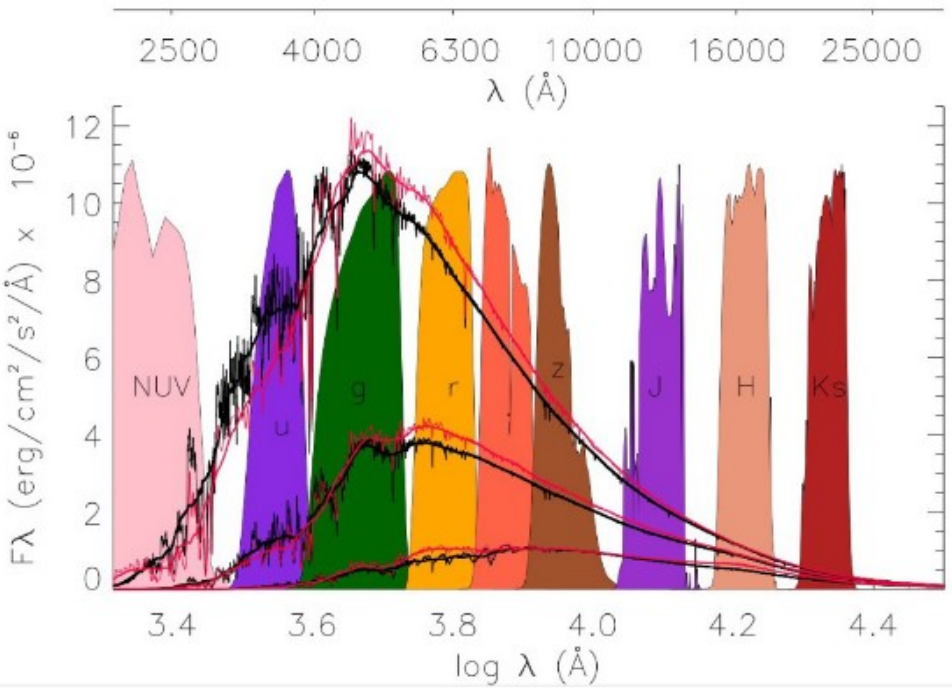
SVO applications making use of FPS

VOSA: THE VO SED ANALYZER



http://svo2.cab.inta-csic.es/theory/vosa/

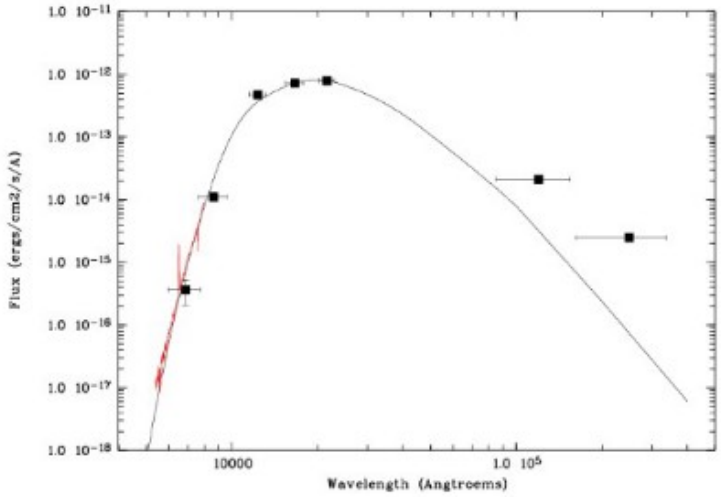
SVO applications making use of FPS



SVO applications making use of FPS

VOSA: BUILDING SEDs

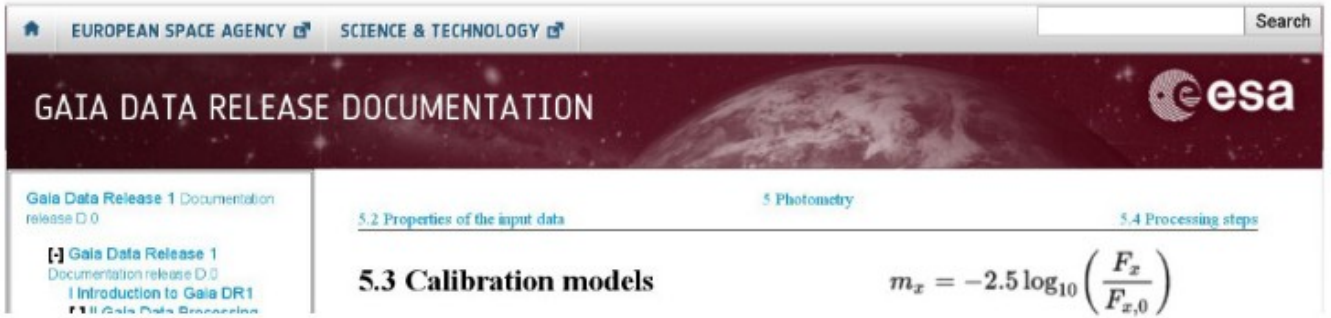
- **Data Manipulation: From magnitudes to fluxes**



I/337/gaia — Gaia DR1 (Gaia Collaboration, 2016)
Post annotation — GaiaSource data (Download Gaia Sc

start AladinLite

Full	RA_ICRS deg	DE_ICRS deg	<Gmag> mag
1	063.4107528711	-89.9888879972	17.965
2	037.5117084305	-89.9858176527	16.664
3	084.7593492719	-89.9781776713	18.553
4	081.5942616579	-89.9832765720	20.472
5	070.9024070024	-89.9715663343	19.829
6	060.8702751299	-89.9781334323	19.492
7	073.1733654732	-89.9817426647	20.019
8	027.3236159503	-89.9767950251	17.006
9	029.9573489468	-89.9759664621	18.649
10	020.0044580076	-89.9836077196	19.202



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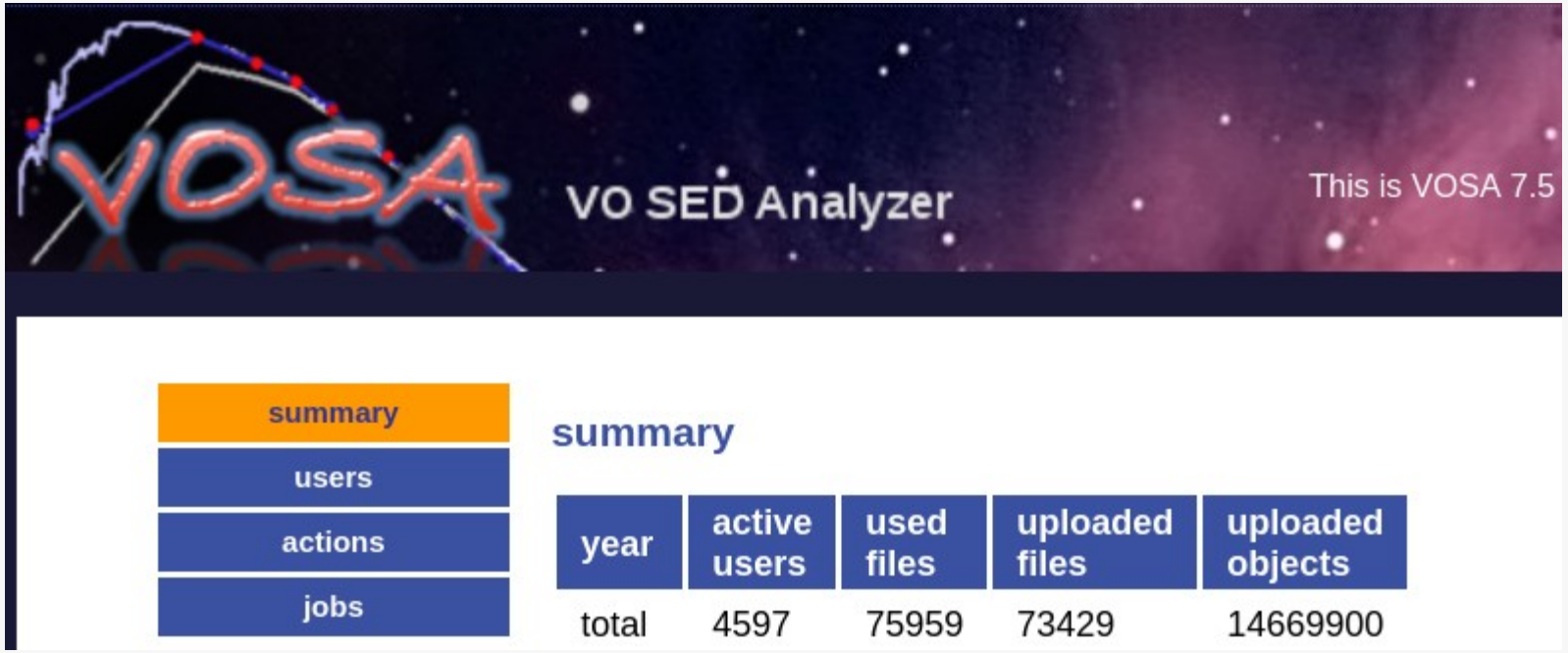


Others applications making use of FPS

Gemini Science Archive

This page provides access to data from the Gemini Observatory. The Observatory has deployed a new archive service described here and it can be accessed from the link in the menu to the left. All proprietary data must now be retrieved using this service.

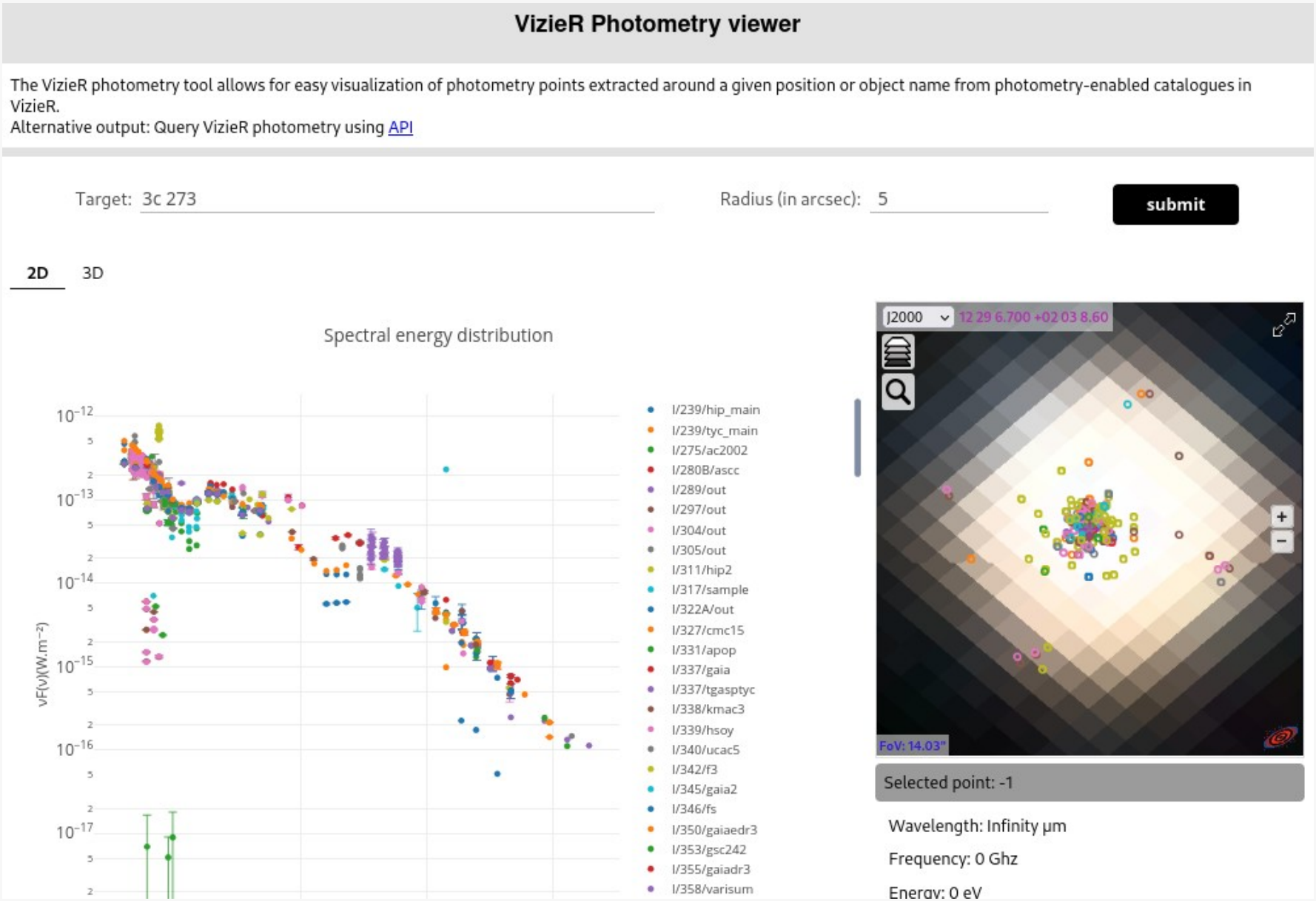
The CADC will continue to provide access to public Gemini data through its Advanced Search service. For convenience a link to a search page for the Gemini collection is provided in the menu to the left.

Acknowledgements

Any paper that includes any data obtained with one or both of the Gemini telescopes should use the appropriate acknowledgement as a footnote on the first page of the paper.
If your research benefits from the use of the SVO Filter Profile Service, we would appreciate if you could include the following acknowledgement in your publication:

> This research has made use of the SVO Filter Profile Service supported from the Spanish MINECO through grant AYA2017-84089.

Others applications making use of FPS



Others applications making use of FPS

README MIT license

ska - Spectral-Kit for Asteroids

Suites of tools to compute colors from spectra or reflectance spectra using the SVO Filter Service in different photometric system: Vega, AB, ST.

Installation

Install from PyPi using `pip`:

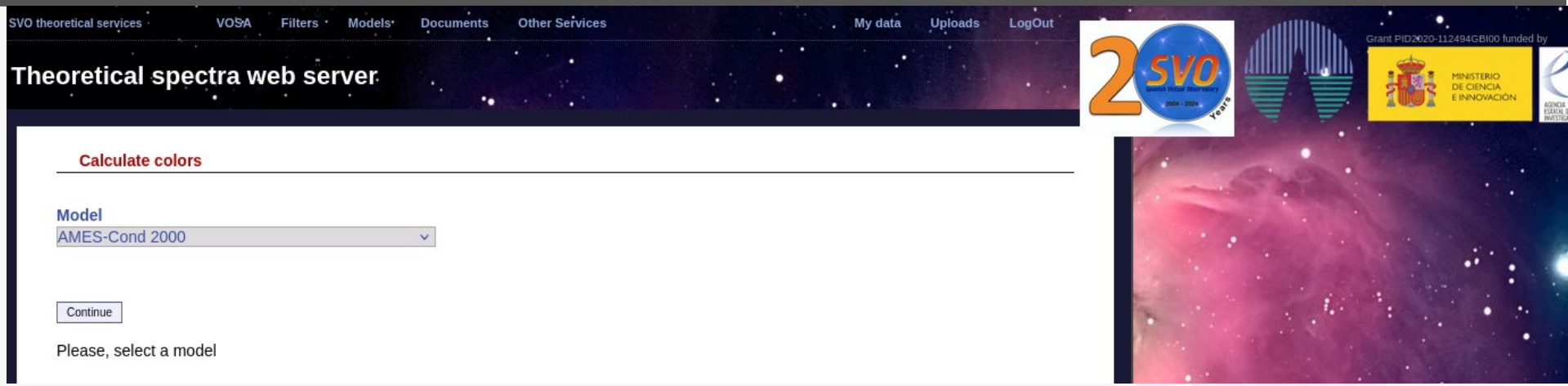
```
$ pip install space-ska
```

The minimum required `python` version is 3.8.

Documentation

Check out the documentation at https://space-ska.readthedocs.io or run

SVO applications making use of FPS



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⋆ *In Memoriam*: This work is dedicated to the memory of our dearest friend and colleague Carlos Rodrigo. The Spanish Virtual Observatory will certainly miss one of its best ambassadors.