VOSA: A short introduction. SEDs in the Virtual Observatory

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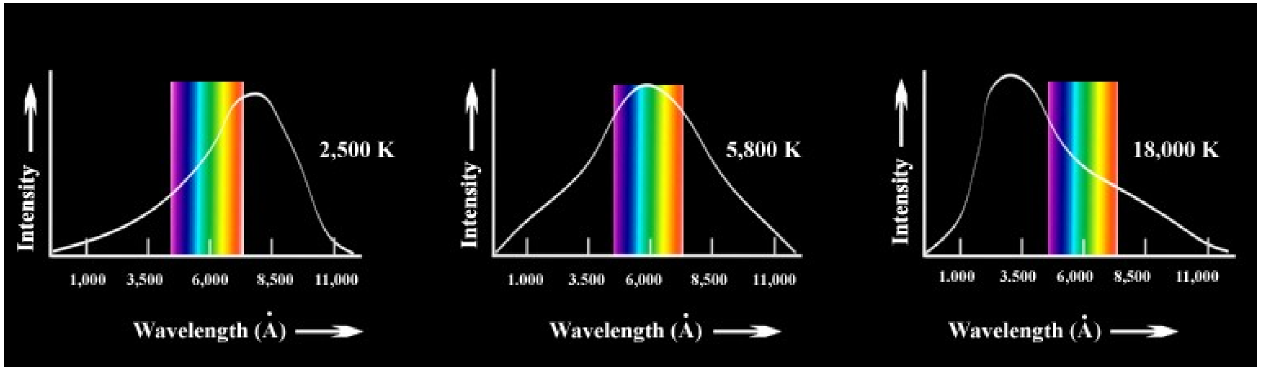
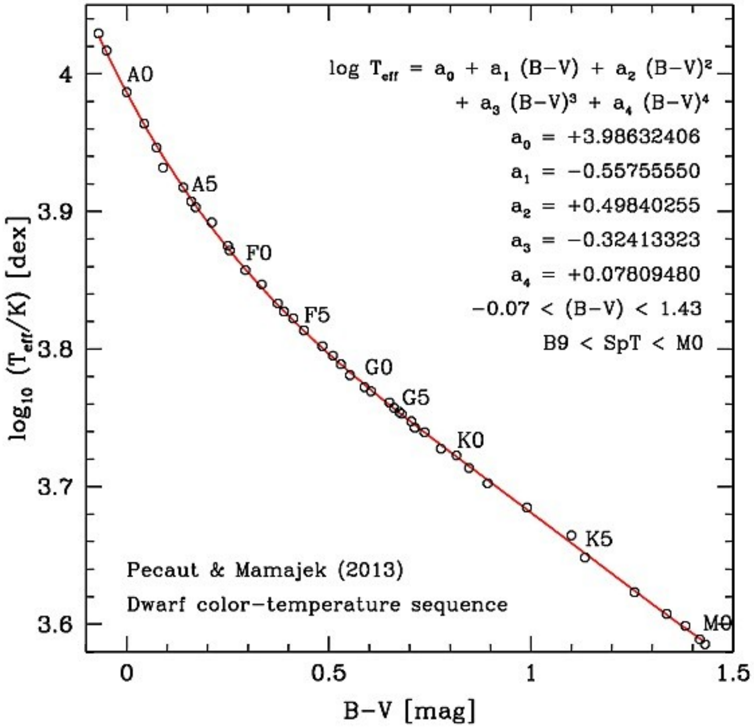
Why SEDs (Spectral Energy Distributions)?





Why SEDs (Spectral Energy Distributions)?

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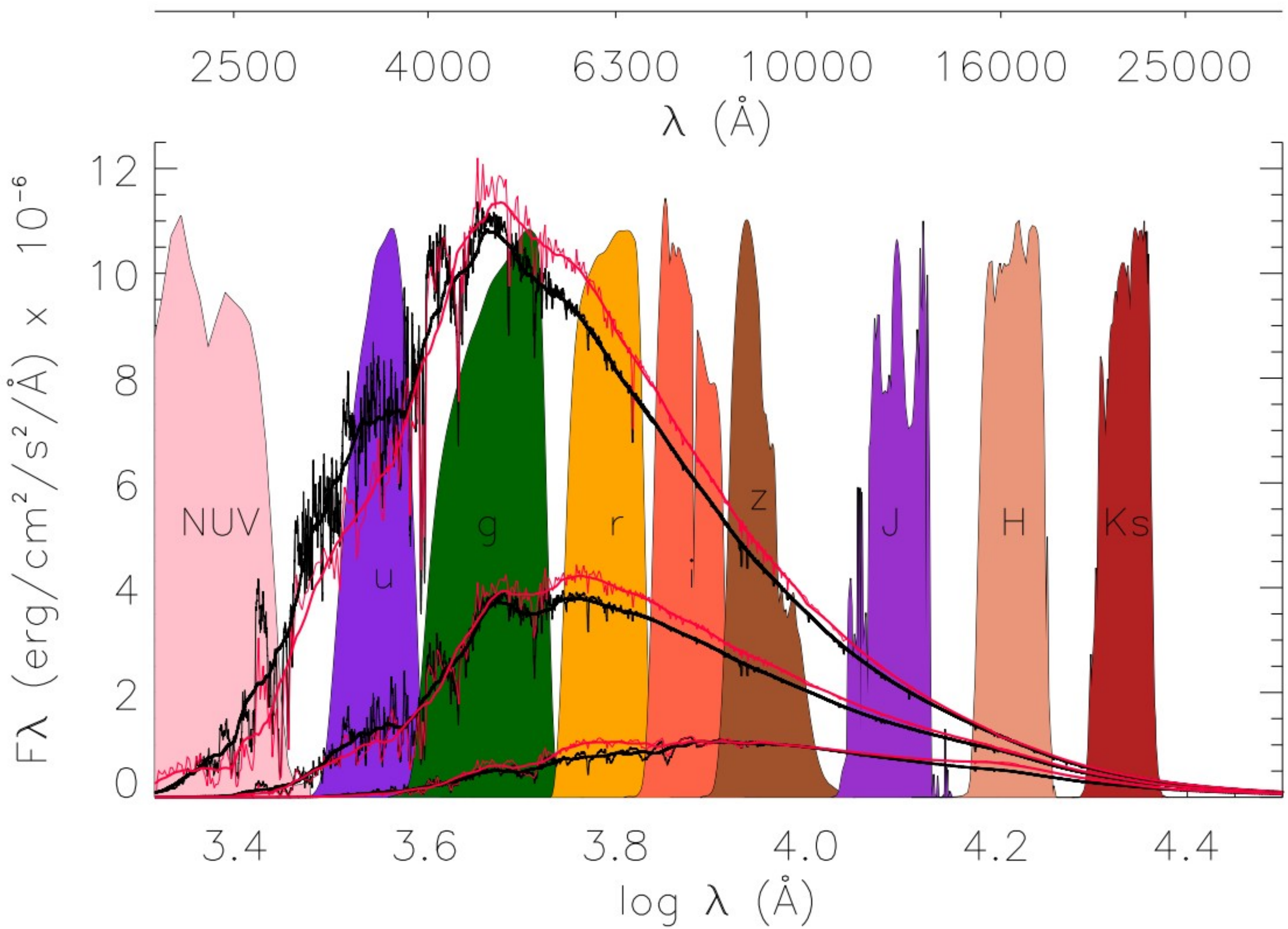
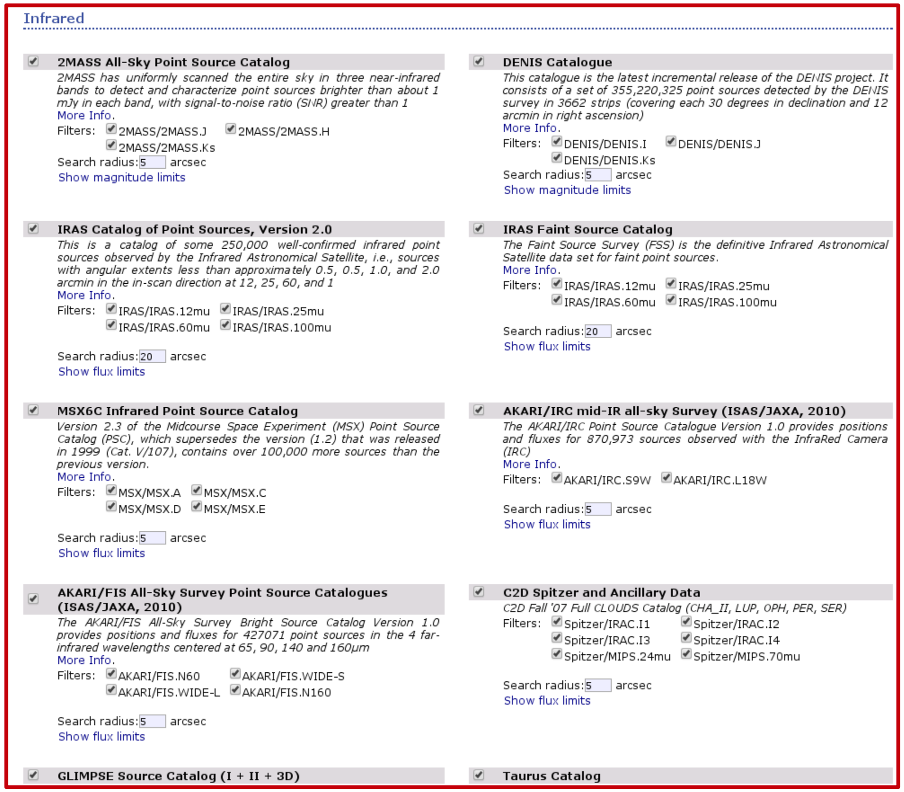
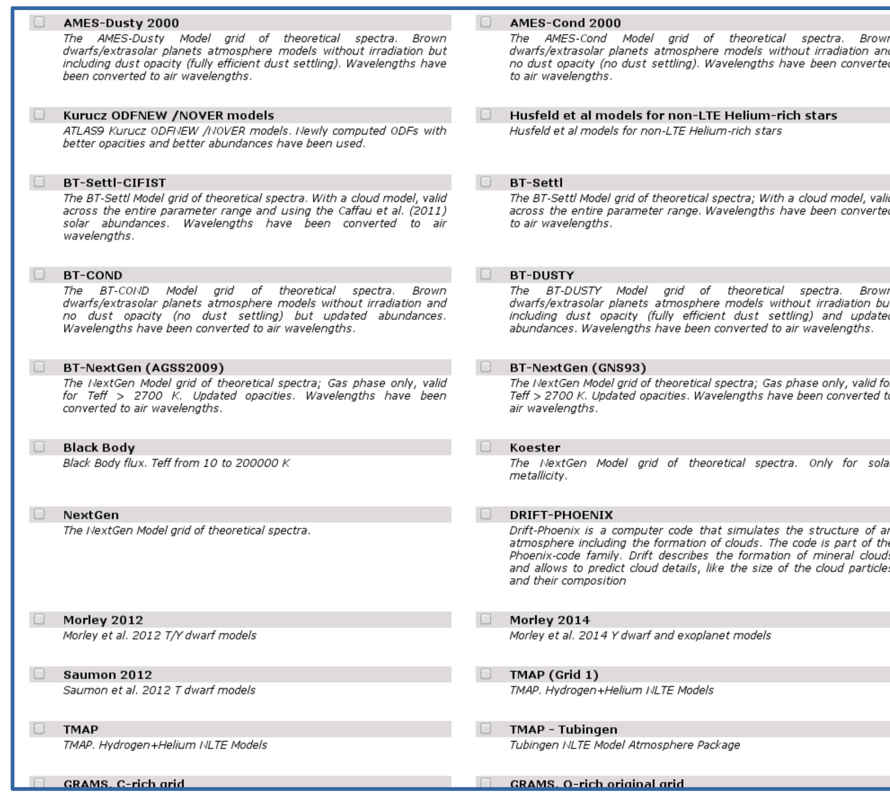


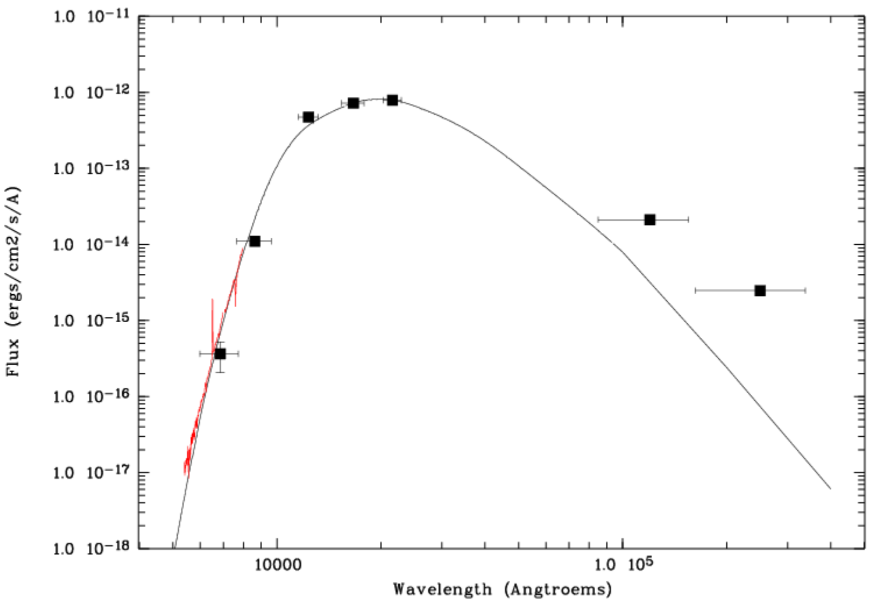
Building SEDs: Difficulties

- **Discovery of information: Observational photometry and theoretical models.**





- **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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GAIA DATA RELEASE DOCUMENTATION — esa

Gaia Data Release 1 Documentation release D.0

[-] Gaia Data Release 1 Documentation release D.0

I Introduction to Gaia DR1

[-] II Gaia Data Processing

5 Photometry

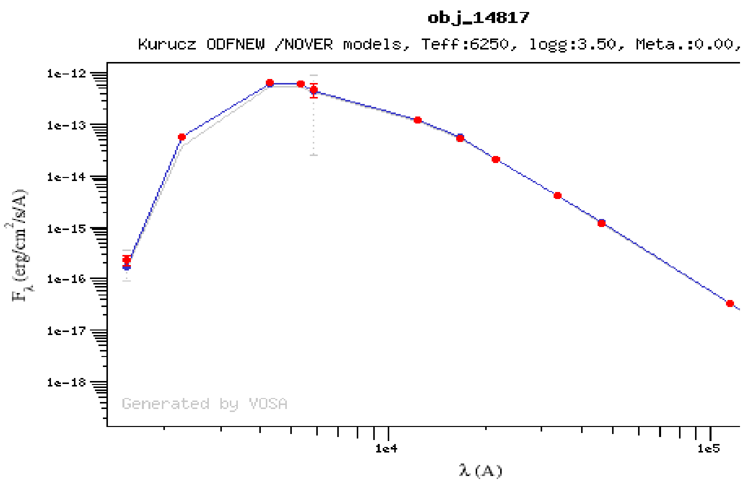
5.2 Properties of the input data — 5.4 Processing steps

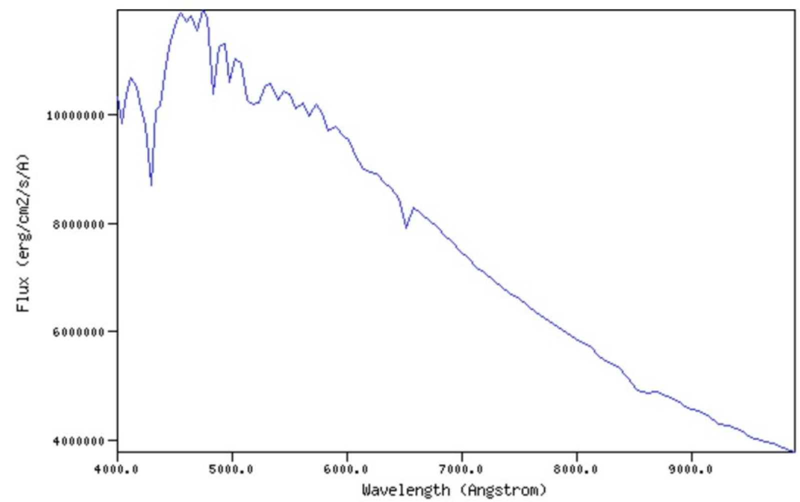
5.3 Calibration models

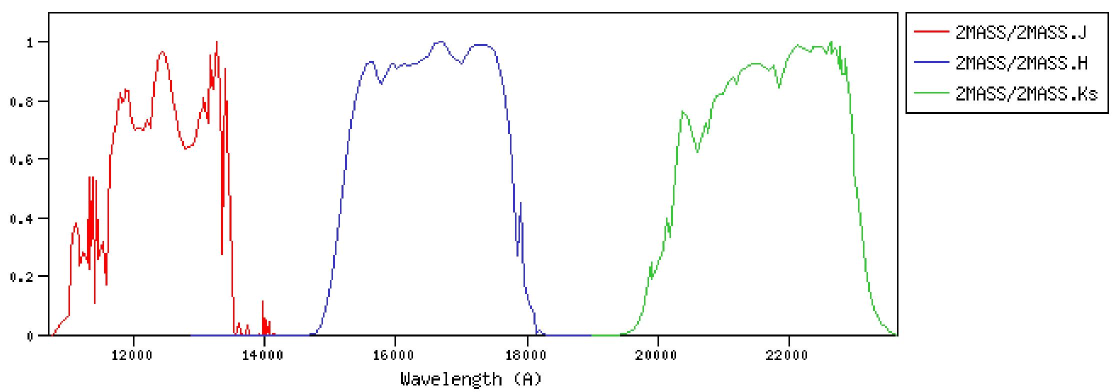
$$m_x = -2.5\log_{10}\left(\frac{F_x}{F_{x,0}}\right)$$

Building SEDs: Difficulties

- **Data Manipulation: From theoretical spectra to synthetic photometry**

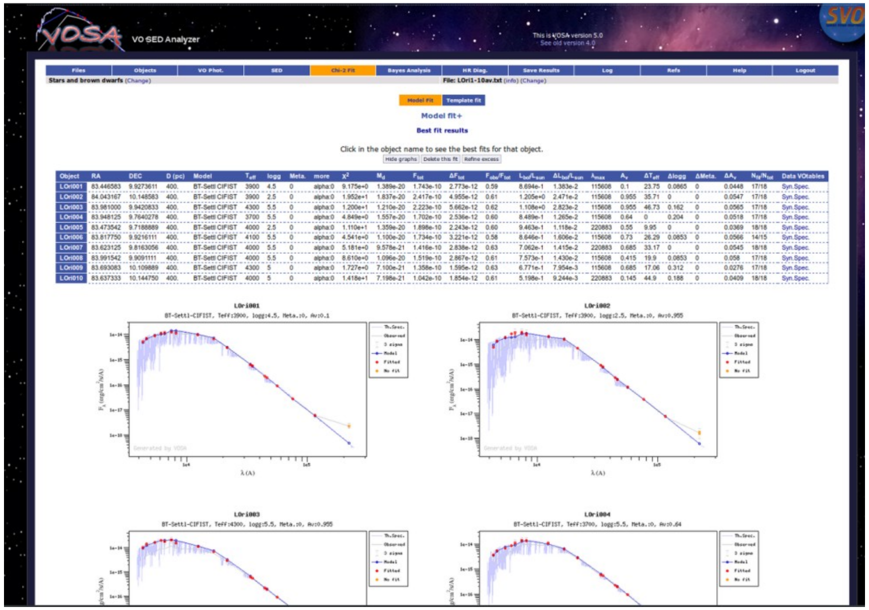






VOSA to the rescue

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



- Available since 2008.
- > 1500 users.
- > 4.700.000 objects.
- > 100 refereed papers.

Science case

THE ASTRONOMICAL JOURNAL

Accurate Empirical Radii and Masses of Planets and Their Host Stars with *Gaia* Parallaxes

Keivan G. Stassun[1,2], Karen A. Collins[1,2], and B. Scott Gaudi[3,4]

Published 2017 March 2 •

The Astronomical Journal, Volume 153, Number 3

Science case

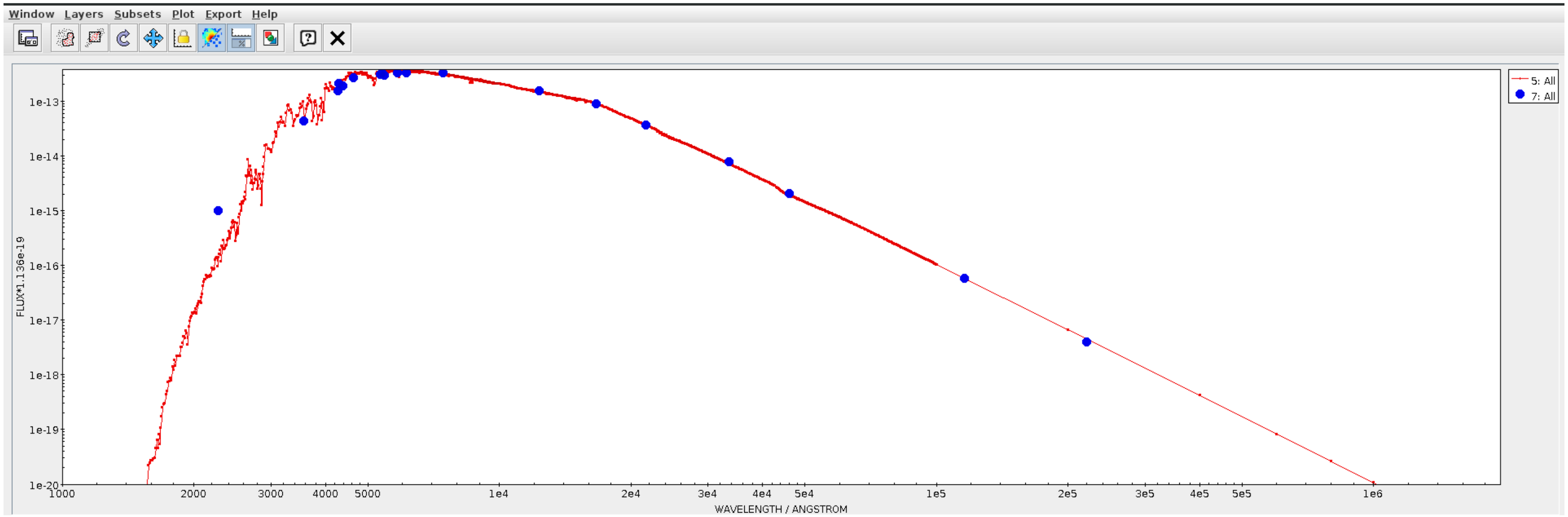
- Masses and radii of planets are necessary to:
  - Shed light on inflated hot-Jupiters.
    - 0.2-2.1M_{Jup}. Radii larger than predicted by models.
    - Internal heating.

    → Planet radius as a function of irradiation, age, magnetic fields, winds,...

$$\Delta F = \left(\frac{R_{planet}}{R_{star}}\right)^2$$

$$M_p = \frac{K_{RV}\sqrt{1-e^2}}{\sin i}\left(\frac{P}{2\pi G}\right)^{1/3} M_\star^{2/3}$$

Science case



- Empirical determination (model independent) of the radii and masses of stars hosting planets.
- SED fitting → F_{bol} and T_{eff}
- $L = 4\pi D^2 F_{bol}$ (D from Gaia-DR2 parallaxes)
- $R = \mathrm{sqrt}(L/(4\pi\sigma T_{eff}^{\ 4}))$
- $g = G\,M / R^2$