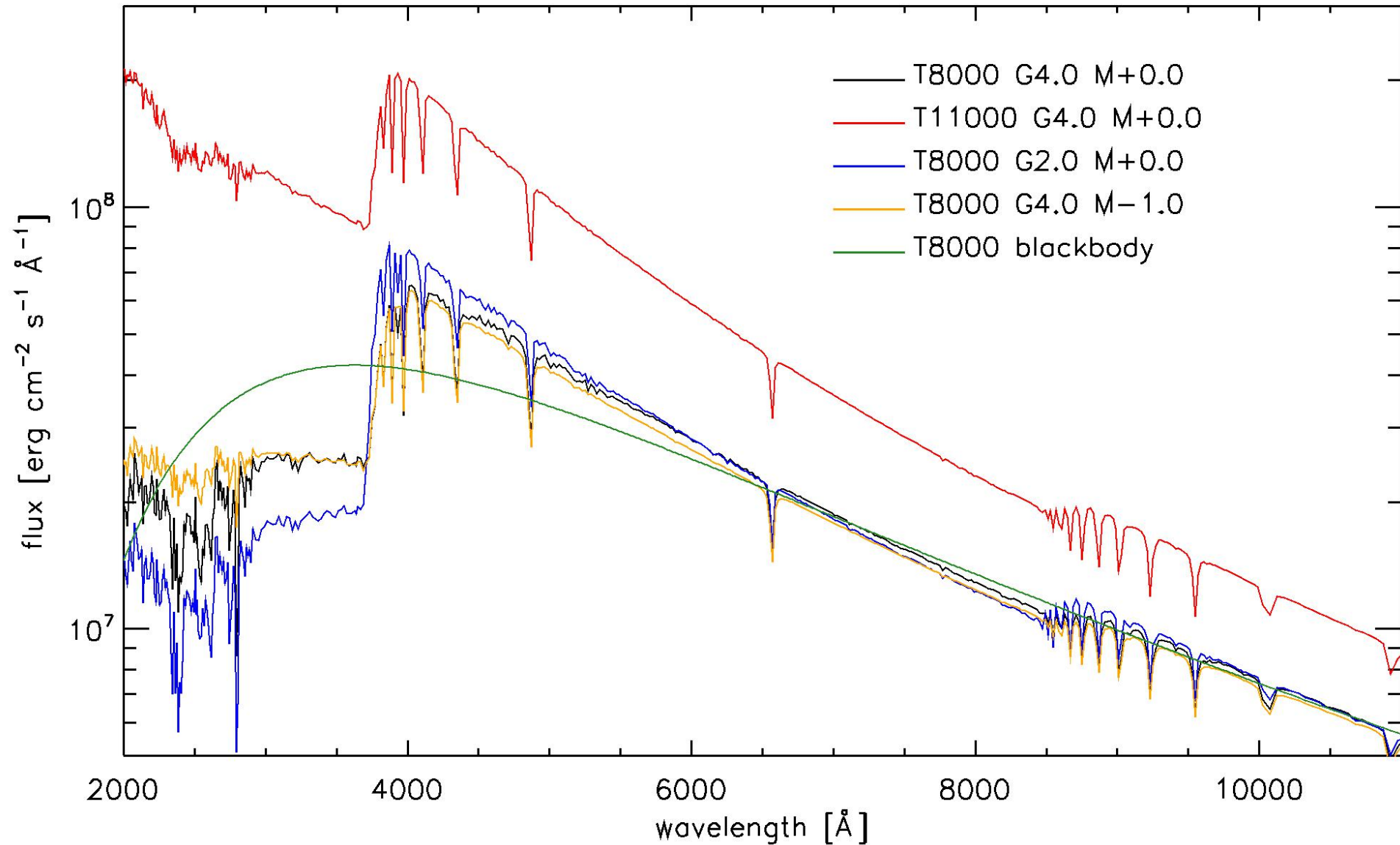
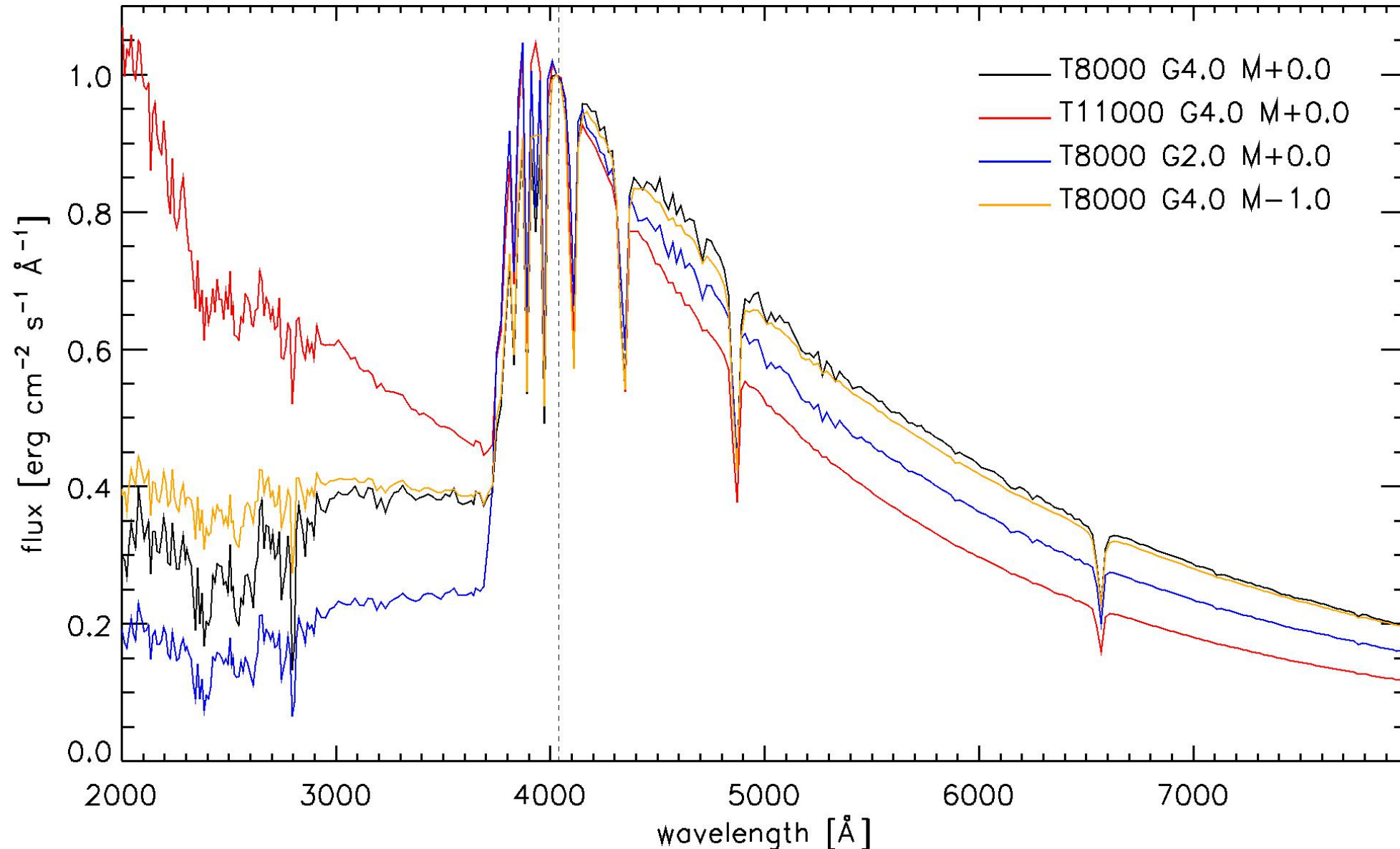


Atmospheric parameters: photometry and SED

Atmospheric parameters: photometry and SED

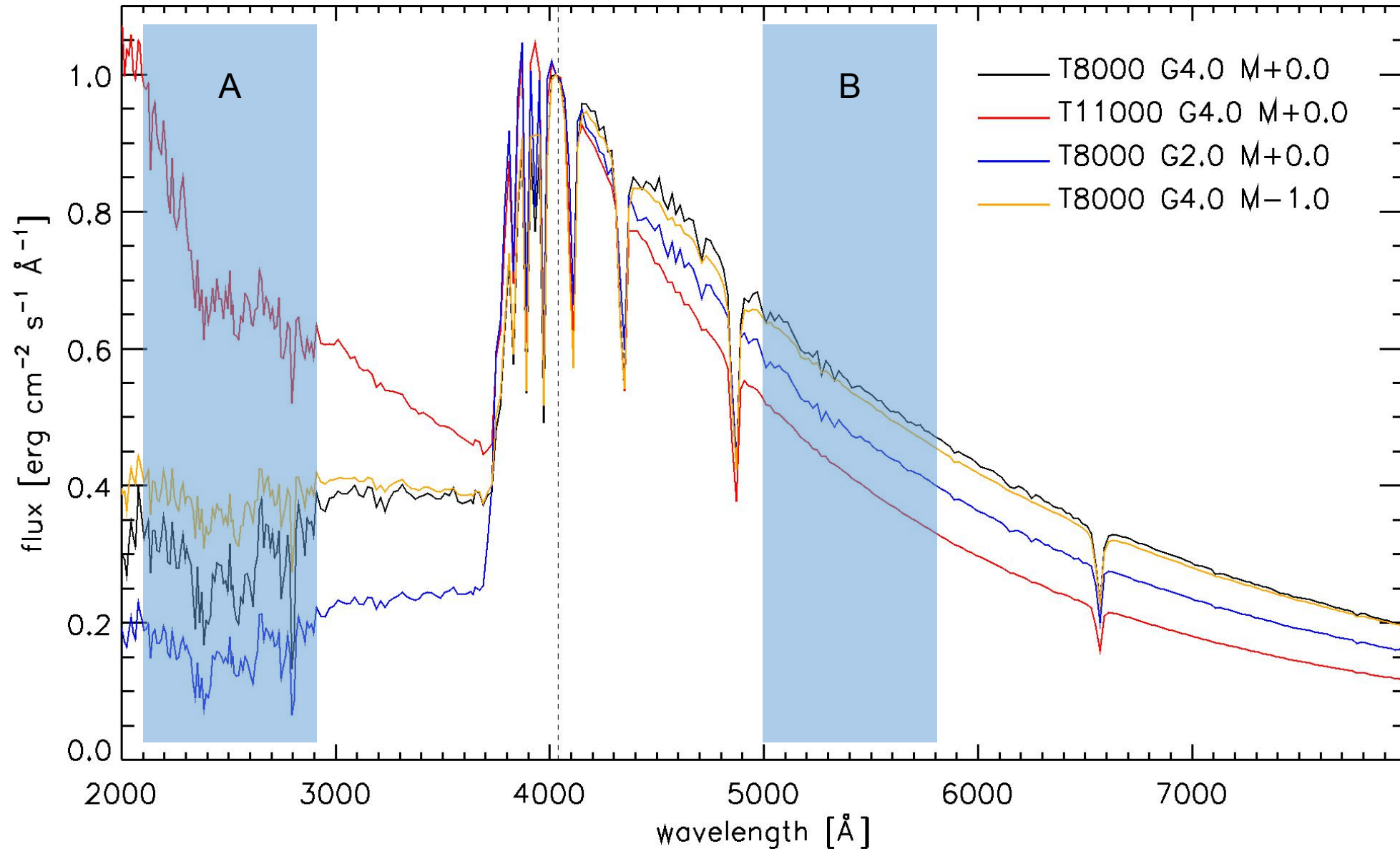


Atmospheric parameters: photometry and SED



- T_{eff} changes the slope of the SED
- $\log g$ changes the slope of the SED in the optical and the amplitude of the Balmer jump
- M affects mostly the UV, where most of the opacity is

Atmospheric parameters: photometry and SED



Let's integrate the flux coming from A and from B.

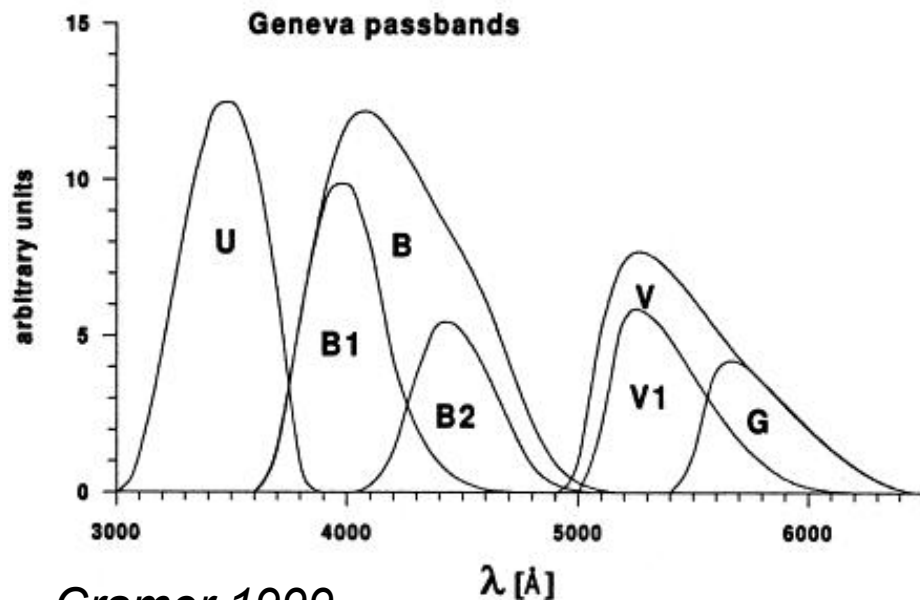
Then the quantity A-B will depend on the atmospheric parameters (i.e. T_{eff} , $\log g$, M).

This is how photometry can be used to derive stellar atmospheric parameters.

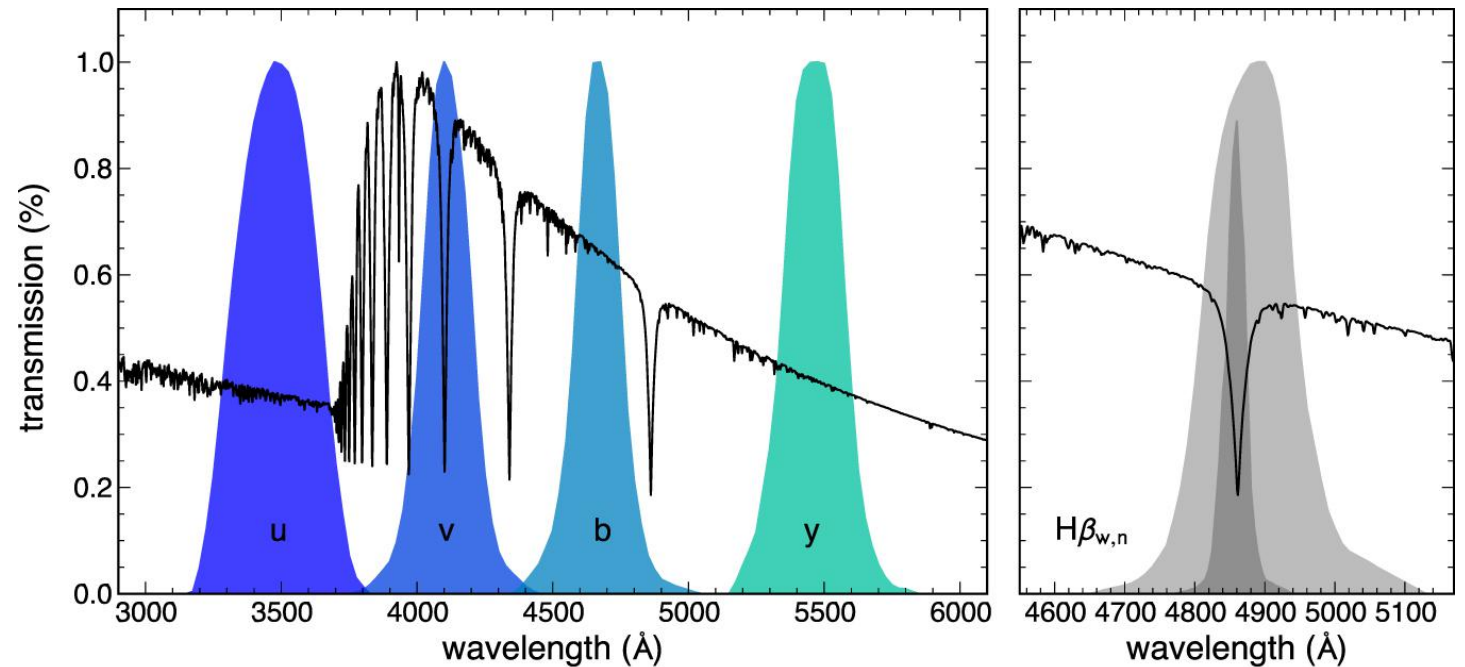
Atmospheric parameters: photometry and SED

A range of photometric systems has been invented and calibrated to derive stellar atmospheric parameters.

- Johnson
- Stroemgren
- Geneva
- ...



Cramer 1999



David+2015

<https://gcpd.physics.muni.cz/>

TempLogG (TNG) I have the code

Atmospheric parameters: photometry and SED

A range of photometric systems has been invented and calibrated to derive stellar atmospheric parameters.

- Johnson
- Stroemgren
- Geneva
- ...

Stroemgren calibrations:

Moon 1985, Napiwotzki 1995, Balona 1994, Ribas 1997,
Castelli 1997 (Gray 1991, Crawford 1979, Hilditch 1983)

Johnson calibrations:

Mathew 1992, Olsen 1984

The screenshot shows the TempLogG TNG - V1.4 software interface. The window has a title bar with 'TempLogG TNG - V1.4' and a close button. Below the title bar is a menu bar with 'File' and 'Help'. The main area features a header with a space-themed background and the text 'TempLogG TNG Version 1.1'. Below the header are three tabs: 'Strömgren', 'Johnson', and 'Geneva'. The 'Strömgren' tab is active. Underneath the tabs are three sub-tabs: 'Interactive Input', 'File Processing', and 'Calibration Settings'. The 'Interactive Input' sub-tab is active. It contains several input fields for photometric data: V, (b-y), m1, c1, HBeta, SPTYPE, Parallax, and vsini. There are also checkboxes for 'uvbybeta' and 'mas'. A 'Calculate' button is located at the bottom right of the input section. Below the input fields is a section titled 'Temperature - Logg' with radio buttons for different calibration methods: 'TempLogG OLD(Moon 1985)', 'uvbybeta (Napiwotzki 1995)', 'Balona 1994', 'Ribas 1997', and 'Castelli 1997'. The 'uvbybeta (Napiwotzki 1995)' option is selected. To the right of this section is a 'Messages' text area. At the bottom of the interface are more input fields for 'E(b-y)', 'Mv', 'Teff', 'logg', 'Fe/H', '(b-y)0', 'm0', 'c0', 'bol.cor.', 'r0', and 'SPTYPE'. There are also checkboxes for 'bol.cor.' and 'r0'.

Atmospheric parameters: photometry and SED

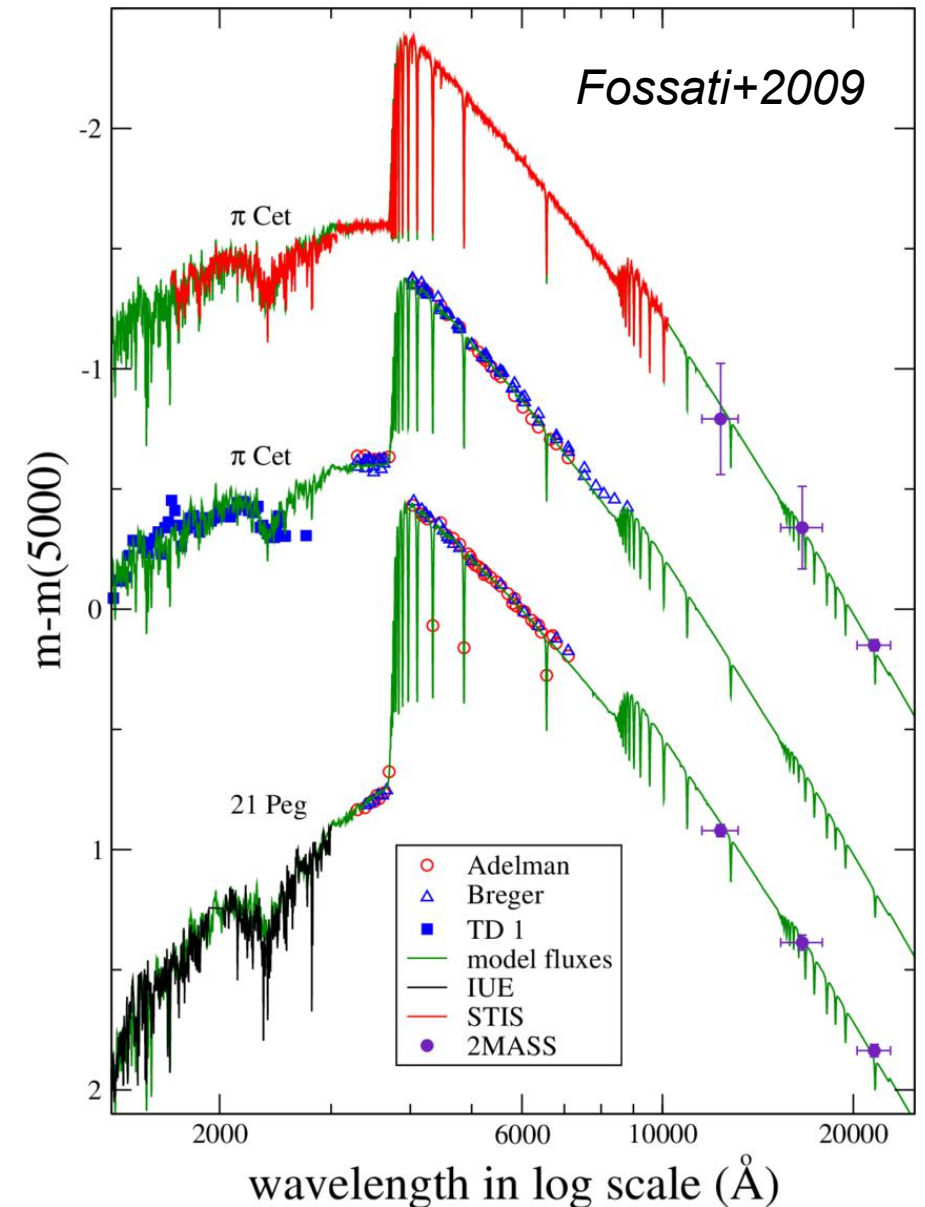
It is also possible to directly compare photometry with stellar SEDs to measure the atmospheric parameters, though this requires to convert the photometry, usually given in magnitude, in flux.

For bright stars, some spectrophotometric data are available in databases (e.g. VizieR).

Data obtained in space (e.g. HST, IUE, GALEX) are excellent.

For distant stars, or for stars with disks, one has to consider extinction as a further parameter.

The excellent distance measurements given by GAIA enable one to use this method to measure stellar radii with great accuracy.



Atmospheric parameters: photometry and SED

Finally, it is also possible to do the opposite, namely take a synthetic stellar SED and convolve it with different photometric filters to obtain synthetic photometry, which can then be compared with the observations. This is a good way to double-check atmospheric parameters obtained from spectroscopy.

For example, the Stroemgren c1 filter is excellent for double-checking $\log g$ values obtained by other means.

