

FLUX CALIBRATION (or lack thereof)

Okay, let's suppose you have either photometric output (magnitudes) or spectroscopic output (whatever format it is in) of how the object of interest (star, galaxy, whatever) compares to a "standard star". What then? How do you convert this into $\text{Watts cm}^{-2} \text{s}^{-1}$?

Here is another dirty little secret in astronomy – *many people cannot agree on how this should really be done!*

Measure laboratory of known characteristics with same instrument

Correct for horizontal extinction

Measure this at many distances

Model your lamp's horizontal extinction using vertical extinction.

The "good old days" of infrared astronomy – assumed stars were blackbodies.

Maybe not? (Sitko 1981, *ApJ* **247**, 1024).

ERRORS IN IRAS SPECTRAL FLUXES

c. 1992 - Martin Cohen begins a LONG series of papers on this.

"Laboratory" IR calibrations by Campins, Rieke & Lebofsky (1985, *AJ* **90**, 896) and Rieke, Lebofsky & Low (1985, *AJ* **90**, 900).

See the discussion on my web page on [IR Flux calibration](#).

How to get from measurements to fluxes:

Measure target object

Measure calibration objects

Correct both for extinction (and do transformation if photometry)

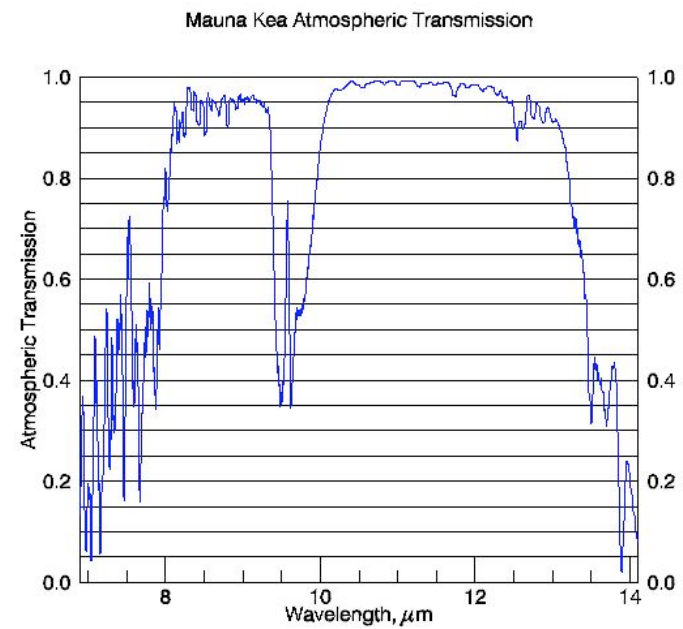
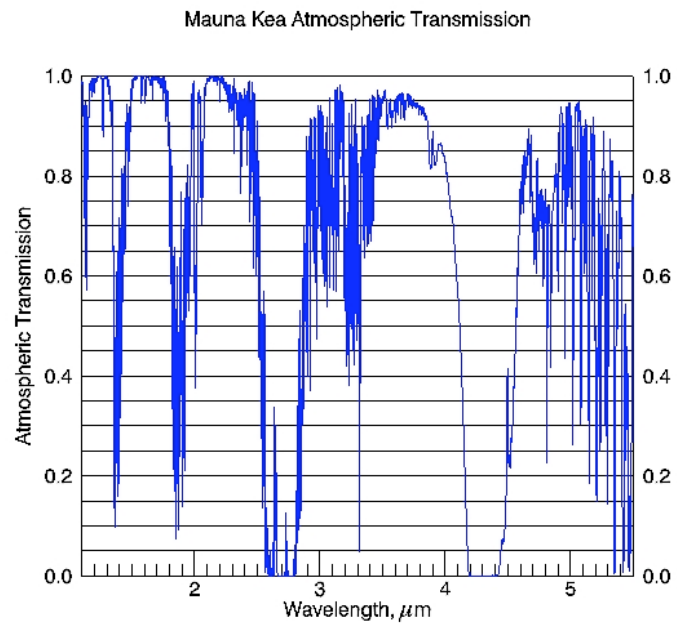
Divide flux of target by flux of flux calibrator (magnitude for photometry, flux ratio for spectra, which is basically the same thing)

Multiply by flux of calibrator.

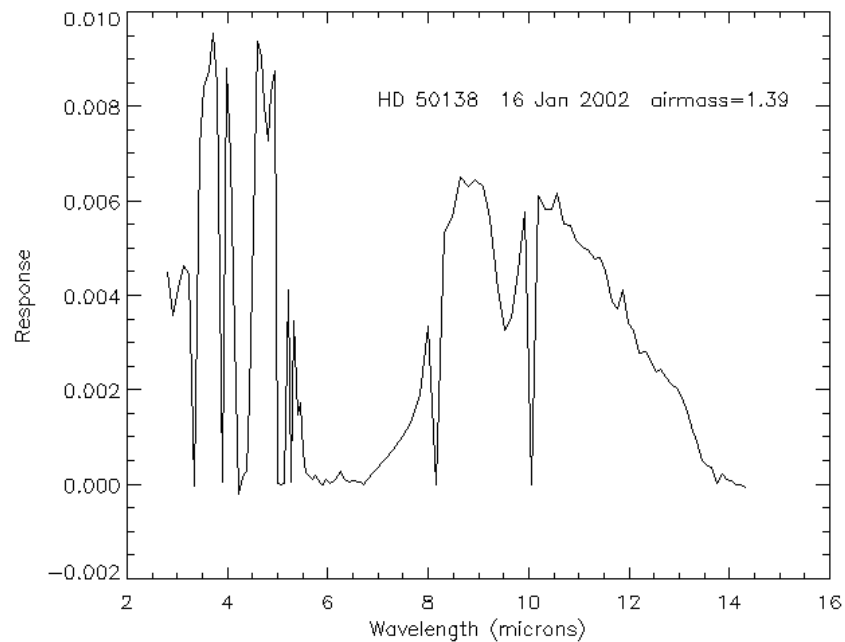
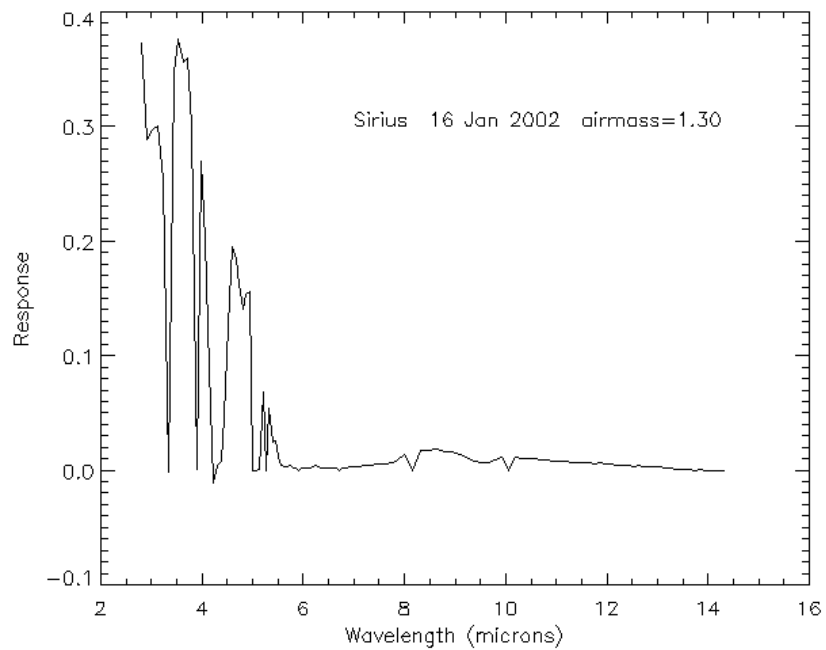
Worked Example:

16 January 2002 – Aerospace Corp. Broad-band Array Spectrograph (BASS) on NASA's Infrared Telescope Facility (IRTF)

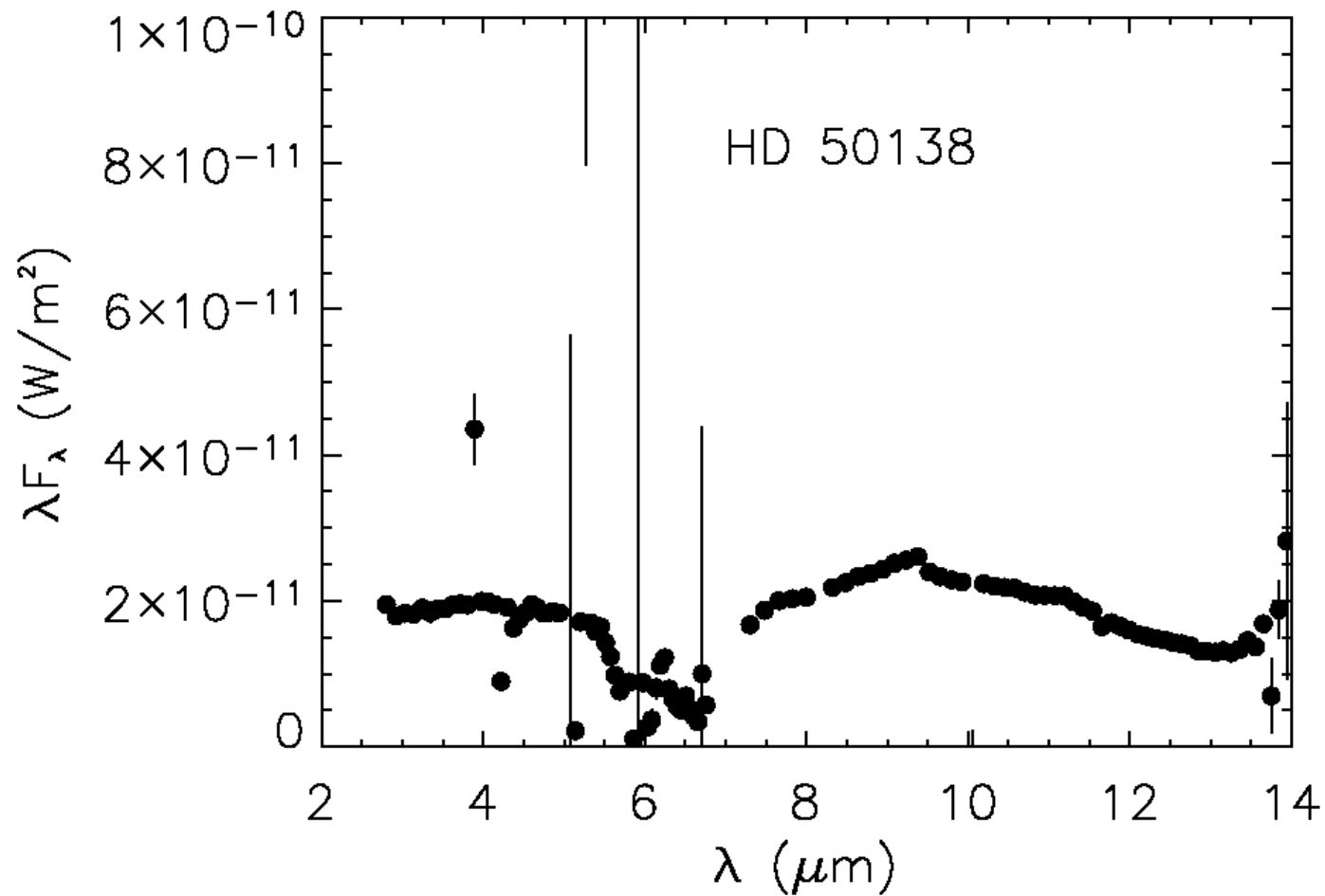




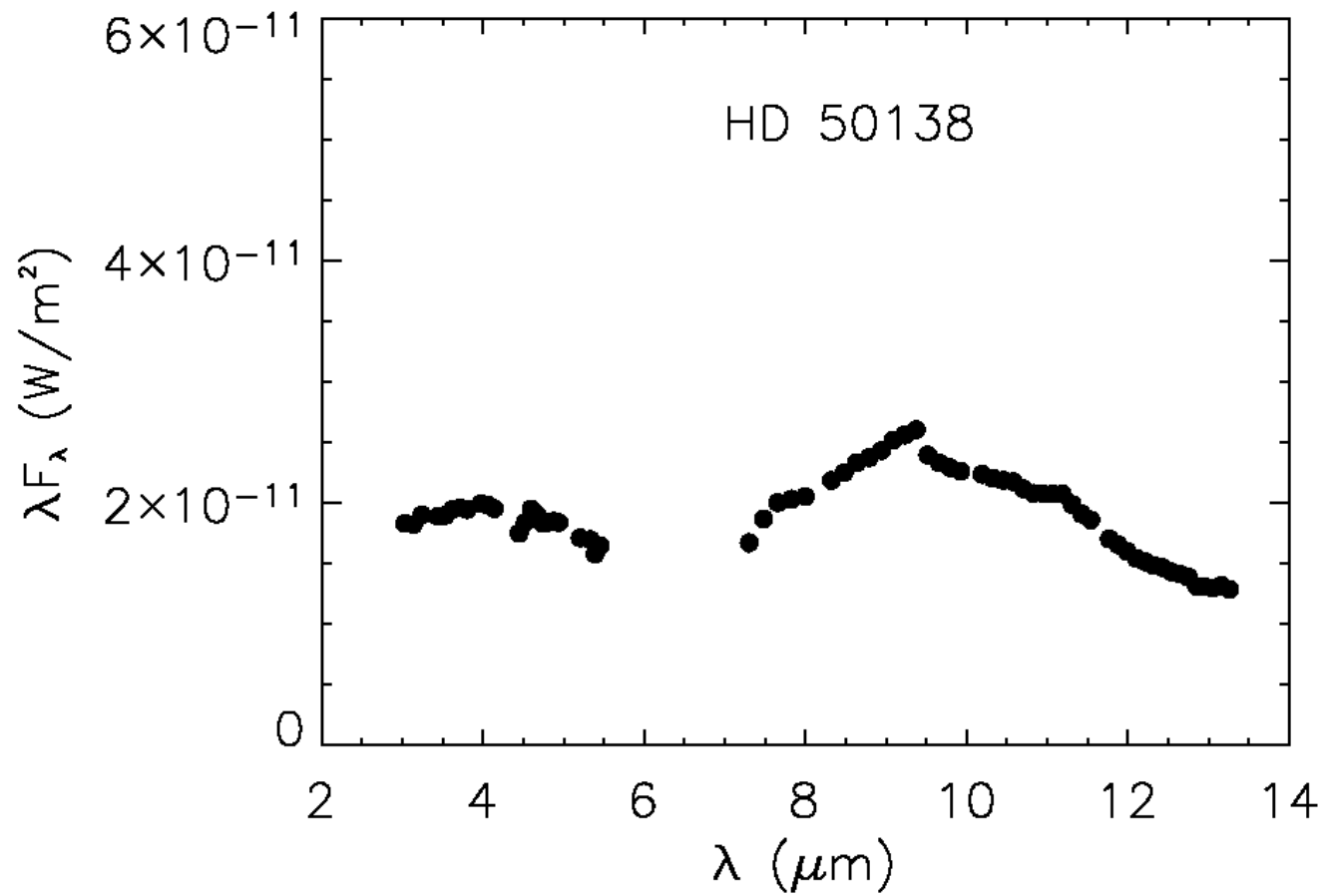
The transmission of the Earth's atmosphere at what is perhaps the best site in the world for most astronomical observations: Mauna Kea, Hawaii



Example of the raw spectra of a calibration star (left) and a “science target” (right)



Initially “reduced” spectrum of the science target, after dividing by the calibration star, and multiplying by the true flux of the calibration star. Note that unless the atmospheric transmission was an exact match, some residual effects of the atmospheric extinction will remain at those wavelengths where it is greatest.



Target star spectrum after removal of the “bad” regions.