



A Novel SIM-BASED Technique for the Precise Determination of Absolute Stellar Fluxes

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Absolute Stellar Fluxes

How Absolute Fluxes are Traditionally Measured

1. Pick a Bright Flux Standard - say Vega
2. Compare the Observed Flux of Vega with a Calibrated Laboratory Standard – say a Black Body – using the Same Telescope.
3. Account for and Correct all Systematic Errors

Current Status

1. On an absolute physical scale stellar fluxes are uncertain at the level of 1% at optical wavelengths.
2. In the UV and the Near IR uncertainties are considerably higher.

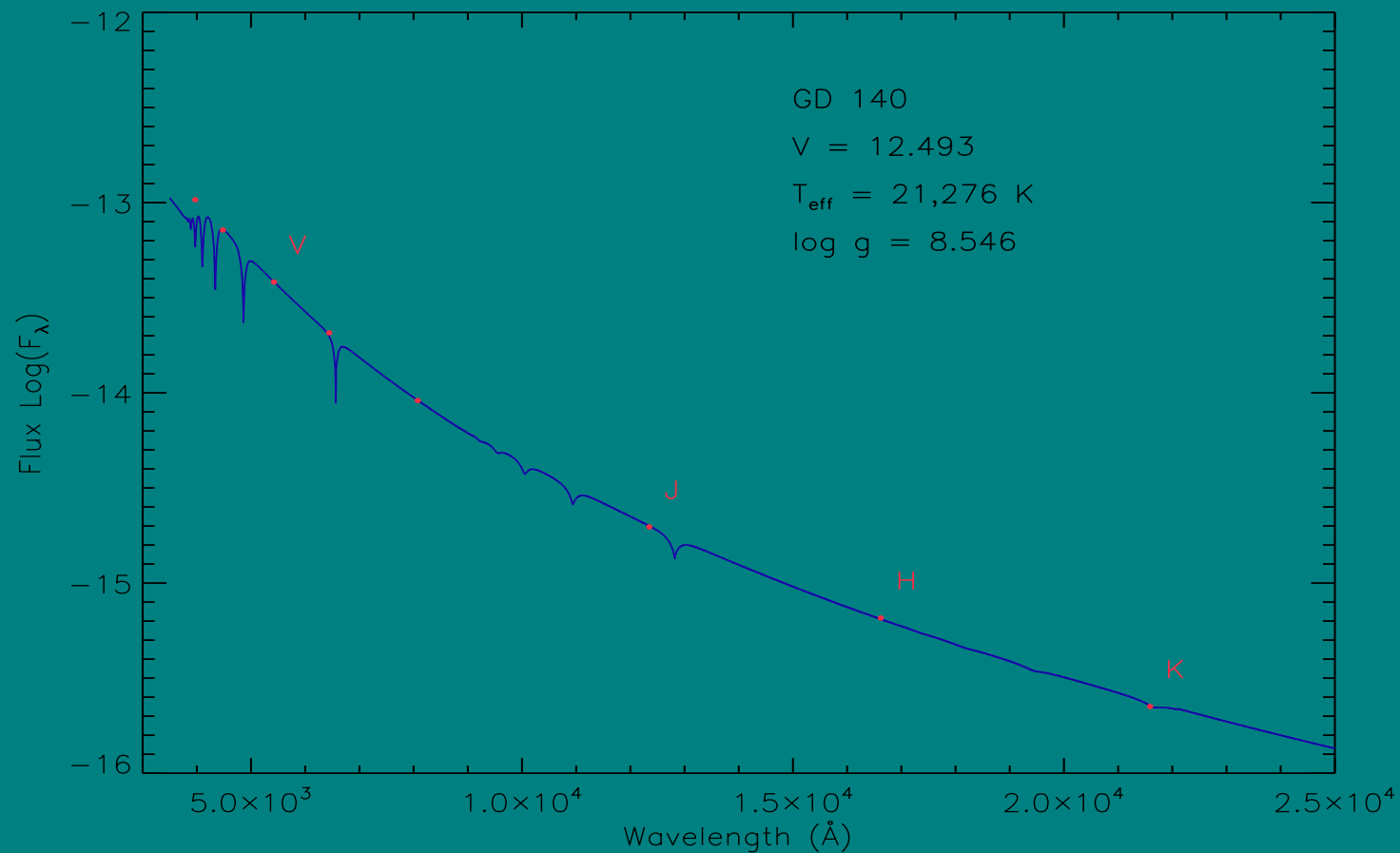
Absolute Fluxes – DA White Dwarfs - SIM

The basic idea:

1. Use White Dwarf Physics to Determine the Relative Fluxes of DA White Dwarfs.
2. Use Highly Accurate SIM Parallaxes to Convert These Relative Fluxes to Absolute Fluxes.

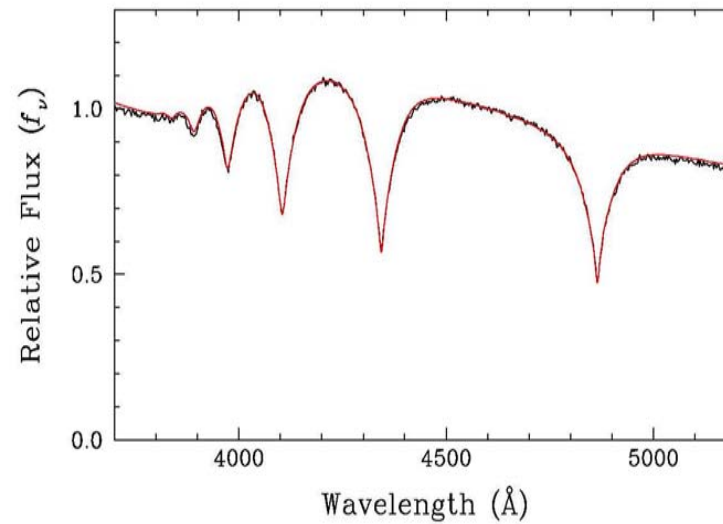
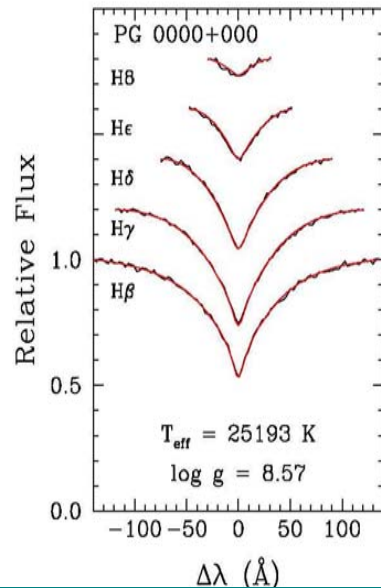
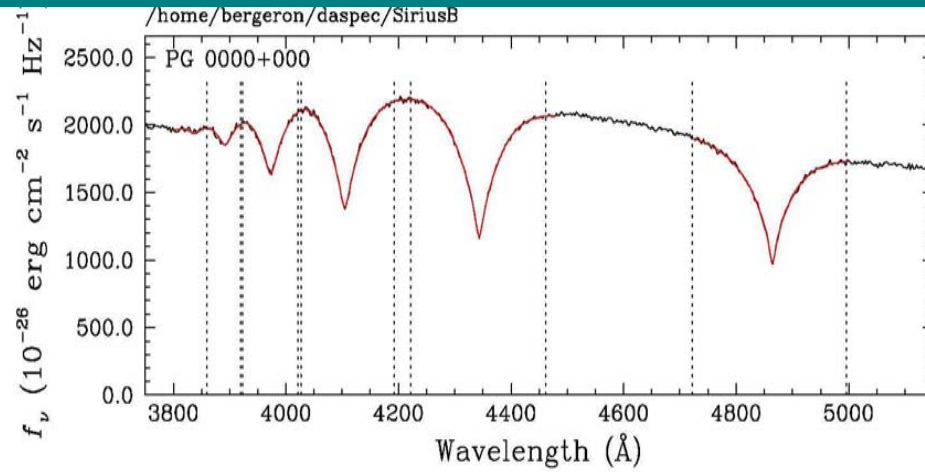
DA White Dwarfs

- Pure-Hydrogen Photospheres
- Fully Radiative Atmospheres
- Simple, Continuum-Dominated Spectra



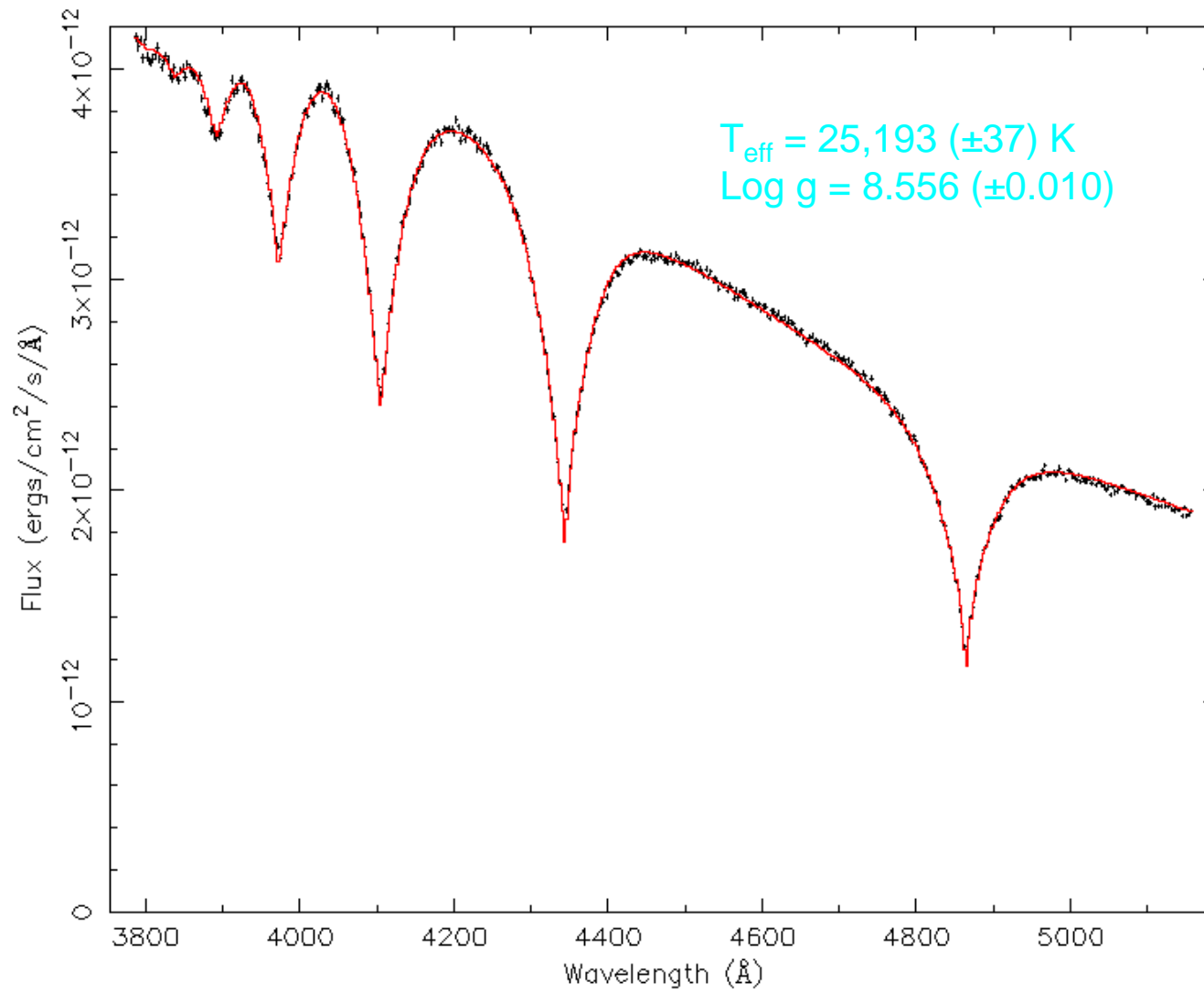
Spectral Fitting for T_{eff} and $\log g$

Sirius B



Synthetic Photometry

Sirius B Barstow et al. (2005)



Stellar Photometry

$$f_{\lambda} = 4\pi H_{\lambda}(T_{eff}, \log g) \left(R^2 / D^2 \right)$$

f_{λ} = Observed flux at the top of the Earth's Atmosphere

$H_{\lambda}(T_{eff}, \log g)$ = Eddington Flux at the Stellar Surface

R = Stellar Radius

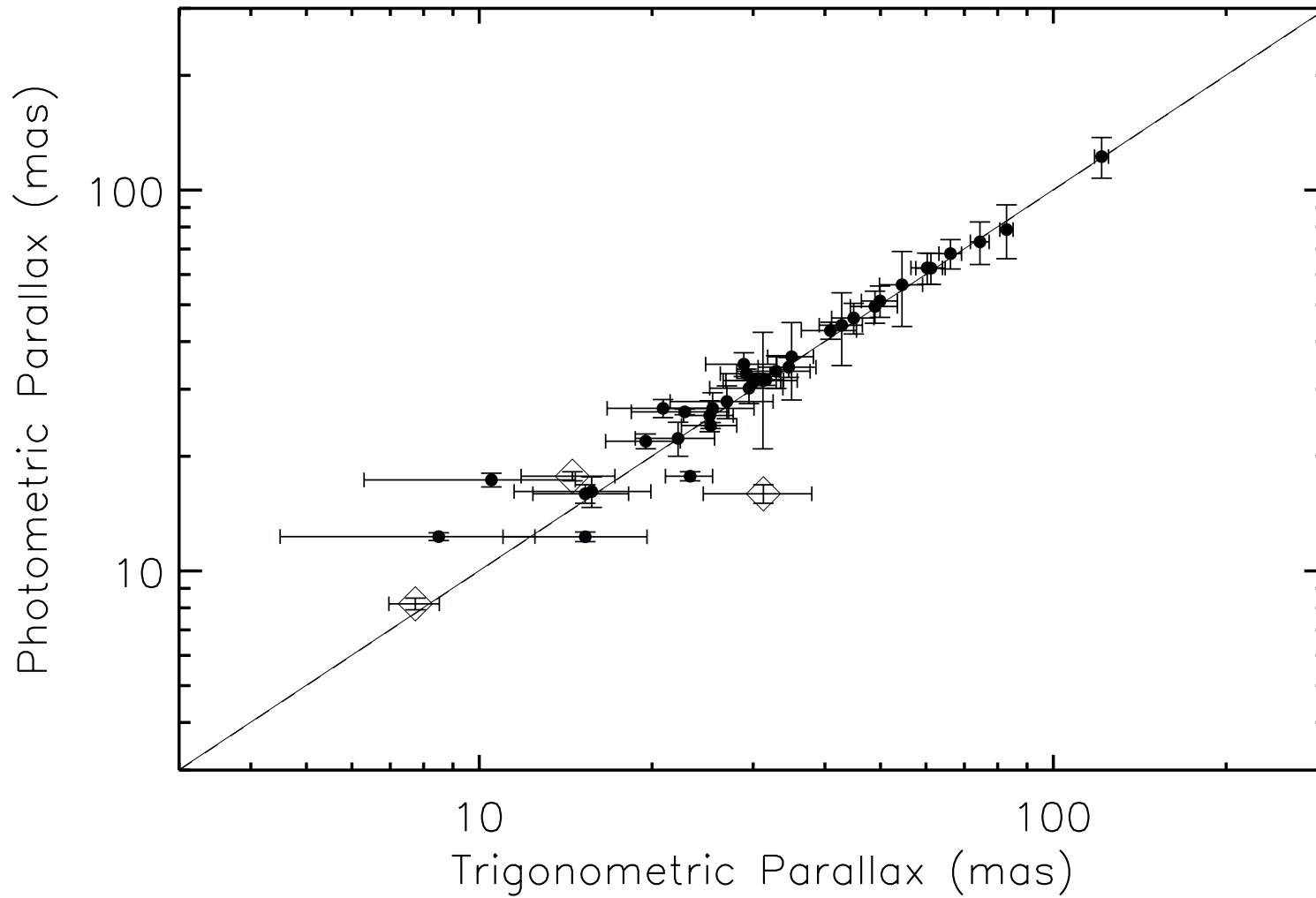
D = Stellar Distance

H_{λ} - Radiative Transfer – *Physics of Hydrogen Atom*

R - White Dwarf Interior Physics – *Mass-Radius Relation and White Dwarf Cooling*

Correlation of Photometric Parallaxes with Trigonometric Parallaxes

Fig. 2 Holberg et al. 2008



DA White Dwarfs can be used as absolute flux standards – if accurate parallaxes can be determined.

Remaining Questions

How accurately can we compute white dwarf synthetic fluxes?

What residual uncertainties are associated with emergent fluxes?

How well can we determine white dwarf radii?

Holberg et al. 2006

