

# SpecMatch-Emp: Stellar Characterization using an Empirical Spectral Library

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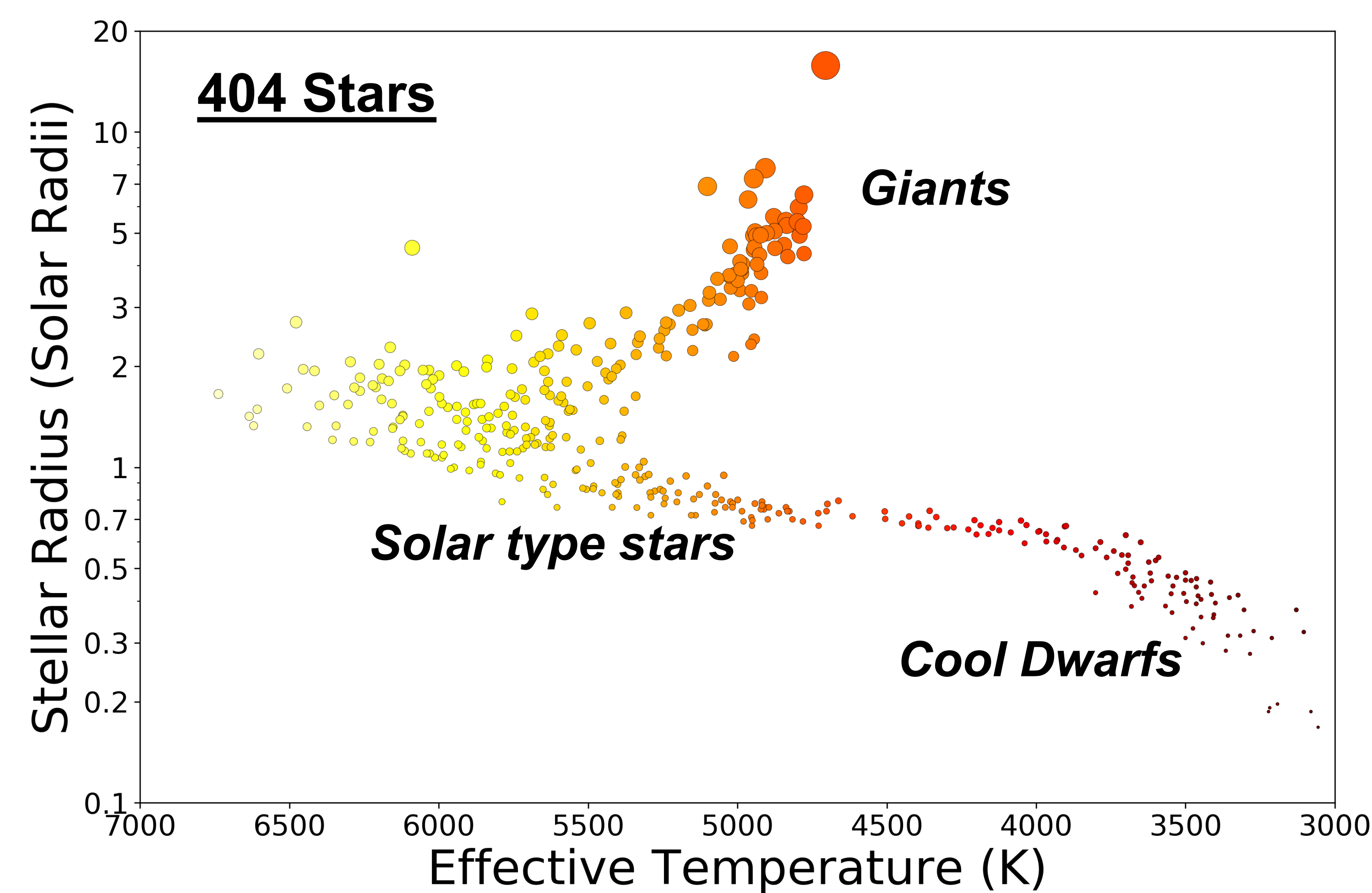
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## Introduction

Classifying stars by comparing their optical spectra has long been a workhorse of observational astronomy. Stellar spectra contain rich information about a star's effective temperature, radius, and metallicity.

SpecMatch-Empirical is a new **freely available** tool to rapidly extract these fundamental stellar properties by comparing a target spectrum to a spectral library of touchstone stars with well-determined properties.

## Library

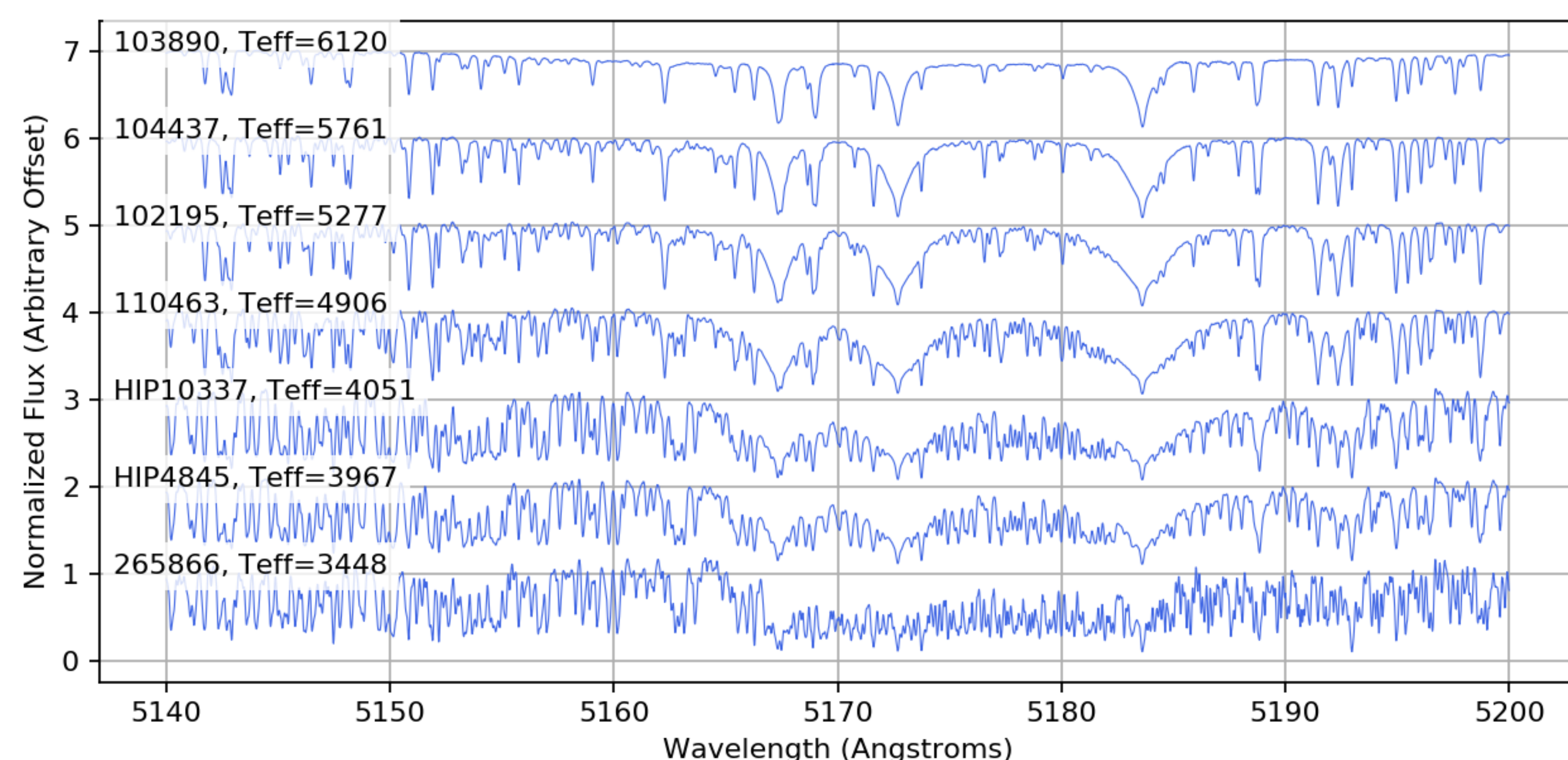


Empirically-determined parameters from:

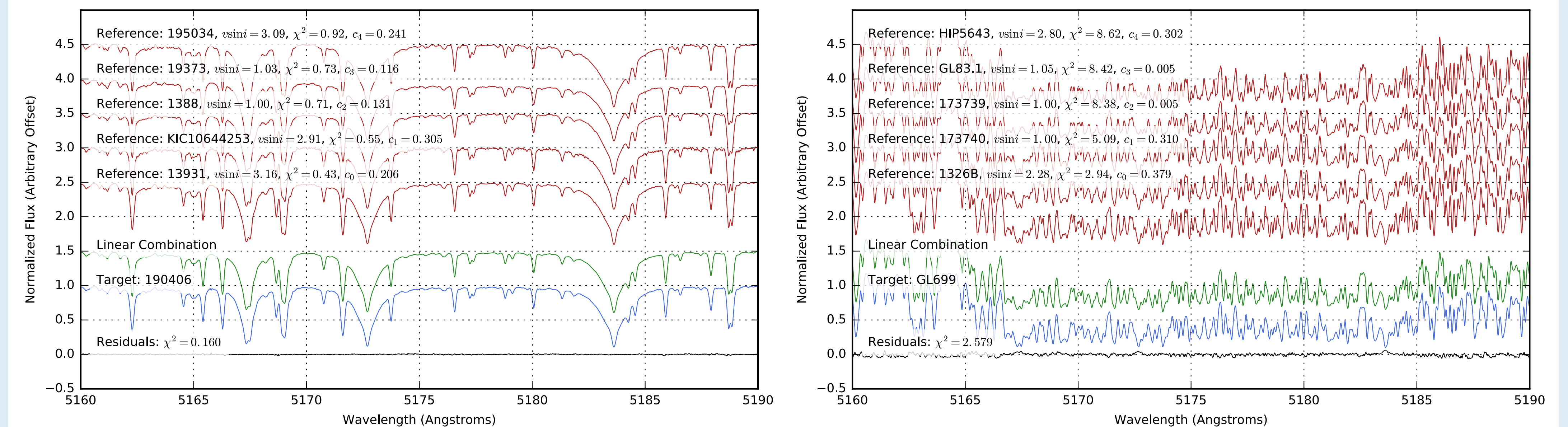
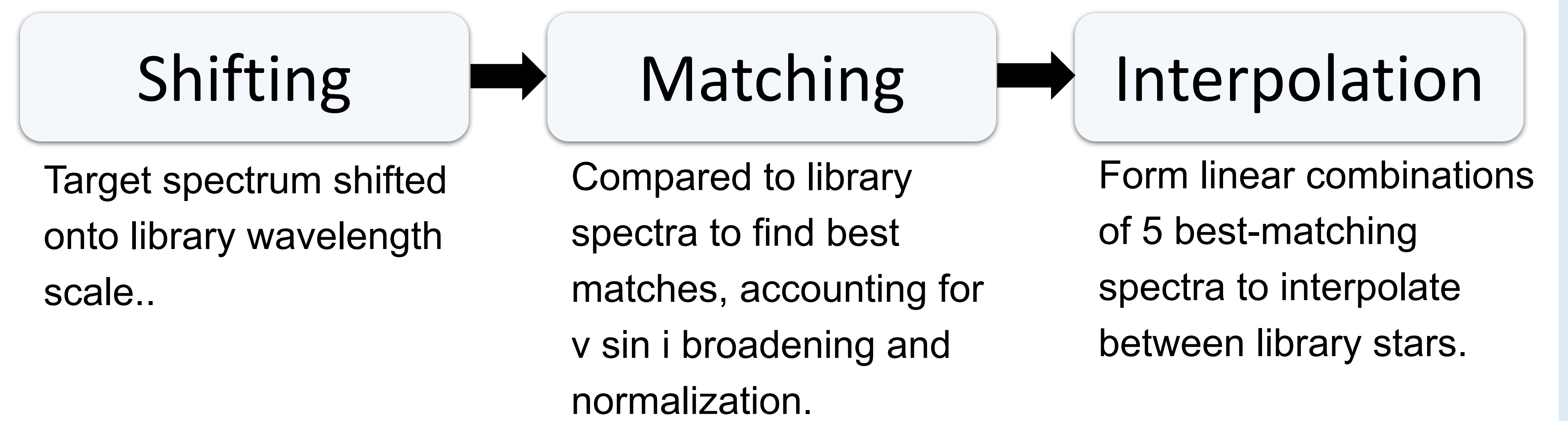
- Interferometry (von Braun et al. 2014)
- Asteroseismology (Bruntt et al. 2012)
- Spectroscopy (Brewer et al. 2016)
- Spectrophotometry (Mann et al. 2015)
- SED Modeling + Gaia parallax for 23 K dwarfs (this work)

Spectral Library:

- Taken using HIRES on Keck-I telescope
- High resolution ( $R = 60,000$ )
- High signal-to-noise ( $\text{SNR} \sim 150/\text{pixel}$ )

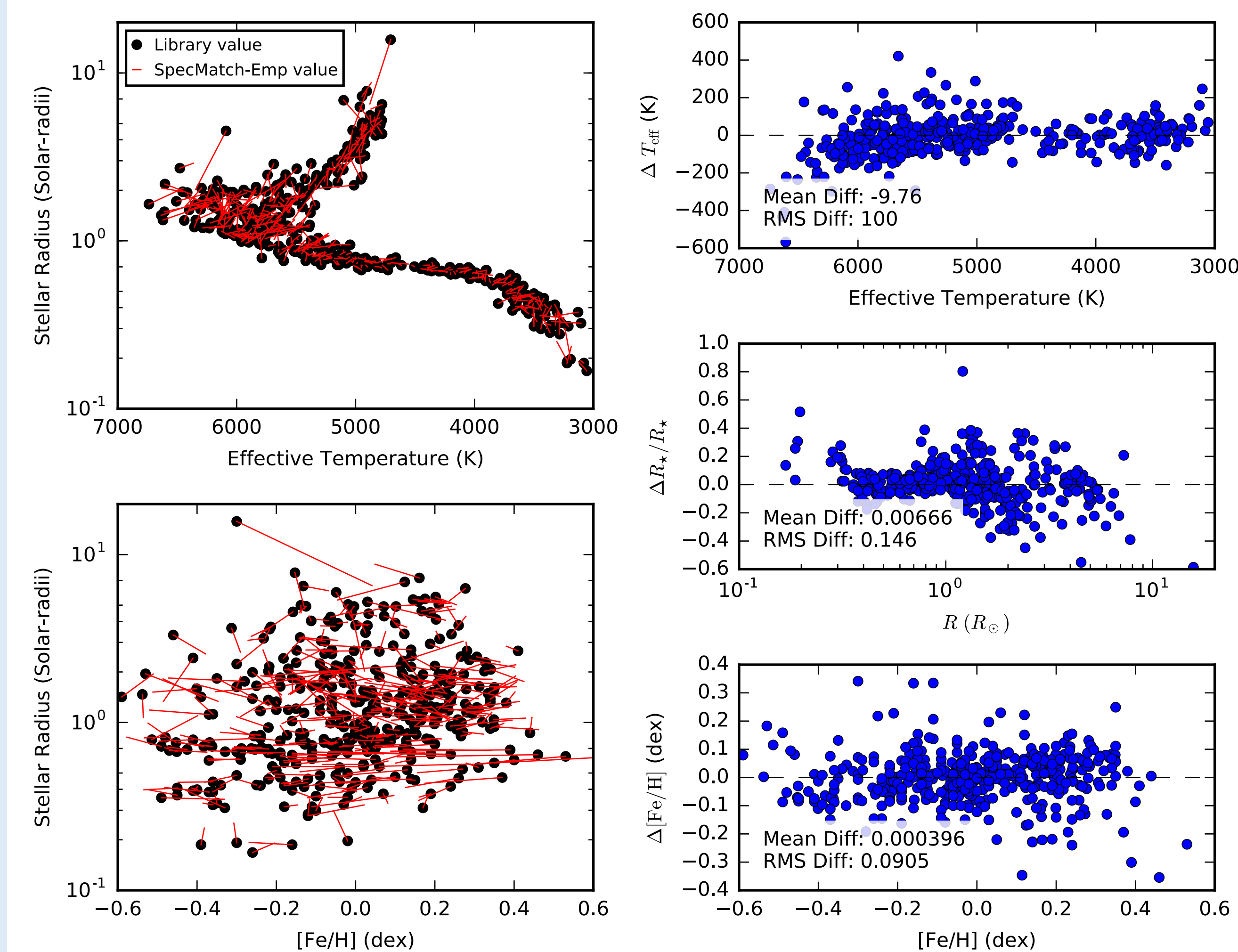


## Algorithm



## Performance

Internal Cross-Validation Analysis



	$\sigma(T_{\text{eff}})$	$\sigma(R)$	$\sigma[\text{Fe}/\text{H}]$ (dex)
<b>All Stars</b>	Typical Library Uncertainties		
	75 K	8%	0.07
	<b>Derived Properties Scatter</b>		
<b>Cool Stars (<math>T &lt; 4500</math> K)</b>	Typical Library Uncertainties		
	60 K	4%	0.08
	<b>Derived Properties Scatter</b>		
	70 K	10%	0.12

Algorithm is robust down to  $\text{SNR} \sim 10$  and resolution  $R \sim 30,000$