Optical and NIR Spectroscopic analysis of OB Stellar Atmospheres

Klaus Rübke[1,2], Artemio Herrero[1,2], Sergio Simón-Díaz[1,2] & Miriam García[1,2].

[1] Instituto de Astrofísica de Canarias

[2] Departamento de Astrofísica, Universidad de La Laguna

krubke@iac.es

Abstract

In order to test the self-consistency of present day model atmospheres of massive hot stars, we present stellar parameters for a few objects derived from the optical spectrum, and compare the resulting NIR profiles with observations data..

Motivation

OB stars actively shape their environment, and contributing to the chemical, and dynamical evolution of their host galaxies. Accurate analyses of massive stars are thus a key ingredient in our interpretation of the light coming from the Milky Way and nearby galaxies. These analyses rely the use of state-of-the-art model atmospheres, that have to be as realistic as possible. In our project, we aim at testing the self-consistency of our model atmospheres when carrying out simultaneous analyses in the optical and the NIR. This is particularly relevant for our galaxy, where extinction obscures the optical wavelengths and the inner OB population can only be studied in the IR

The Sample

We selected stars from the IACOB catalog (Simón-Díaz et al. 2011) containing optical stellar spectra observed at high resolution (R>20000) and S/N (>150) in the optical wavelength range. From those, we selected star also present in the NIR catalog by Hanson et al., (2005).

Fastwind Model and Grid

We use the model atmosphere code FASTWIND (Puls et al. 2005). The code includes NLTE, sphericity, mass loss and line blanketing. Its fast performance makes it possible to create grids covering a large range of stellar parameters with low computational times. Our FASTWIND grid (Simón-Díaz et al. 2011) consists of ~192000 models for which: Teff, log g ,He abundance, wind strength (log Q), wind velocity law exponent (β) and microturbulence are varied. The reduced size is ~34Gb. Our predefined grid can be easily updated and/or extended if necessary using appropriate scripts implemented in IDL, CONDOR, and LINUX

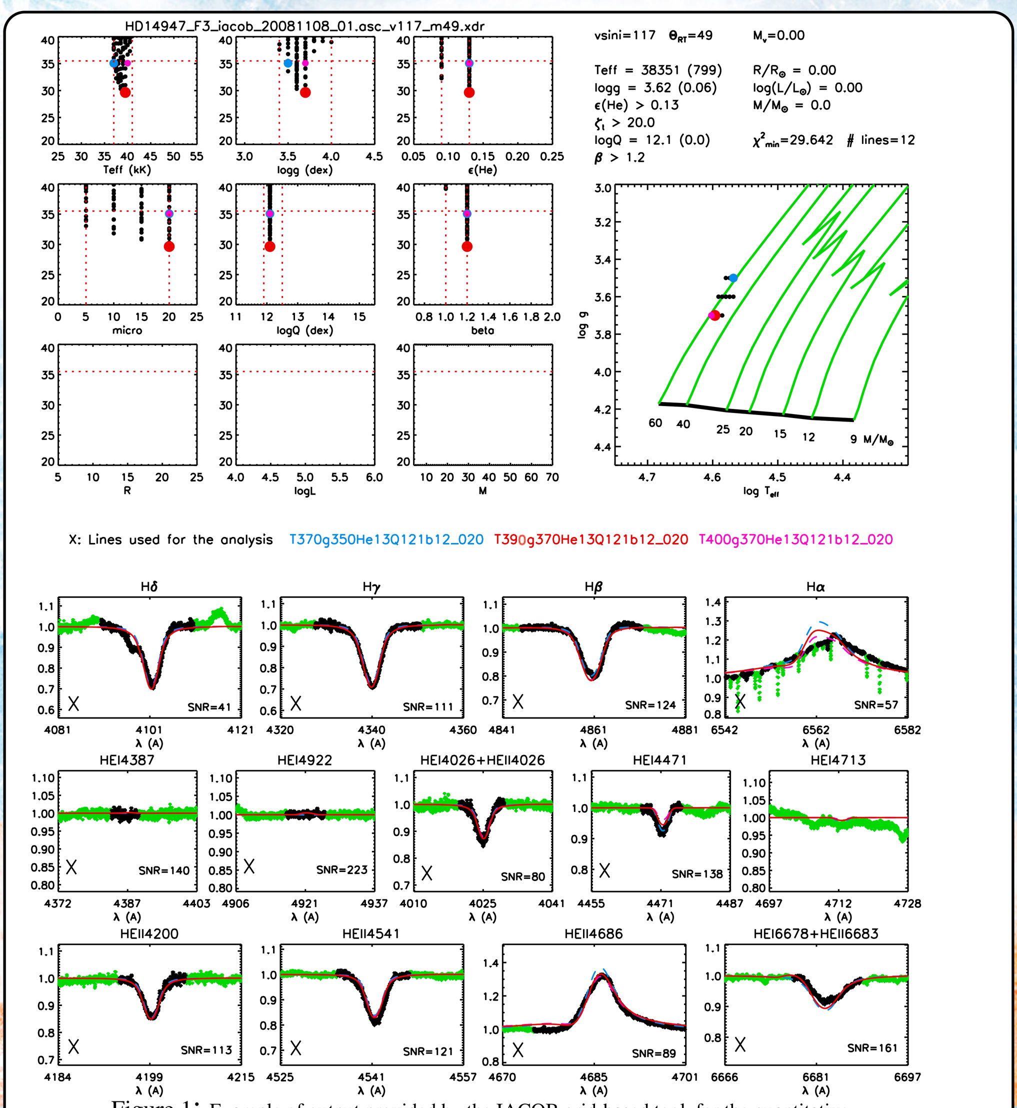

Figure 1: Example of output provided by the IACOB grid-based tool, for the quantitative spectroscopic analysis of the Galactic O5If star HD14947.

Stellar and wind parameter determination

To determinate stellar parameters for each of the stars in the sample we use the iacob_gbat, grid-based automatic tool (Simón-Díaz et al. 2011). This software package explores in idl the FASTWIND grid previously generated, using standard techniques Herrero et al., (2002),and Repolust et al., (2004) it makes automatic fit for H and He profiles. This method delivers the distribution of chi-squared values for each model (Figure 1) from which the best-fit parameters can be determined. In our analysis >70000 models were used for each star.

Results and Conclusions

After deriving stellar parameters from the fitting of the optical spectra, we calculated the NIR spectra with FASTWIND. As can be seen in Figure 2, the optical parameters do not always fit the infrared spectrum. As future work we will check if this discrepancy lies in problems with the atomic models, or whether it lies in the higher sensitivity of NIR to stellar wind effects.

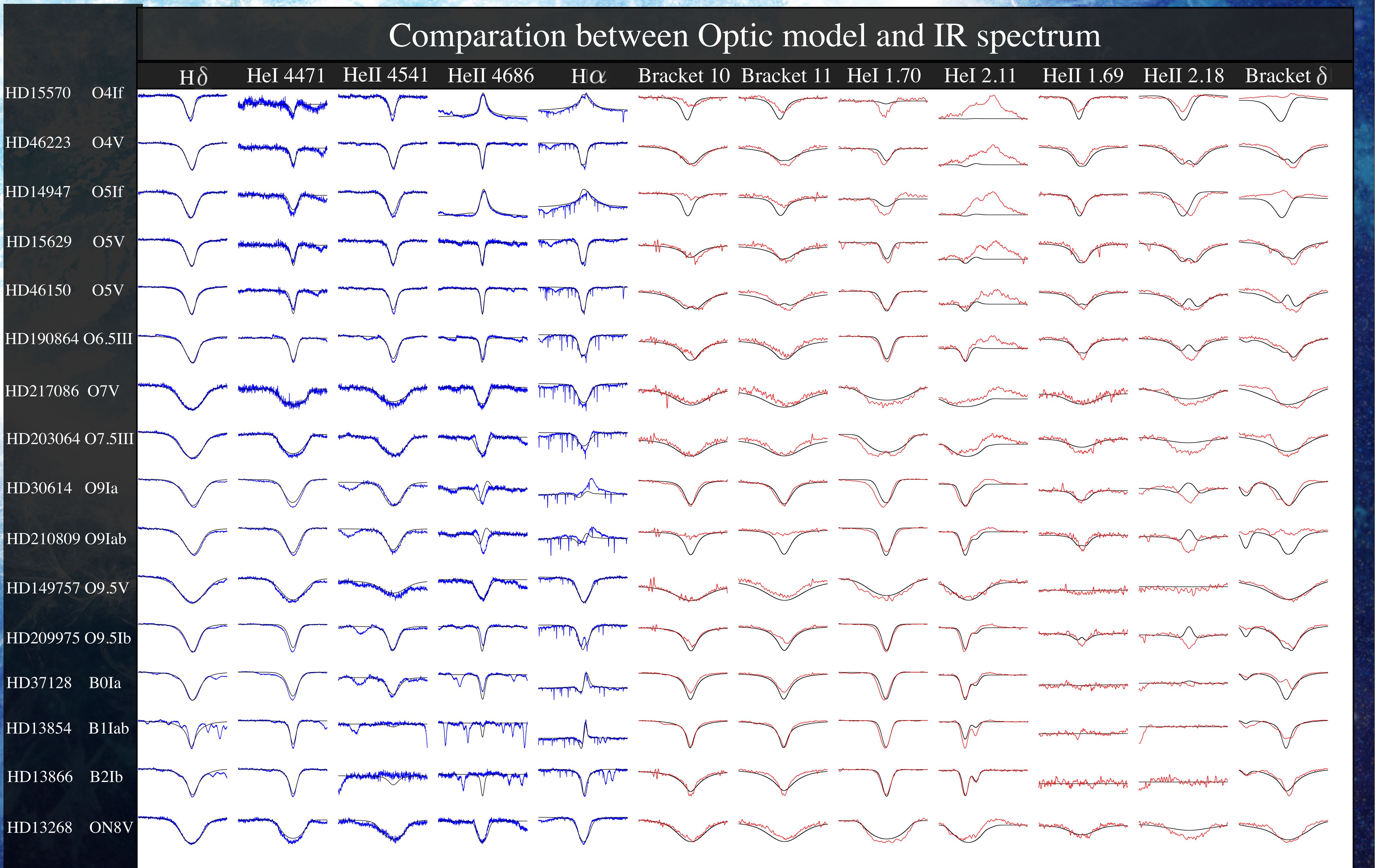

Figure 2 : Comparative plot, in blue the optical spectra, in red de infrared spectra and in black the models.

Future Work

✤ Find diagnostics for stellar parameters based exclusively on NIR lines.

✤ Check the atomic models for the NIR lines generated

✤ Examine how to use the NIR lines to constrain the stellar wind parameters

Acknowledgments

This work has been partially funded by Spanish MICINN under Consolider-Ingenio 2010 (CSD2006-00070, http://www.iac.es/consolider-ingenio-gtc/) and grant AYA2010-21697-C05-04.
The authors also gratefully acknowledge support from the Gobierno de Canarias (grant PID20100119).

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