

# A SPECTROSCOPIC SURVEY OF FIELD HORIZONTAL-BRANCH STARS NEAR THE SOUTH GALACTIC POLE

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## Abstract

We present the results of a medium-resolution spectroscopic survey of 43 FHB candidates carried out near the south Galactic pole, selected from the original list of FHB candidates compiled by Beers et al. (2007). The observation list includes only stars designated by Beers et al. (2007) as *high-probability* candidates, according to their 2MASS infrared colours. Atmospheric parameters of some stars have been obtained by comparing some spectral features with theoretical models provided by Kurucz (1993). The effective temperature was determined from the B-V colour and, when this measurement was not available, it was estimated from the 2MASS J-H colour index. A comparison between the theoretical curves  $T_{\text{eff}}$  versus  $H\delta$   $D_{0.2}$  and the data allowed the determination of the stellar gravity, and the metallicity was estimated by comparing the equivalent width of the MgII 4481 line with theoretical models. About 77% of the sample have been classified as FHB stars, ~10% as subdwarfs, whilst the remaining 13% are probably main-sequence A-type stars far from the Galactic plane.

## 1. The sample and the spectroscopic observations

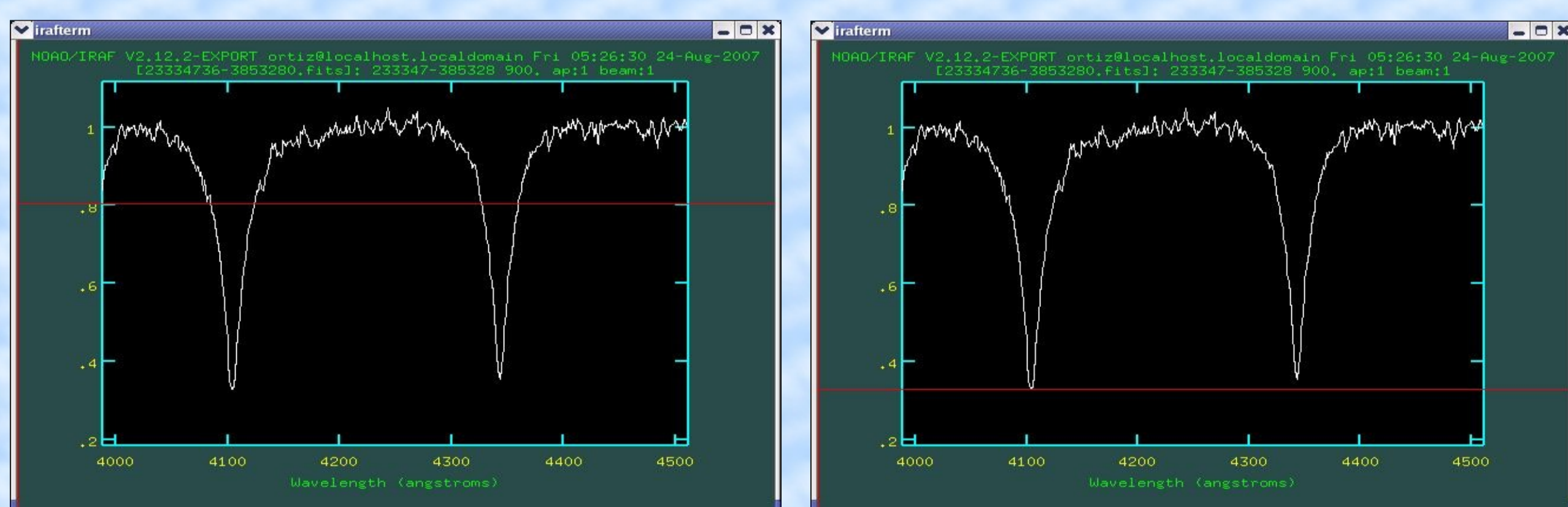
All the 43 stars have been previously classified as *high-probability* FHB by Beers et al. (2007). The selection criteria are the following:

$$-0.2 < (B-V)_o < +0.2$$

$$b < -60^\circ$$

The spectra were obtained with the Boller & Chivens Cassegrain Spectrograph and the 1.6-m Telescope of the Pico dos Dias Observatory (LNA, southeast Brazil). The reciprocal dispersion was 1.2 Å/pixel, using a 600 lines/mm grating, and the SNR varied between 19/1 and 125/1 at  $\lambda=4480$  Å.

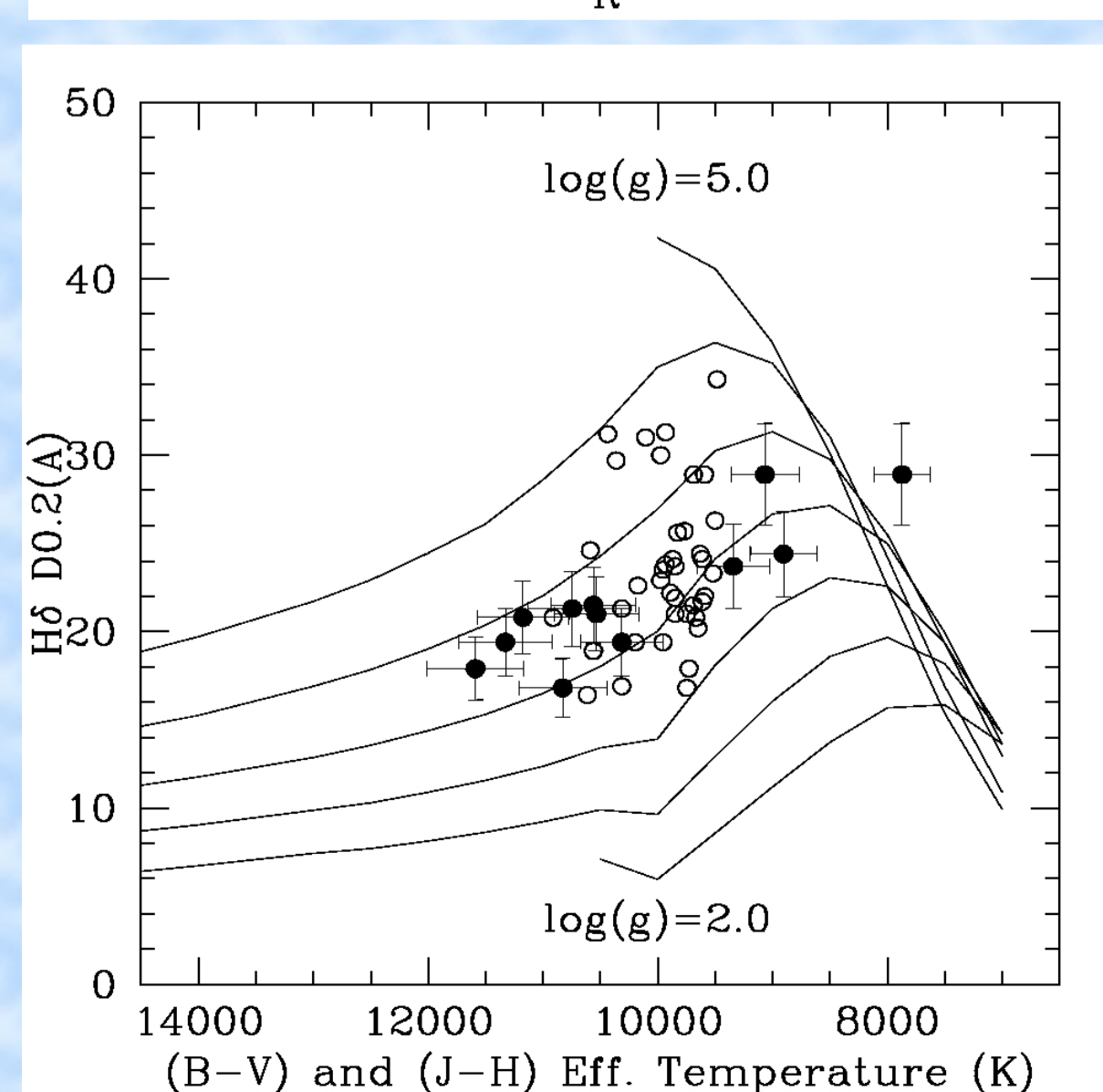
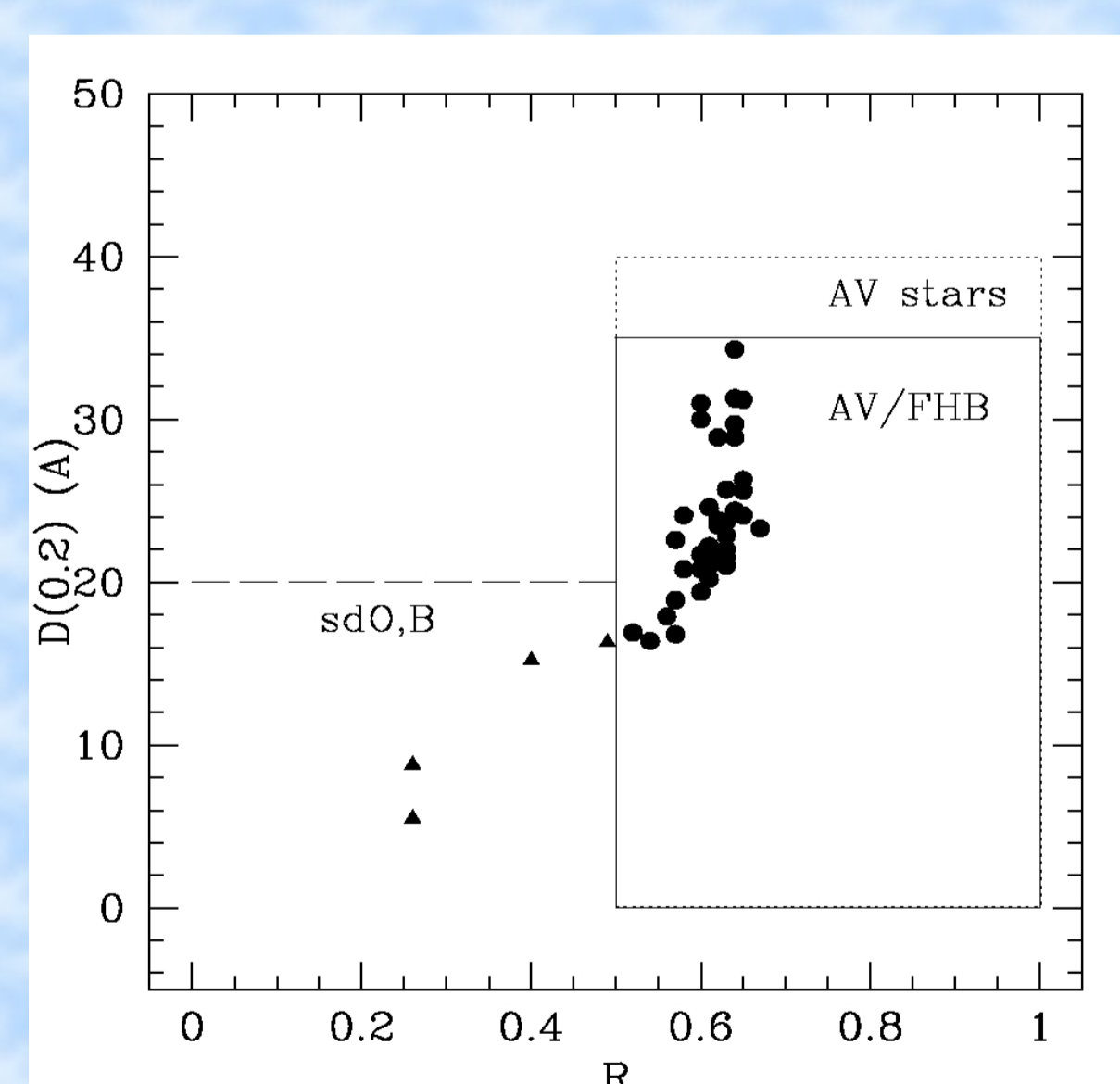
The figures below show two line quantities used to classify the spectra. The  $H\delta$   $D_{0.2}$  quantity (left) is the  $H\delta$  line width taken at 80% of the continuum. The  $R$  index (right) is the line depth relative to the normalized continuum.



## 2. Results:

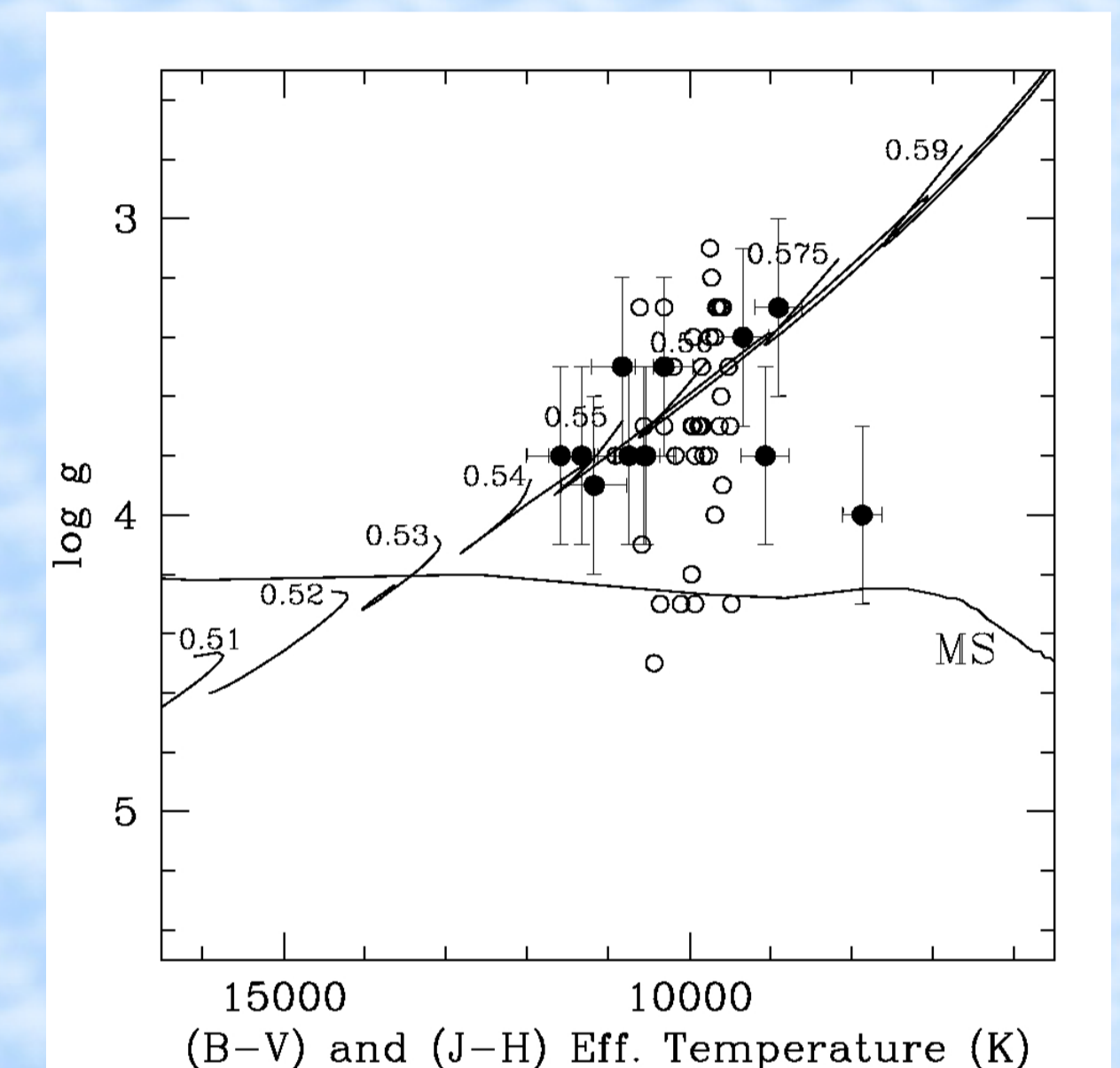
The  $H\delta$   $R$  versus  $D_{0.2}$  diagram (right) proposed by Pier (1983) and Sommer-Larsen & Christensen (1986) clearly discriminates the subdwarfs, but it does not provide an efficient way to distinguish FHB from main-sequence (AV) stars.

$T_{\text{eff}}$  versus  $H\delta$   $D_{0.2}$  diagram (right).  $T_{\text{eff}}$  has been obtained from the *measured* (B-V) (filled circles) and the *estimated* (B-V) from the (J-H) colour (open symbols). Continuous lines have been calculated from Kurucz's models.



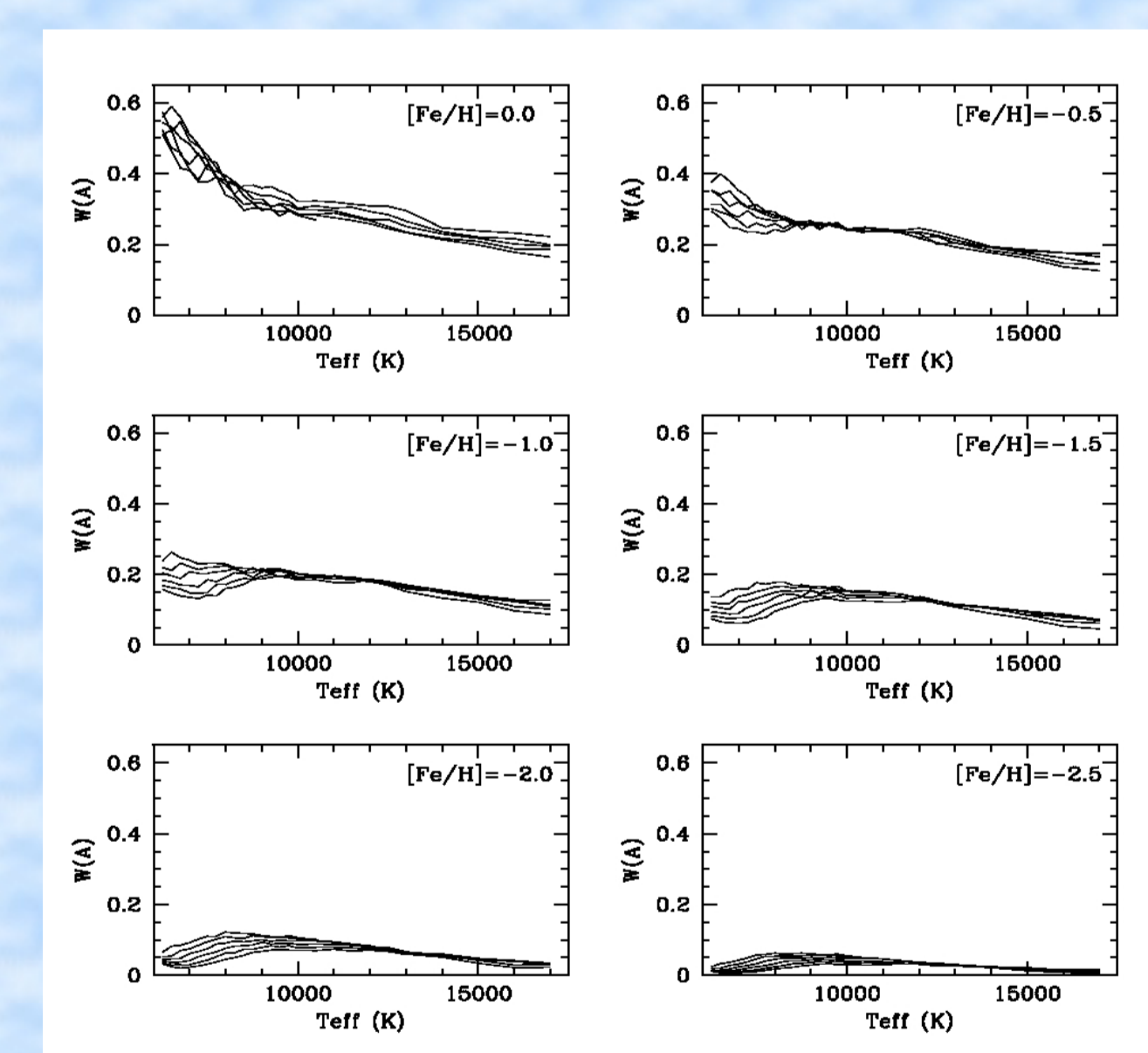
## Stellar gravity versus $T_{\text{eff}}$ diagram

(right): The temperatures have been obtained from the *measured* (B-V) colour (filled circles) and the *estimated* (B-V) from the (J-H) colour (open symbols). The continuous lines designate the theoretical MS and ZAHB for several stellar masses.



## The metallicity:

[Fe/H] of hot stars is generally estimated from the equivalent width of the CaII 3933 line. However, this feature shows strong dependence with  $T_{\text{eff}}$ , which can be only crudely estimated in some cases. In this work [Fe/H] is estimated from the MgII 4481 equivalent width, which shows little dependence with  $T_{\text{eff}}$  (below).



## Main conclusions of this work:

- The criteria proposed by Beers et al. (2007) for selecting FHB stars produced the following results:
  - **77% of the stars have been classified as FHB**
  - **10% are subdwarfs**
  - **13% are main-sequence (AV) stars**
- The  $H\delta$   $D_{0.2}$  parameter is a good estimator of the **stellar gravity**
- **[Fe/H]** can be better estimated using the **MgII 4481** line width rather than CaII 3933.

## References:

Beers et al., 2007, ApJS, 168, 277

Kurucz, R.L., 1993, *Private Communication to R.W.*

Pier, J.R., 1983, ApJS, 53, 791

Sommer-Larsen & Christensen, 1986, MNRAS, 219, 537