CARMENES

Spectroscopic characterization of CARMENES target candidates

V. M. Passegger[1], S. Wende[1], A. Reiners[1], S. V. Jeffers[1], A. Lamert[1], A. Quirrenbach[2], P. J. Amado[3], J. A. Caballero[4], D. Montes[5], R. Mundt[6], I. Ribas[7] and the CARMENES Consortium

[1]Institut für Astrophysik Göttingen · [2]Landessternwarte Königstuhl · [3]Instituto de Astrofísica de Andalucía · [4]Centro de Astrobiología · [5]Universidad Complutense de Madrid · [6]Max-Planck-Institut für Astronomie · [7]Institut de Ciències de l'Espai

Our URL: **http://carmenes.caha.es/**

Abstract. CARMENES, a new upcoming high-resolution spectrograph at Calar Alto observatory, will search for planets in the habitable zones of M dwarfs. High-resolution spectra from CAFE/2.2 m Calar Alto and FEROS/2.2 m La Silla have been obtained to characterize the candidate sample regarding effective temperature (T_{eff}), surface gravity (log g), metallicity ([Fe/H]) and rotational velocity (v sin$i$). For this we developed an algorithm using PHOENIX-ACES model spectra and χ^2-minimization. We show a sample overview and first results of our work.

Introduction. We determine stellar parameters of the CARMENES M-dwarf sample using high-resolution spectra taken with FEROS and CAFE. This will help to characterize planets that might be found orbiting those stars. In M dwarfs the parameters T_{eff}, log g and [Fe/H] can be strongly degenerate, so spectral regions should be used which are sensitive to one or more stellar parameters simultaneously.

Method. We use the following spetral regions for the model fit:

- T_{eff}: TiO-bands around λ 705-718 nm and 843.7 nm
- log g: K I (λ 766.6 nm, 770.1 nm), Na I (λ 818.5 nm, 819.7 nm)
- [Fe/H]: same as for Teff and log g

We compare PHOENIX-ACES model spectra [1] to our observations. This latest PHOENIX model grid uses a new equation of state to account for the formation of molecules in M dwarfs. A downhill simplex walks around in the four-dimensional parameter space (T_{eff}, log g, [Fe/H], $v$sin$i$) and χ^2-minimization determines the best fit to the data. Figure 1 shows an example of a good fit.

Figure 1: Spectrum of HD 285968 (M2V, black) and the best fit model (green: model outside fit region, red: model inside regions for χ^2-minimization).

Figure 2: Spectral type-temperature relation together with average and standard deviation for each spectral type (from spectral indices [2], left) and temperature distribution of candidate sample (right).

Results. Using the method described above stellar parameters have been obtained for 390 FEROS and 260 CAFE spectra. Figure 2 shows first results from these spectra. The spectral types have been calculated using spectral indices [2]. As shown in Figure 2 most stars lie within a temperature range of 3200-3900 K with spectral types between M1V and M5V.

References. [1] Husser et al. 2013, A&A, 553, A6. [2] André Lamert, "Spectroscopic analysis of CARMENES sample", Msc thesis 2014