IV. Preliminary low-resolution spectroscopic characterisation

F. J. Alonso-Floriano[8], D. Montes[8], J. A. Caballero[co-PM,10], A. Klutsch[8], J. C. Morales[4], R. Mundt[1], I. Ribas[PS,4], A. Reiners[co-PS,5], A. Quirrenbach[PI,3], P. J. Amado[co-PI,2] and the CARMENES Consortium[1,2,3,4,5,6,7,8,9,10,11]

[1]Max-Planck-Institut für Astronomie • [2]Instituto de Astrofísica de Andalucía • [3]Landessternwarte Königstuhl • [4]Institut de Ciències de l'Espai • [5]Institut für Astrophysik Göttingen • [6]Instituto de Astrofísica de Canarias • [7]Thüringer Landessternwarte Tautenburg • **[8]Universidad Complutense de Madrid** • [9]Hamburger Sternwarte • [10]Centro de Astrobiología • [11]Centro Astronómico Hispano-Alemán – Calar Alto Observatory

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

Abstract. Our project consists in the characterisation of M dwarfs to define the input catalogue of CARMENES, a next-generation instrument to be built for the 3.5 m telescope at Calar Alto. We have used the CAFOS spectrograph at the 2.2 m Calar Alto telescope for observing over 300 stars from our initial sample with a spectral resolution R ~ 1500. We have performed a spectral-type classification of the targets by comparing their acquired spectra with those of spectral-type standard stars observed during the same observing runs, and using spectral indices well calibrated for M dwarfs, such as TiO5, CaH2 and CaH3. We have also derived chromospheric activity indicators (e.g. Hα). Our final goal will be to choose the best candidates to be observed with this future exoplanet hunter and prepare the CARMENCITA (CARMENES Cool star Information and daTa Archive) database.

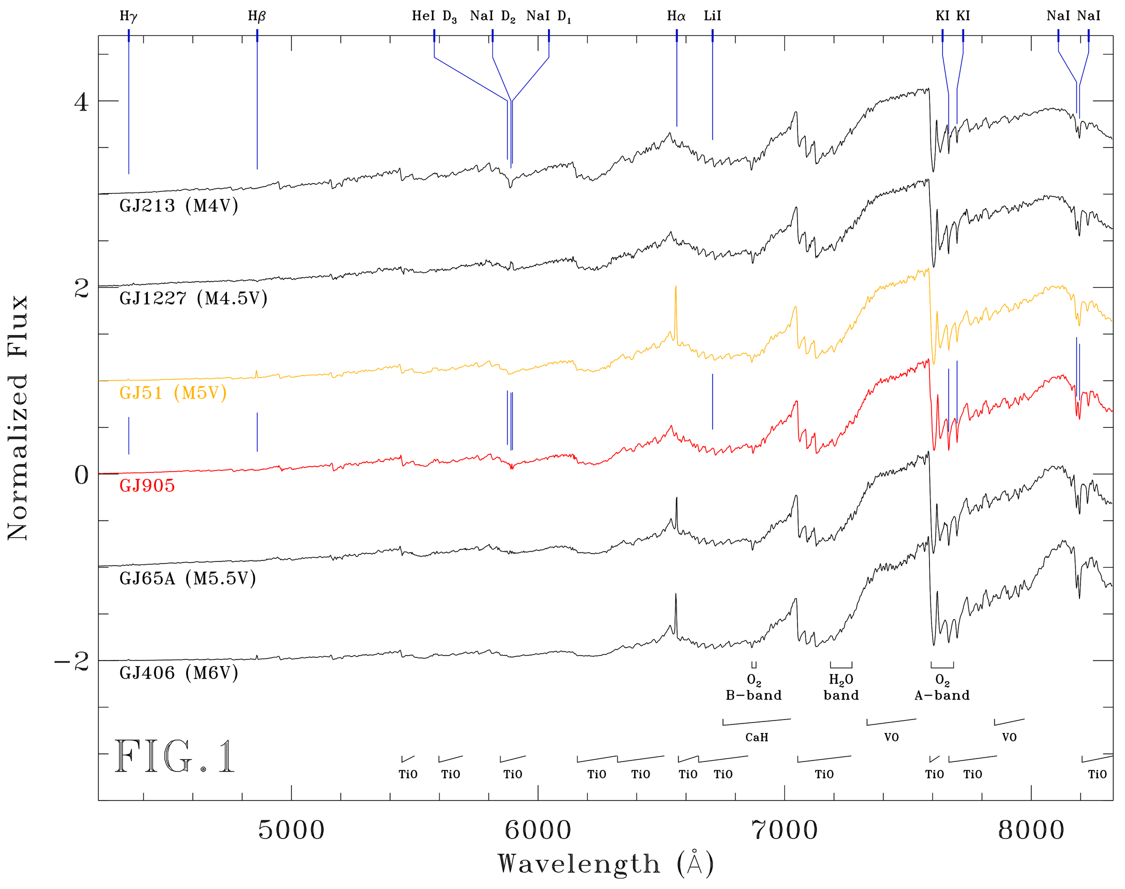

FIG.1

Input sample. Until now, we have observed 362 stars, mostly taken from Lépine & Gaidos (2011) and the Gliese and Luyten catalogues (see Poster CARMENES II by Caballero et al.). Of them, 50 stars are standard stars (K5 to M7 for both dwarf and giant classes) from which we retained only the most representative one for each spectral type (SpT). The rest of the sample will be observed in forthcoming CAFOS runs.

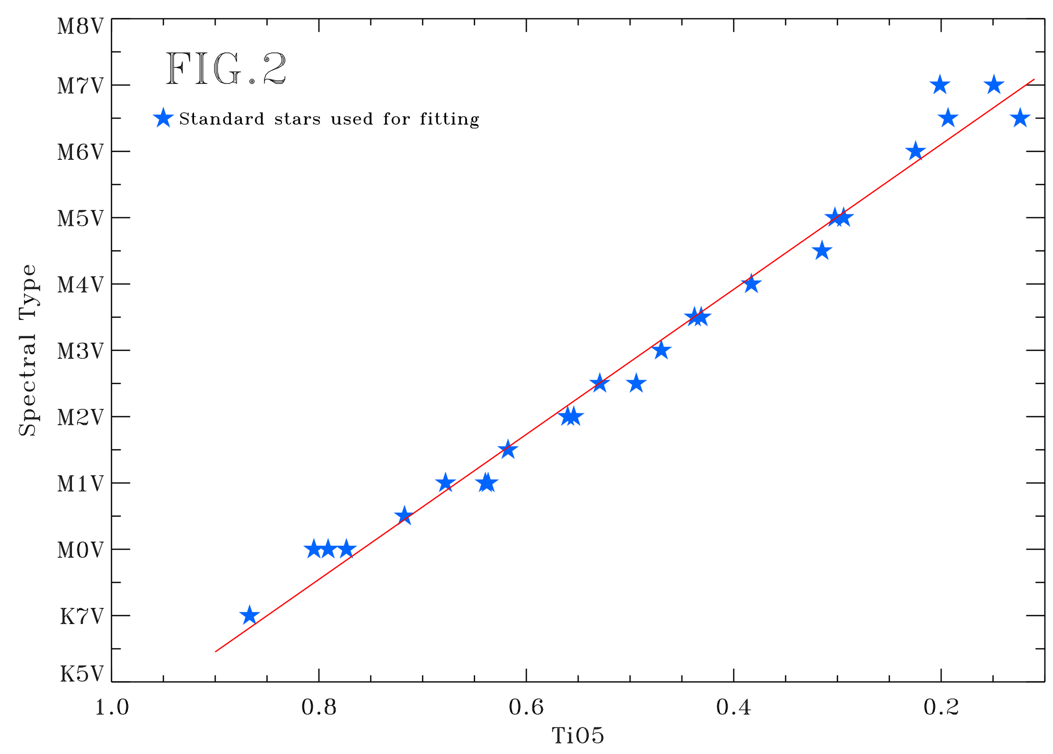

FIG.2

Spectral typing. By least-square minimisation: we look for the best matches between normalised spectra and our standards. (Fig.1: in red, target spectrum; in orange, the best match; in black, other standard spectra). **By calibration with spectral indices:** we derive the spectral types of our stars by interpolating the relation between one given spectral index and the spectral type (e.g. TiO5 see Fig.2). The indices studied until now (TiO1-5, CaH1-3, CaOH and Hα) come from Reid et al. (1995), but more indices will come later (e.g. Lépine et al. 2003). The accuracy between our two methods is ±0.5 subtypes. Our results show that the SpTs of the 312 target stars mainly range from M3V to M5V.

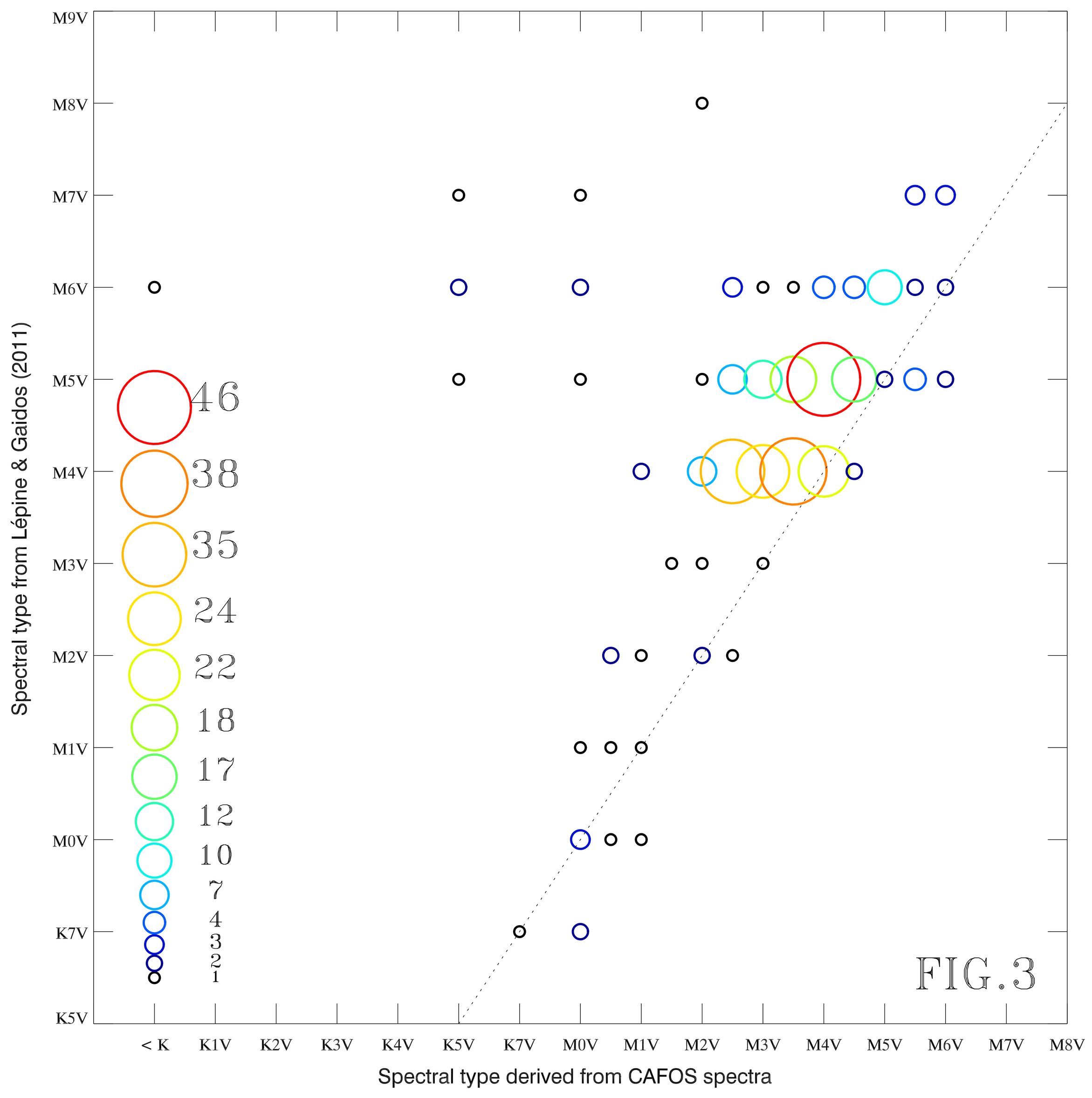

FIG.3

Comparison. Most of the standard stars, which are both in PMSU catalogue (Hawley et al. 1996) and in our sample, have the same SpT, with an accurancy of ±0.5 subtypes. We also compared our SpTs with those estimated by Lépine and Gaidos (2011; Fig. 3). We found that SpTs derived from optical-nIR colours are 1-2 subtypes later than SpTs derived from our spectra (and over 5 subtypes in some cases).

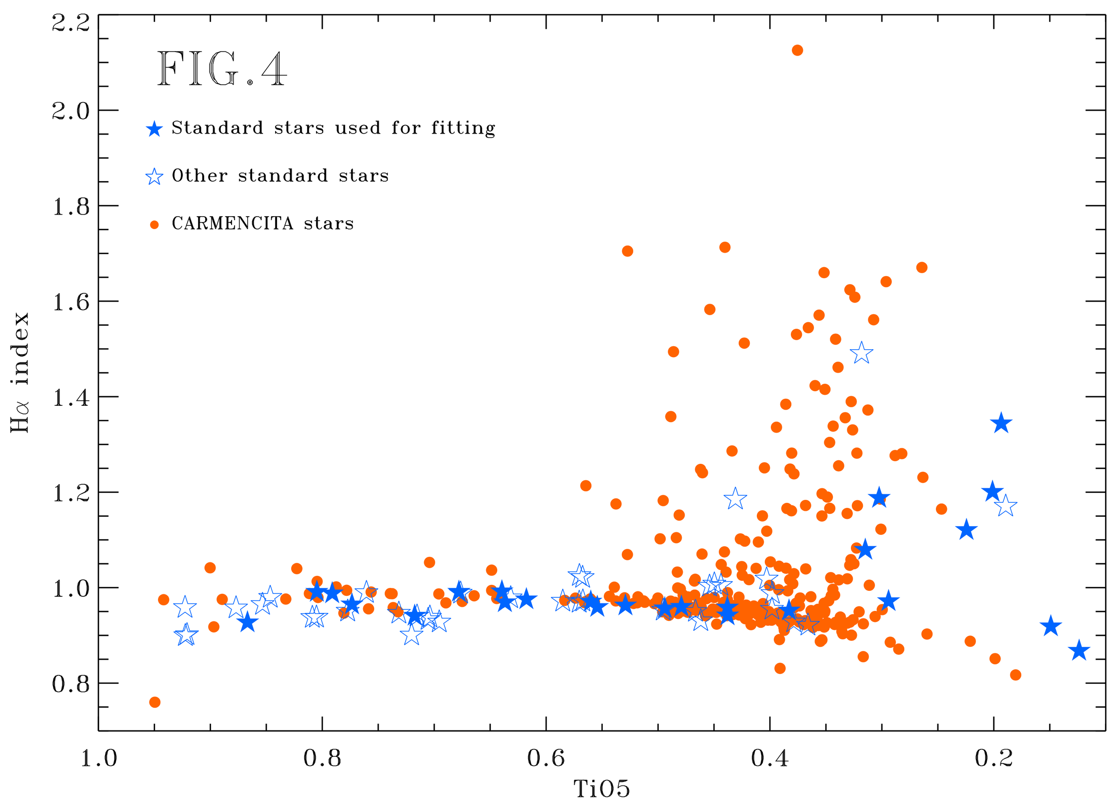

FIG.4

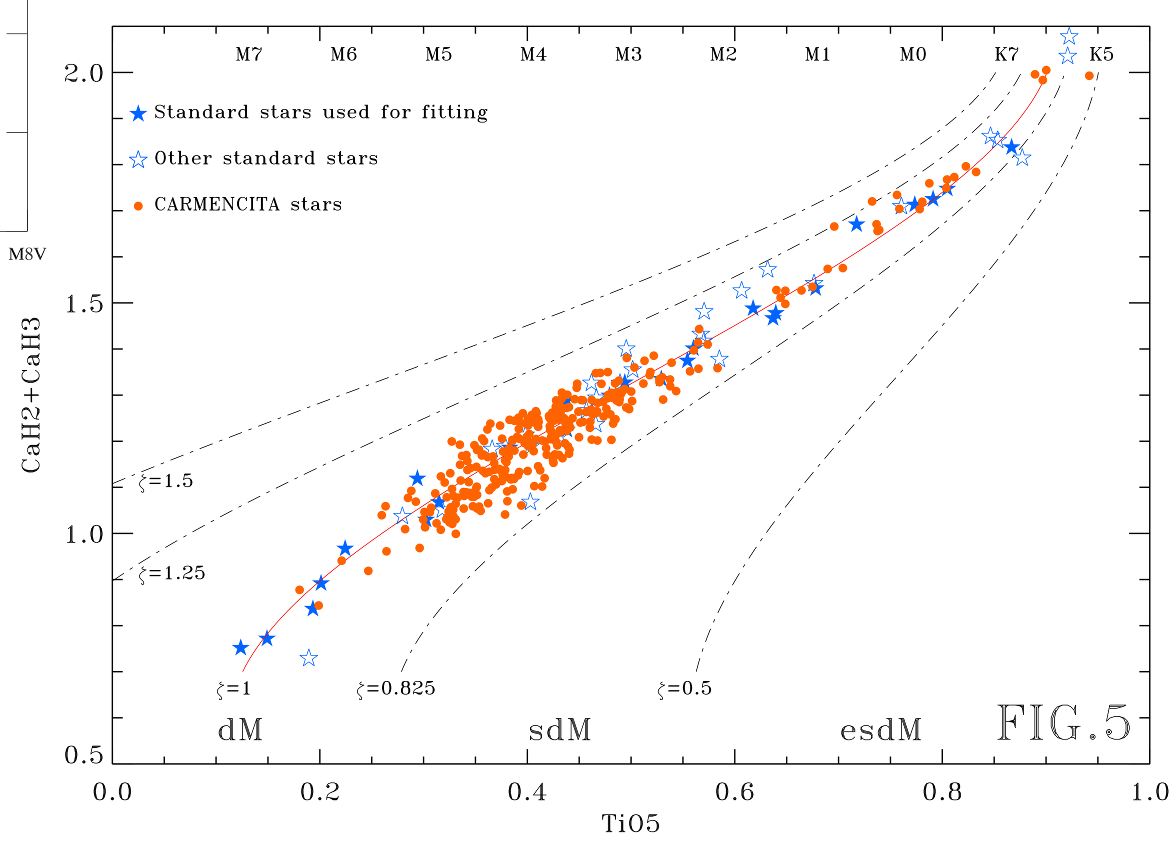

FIG.5

Chromospheric activity. The Hα index allows us to make a preliminary identification of active stars in our sample. The most active stars have SpTs M4-5V (Fig.4). A detailed study of the Hα and Hβ behaviours will give us a better characterisation of their activity.

Metallicity. We have determined relative metallicities using the method described by Lépine et al. (2007), where $\varsigma = [1\text{-TiO5}]/[1\text{-TiO5}_{\odot}]$. None of our targets are classified as subdwarfs in our sample (Fig.5). For absolute metallicities see the CoolStars17 poster by Montes et al.

Acknowledgements. This work was supported by the Universidad Complutense de Madrid (UCM), the Spanish Ministerio de Economía y Competitividad (MINECO) under grants AP2009-0187, AYA2011-30147-C03-02, and the Comunidad de Madrid under PRICIT project S2009/ESP-1496 (AstroMadrid).

Calar Alto CSIC ICE TLS