Abstract

We present spectroscopic characterization of 39 early-type stars located in the Kepler satellite field of view. Fourteen stars have been already selected as Kepler targets and they will be observed during the first 9 months of observations. The observations have been carried out at the INAF - Osservatorio Astrofisico di Catania, during the summer 2007. For all the stars, using spectral synthesis, we have derived the stellar atmospheric parameters such as: effective temperatures, surface gravities and metallicities. Rotational and radial velocities have been derived as well. For a few stars also the spectral type has been estimated. Detailed abundances have been computed for the 11 stars with the lowest rotational velocity (v sin i < 90 km s\(^{-1}\)). One of this (HIP 96230) resulted to be a Manganese star. General remarks are discussed in the text.

Characterization of the stellar atmospheres

We have used our spectra to perform the spectral classification of the targets. For this purpose we have degraded their resolution from 20000 to 3000, convolving them with a Gaussian kernel of the appropriate width, and we have measured the equivalent width of photospheric absorption lines useful for the spectral classification of hot stars, such as: H\(_\alpha\), He I 4471 Å, and He I 5876 Å, as well as the MgiI 4481 Å (Hernandez et al., 2004). From their calibration relations EW-Spectral type, we have derived the spectral type. The uncertainty, as derived from the agreement between different diagnoses, is typically of about 1 spectral subclass, but reaches 2 subclasses in the worst cases (lowest S/N and/or high v sin i).

The radial velocity measurements were obtained cross-correlating each echelle order of the targets with the corresponding one of a bright RV standard star. We selected HD389 (A2V-V), i Ps (F7V), and Vega (A0V) as RV standard stars. For this purpose the IRAF task FXCOR was used.

The approach we used to determine effective temperature (T\(_\text{eff}\)) and surface gravity (log g) was to compare the observed and theoretical profiles of a Balmer line. In practice, the procedure used for our targets was to minimize the difference among observed and synthetic H\(_\alpha\) profiles, using goodness-of-fit parameter i\(^2\). Errors have been estimated as the variation in the parameters which increases the i\(^2\) of a unit. The synthetic profiles have been computed by using Kurucz codes ATLAS9 and SYNTHE, the former to compute the LTE atmospheric model and the latter to derive the synthetic profile. The rotational velocity for each star has been computed by matching the observed profile of the Mgii I 4481 Å line with a synthetic one. Results are displayed in Tab. 1. For all the slow rotating stars we performed a detailed chemical analysis. We used the atmospheric parameters reported in Tab. 1 to compute the ATLAS9 LTE atmospheric model and SYNTHE to reproduce the observed spectra. Tab. 2 reports the abundances computed for the selected stars. For the remaining fast rotating stars, it was possible only to derive their iron content using two prominent FeII lines, at 5018 Å and 5316 Å. The results have been reported in Tab. 3.

Table 1. Here are reported: Hipparcos ID, other name, spectral type, T\(_\text{eff}\), log g, radial velocity, heliocentric pulsation day and radial velocity. All these quantities have been evaluated by us. Stars labeled in red are those for which a detailed abundance analysis has been performed. Footnote a) means that the star has already been selected to be observed with Kepler.

Table 2. Chemical abundances computed for the slow rotating stars (v sin i < 90 km s\(^{-1}\)) of our sample. The abundances are given in terms of the solar ones (Asplund et al., 2005).

Table 3. Iron abundances for the fast rotating stars of our sample. Typical errors are of the order of 0.3 dex.

Conclusions

In this paper we have presented the preliminary results obtained for a sample of early-type stars considered to be observed with Kepler satellite. For all the objects we computed the radial and rotational velocity, and when possible we estimated the spectral type. Further, we divided our objects in two groups depending to their rotational velocity: slow rotating (v sin i < 90 km s\(^{-1}\)) and fast rotating (v sin i > 90 km s\(^{-1}\)) stars. For the stars belonging to the former group we undertook a detailed abundance analysis (see Tab. 2), all those stars show good standard abundances with the exception of three objects: HIP 93941, HIP 96061 with an enhanced metallicity and HIP 96920 that shows the typical fingerprints of HgMn stars, i.e. strong overabundance (0.72 dex) of magnesium of the latter group, show instead standard iron content (see Tab. 3).

We have also placed in the HR diagram all the objects with a fairly accurate parallax. With the only exception of HIP 93941, they seem to be main sequence stars. The former object shows instead a location consistent with the stellar parameters derived by us and deserve a more accurate analysis.

References

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