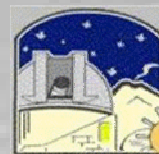


Searching for solar twins in the open cluster M67

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Introduction

Exo-planet research:

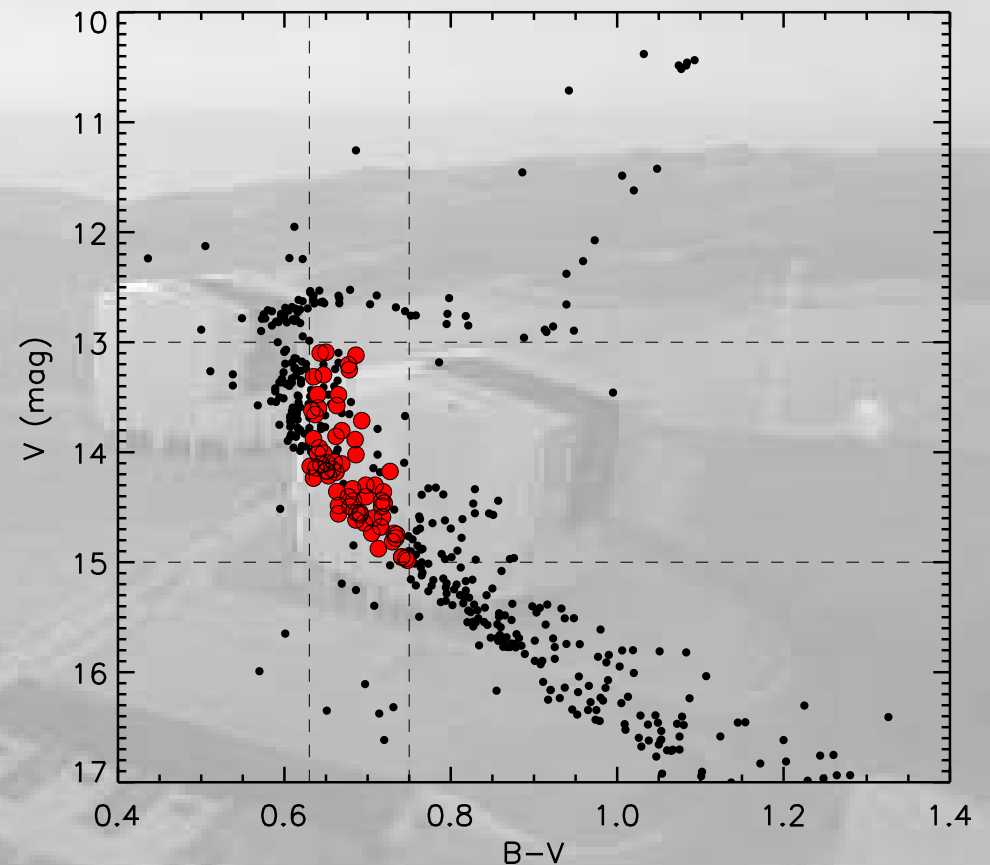
- ❑ field stars (variety in mass, age, chemical composition, etc.)
- ❑ solar stars → open clusters (homogeneous age and chemical composition, common birth and early dynamical environment, Randich et al. 2005) → good target: M67 (NGC 2682)

Why are we interested in M67?

- ❑ Many main sequence stars
- ❑ Age encompassing that of the Sun (≈ 4 Gyr, Puls et al. 1998)
- ❑ Solar metallicity ($[Fe/H]=0.03\pm 0.02$, Randich et al. 2006)
- ❑ Lithium depleted G stars (Pasquini et al. 1997)

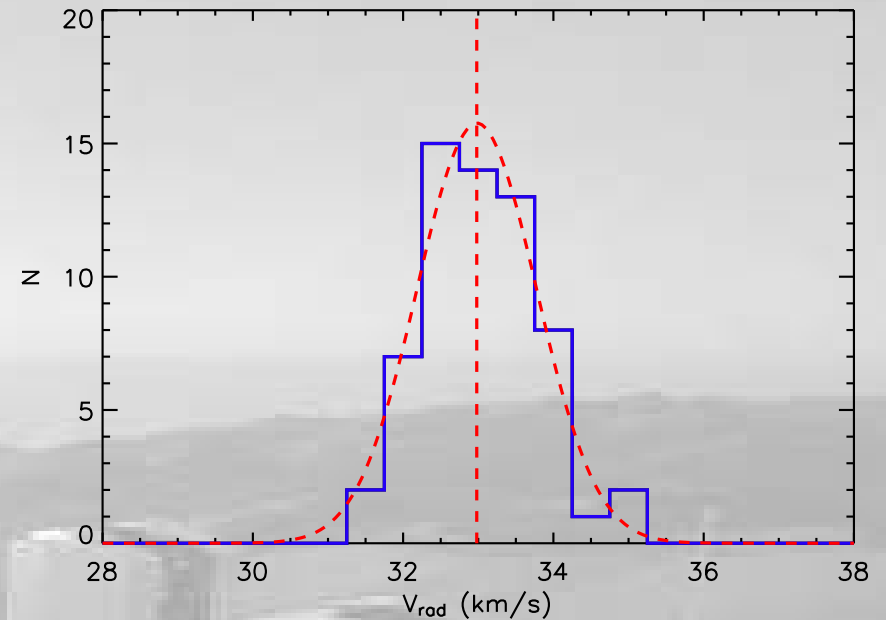
Observations

- ❑ Time allocated: 2.5 hours in DDT during three nights in Feb 2007
- ❑ Spectrograph: FLAMES/GIRAFFE@ESO-VLT
- ❑ Spectral range: 6470-6790 Å (H α and lithium lines)
- ❑ Spectrograph resolution: 17 000
- ❑ Characteristics of the observed stars:
 - bright ($13^m \lesssim V \lesssim 15^m$)
 - $B-V$ in the solar neighbour
 - good combination of proper motions measurements and proper-motion membership probability (Yadav et al. 2007)
- ❑ Observed stars: ≈ 100



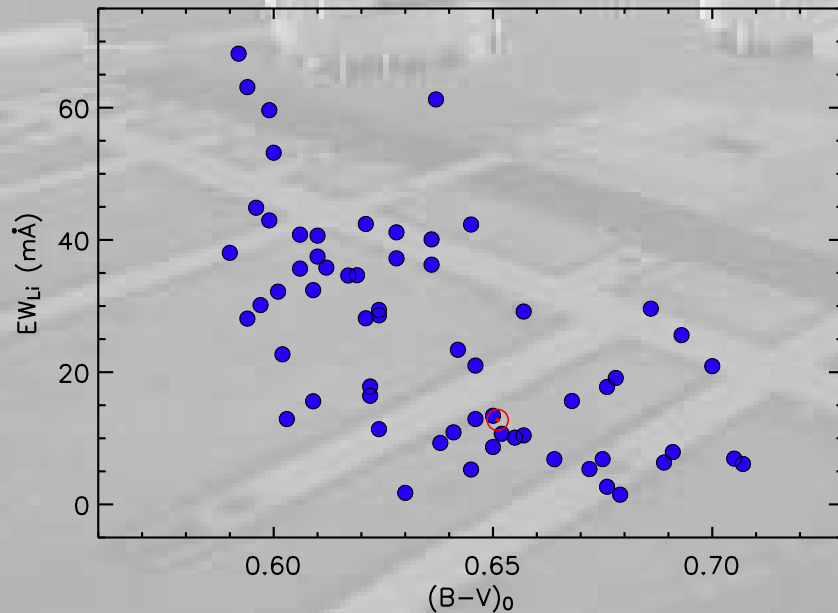
Membership

Radial velocity. From the V_{rad} variations, 62 stars are probable cluster members with $\langle V_{\text{rad}} \rangle = 33.3 \text{ km/s}$ ($\sigma = 0.8 \text{ km/s}$).



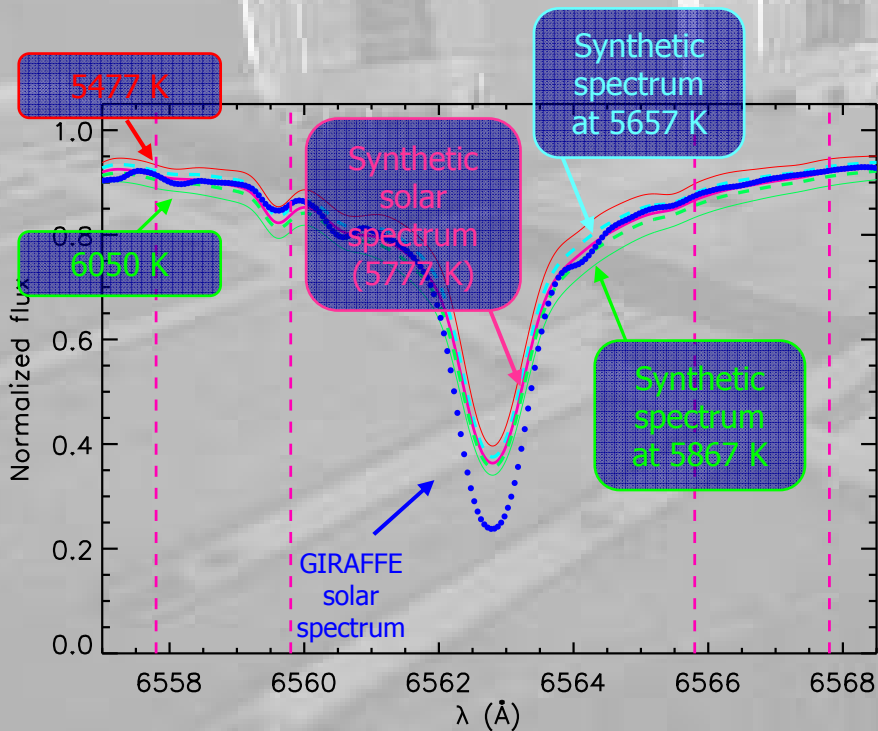
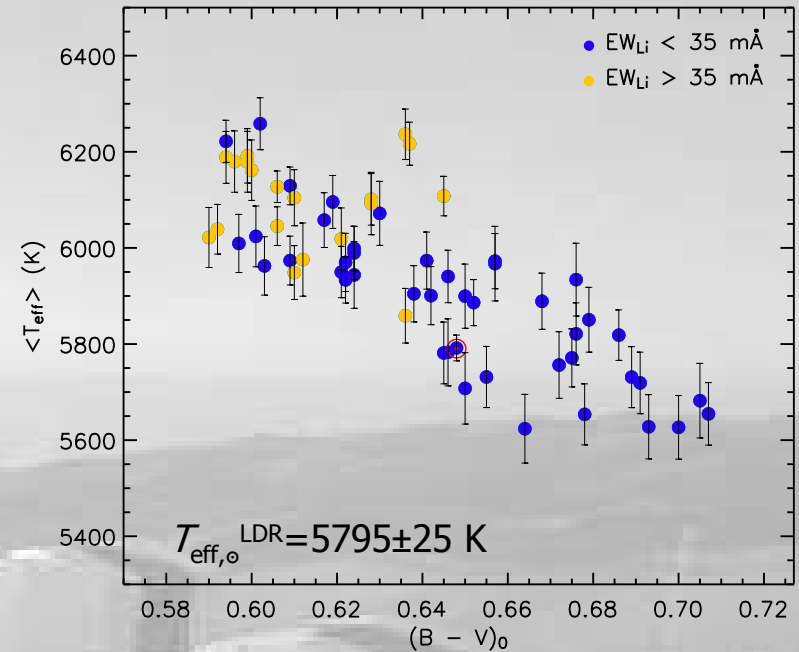
Lithium

Lithium. Many MS stars share the same lithium line (at $\lambda = 6707.8 \text{ \AA}$) abundance of the Sun.



Temperature from LDR

Effective temperature. We have selected six couples of line sensitive to temperature and applied a method based on line-depth ratios (LDRs) to derive the effective temperature of the probable members (Gray & Johanson 1991, Catalano et al. 2002, Biazzo et al. 2007).



Temperature from $H\alpha$ wings

$H\alpha$ line. We are also studying the behaviour of the $H\alpha$ wings (between 3 and 5 \AA from the line-center) as temperature diagnostics (Cayrel et al. 1985).

$$T_{\text{eff,o}}^{H\alpha} = 5717 \pm 100 \text{ K}$$

What we have to do ...

- ❑ Determine T_{eff} by the $H\alpha$ wings
- ❑ Select the best 10 solar analogues (T_{eff} , Li)
- ❑ Derive $\langle (B-V)_0 \rangle$ from our solar analogues
- ❑ Determine the distance modulus of the cluster
- ❑ Two Proposals submitted (HARPS@3.6m in La Silla Observatory and SOPHIE@1.93m in *Observatoire de Haute-Provence*)