



Radial Velocity compilation in the Hyades and Pleiades

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Abstract

A bibliographical compilation of radial velocities in a large field including the Hyades and the Pleiades open clusters is presented. This catalogue is intended to be used for the validation of RVS measurements for DR2 by WP947. The catalogue includes 3678 radial velocities of 2685 stars within a radius of 20° around the centre of the Hyades.

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1 Introduction

The sky field around the Hyades and Pleiades is ideal to test the RVS data. Hyades and Pleiades are benchmark open clusters, the most studied ones, in particular with high resolution spectroscopy. Many publications provide lists of radial velocity (RV) measurements in this sky area. The GK dwarfs members of the Hyades are numerous and bright, and they span a large field : astrometric members are found within a radius of 17.2° in the Gaia DR1 (Gaia Collaboration et al., 2017). The mean RV of the Hyades, around 39 km s^{-1} , is significantly different from the field, making it relatively easy to separate members and field stars. The cluster is old enough so that most of its stars are not rotating anymore. Consequently the RVS measurements are expected to be of good quality. By considering a large field around the centre of the cluster, 20° is adopted here, it is expected to build a large sample of bright stars where the fraction of Hyades members will be significant. This area also includes the Pleiades, at $\sim 12^\circ$ from the Hyades centre. The Pleiades being much younger, some stars are affected by a significant rotation, which has an impact on the RV determination. The RV compilation presented here will allow DU947 to investigate the precision and completeness of the RVS measurements in that field. The stellar properties of this sample are also briefly presented.

TABLE 1: Bibliographical sources considered in the compilation, with the number of stars within 20° of the Hyades centre and their median error on RV

Reference	nb	σ_{RV} km s $^{-1}$	note
Chubak et al. (2012)	124	0.11	
Famaey et al. (2005)	203	0.23	
Nordström et al. (2004)	471	0.40	Geneva-Copenhagen Survey
Kunder et al. (2017)	1308	1.24	RAVE DR5
Maderak et al. (2013)	26	0.28	
Mermilliod et al. (2008)	79	0.40	
Mermilliod et al. (2009)	427	0.32	
Nidever et al. (2002)	40	0.355	
Perryman et al. (1998)	238	0.24	
Soubiran et al. (CS-015)	467	0.003	CU6 catalogue
Tabernero et al. (2012)	8	0.03	
Tokovinin & Smekhov (2002)	31	0.28	
Valenti & Fischer (2005)	41	0.67	SPOCS
White et al. (2007)	77	0.78	
Worley et al. (2012)	63	0.13	AMBRE-FEROS

2 Construction of the bibliographical compilation

With the help of Simbad and VizieR at CDS and of WEBDA, we searched bibliographical references providing RV in the Hyades field. Only references providing RV measurements with a formal uncertainty better than $1\text{-}2\text{ km s}^{-1}$ were selected. We considered only those references which give a significant number of stars brighter than $V=12$ since this is the approximate limiting magnitude of the RVS data in DR2. We also considered the catalogue provided by us to CU6 (Soubiran et al., CS-015) for their calibration and internal validation. The resulting references with the number of stars within a radius of 20° around the centre of the Hyades are presented in Table 1. The catalogue AMBRE-HARPS (De Pascale et al., 2014) is not in that list because it is already included in CS-015. It is worth noting that the errors quoted in each catalogue may have not been computed the same way.

The resulting compilation includes 3678 RV measurements for 2685 different stars. The histogram of RV is shown in Fig. 1. The two peaks corresponding to the Hyades and the Pleiades stars are clearly visible, centered on the expected values of ~ 39.4 and $\sim 5.5\text{ km s}^{-1}$ respectively. We look at the sky distribution of RV and at the stellar properties of this sample in the next section.

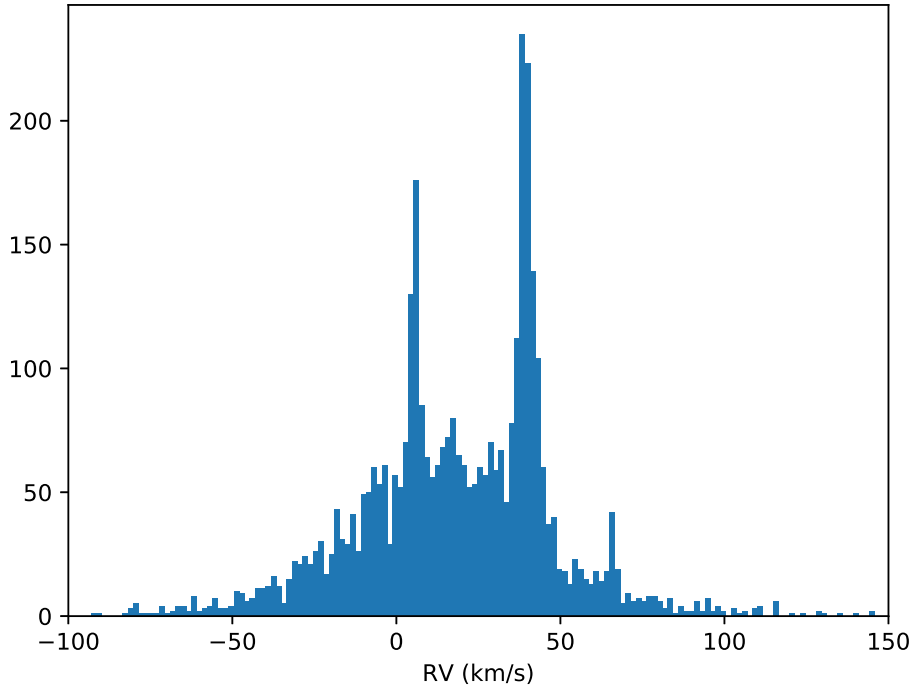


FIGURE 1: RV histogram of the compilation

3 Stellar content of the compilation

The sky distribution of the RV compilation is shown on Fig. 2. The higher density of the two open clusters is clearly visible. A third zone of higher density at the bottom is due to RAVE DR5, shown in Fig. 3, which is a southern survey, the Pleiades and Hyades being observed only as reference fields. It is worth noting that in Fig. 2, each point represents a RV determination, not a single star, since the same star may appear in several catalogues. Figure 4 shows the most probable Hyades members, selected within the RV range $39.4 \pm 5 \text{ km s}^{-1}$. For clarity the Hyades probable members are shown for the whole compilation, and without RAVE-DR5. It shows that RAVE-DR5 includes many stars at large distance from the open cluster centre that seem to share the Hyades motion. The RVs measurements combined with the Gaia astrometry will make it possible to investigate whether these stars are physical members of the open cluster or of the larger Hyades moving group. It is also interesting to note that a velocity gradient is seen in that map.

Figure 5 shows the G_{RVS} magnitude histogram of the 2685 stars included in the RV compilation, together with their B-V colour histogram. G_{RVS} have been computed from V and B-V using the transformations of Jordi (CJ-041). As expected the stellar content of the compilation is bright

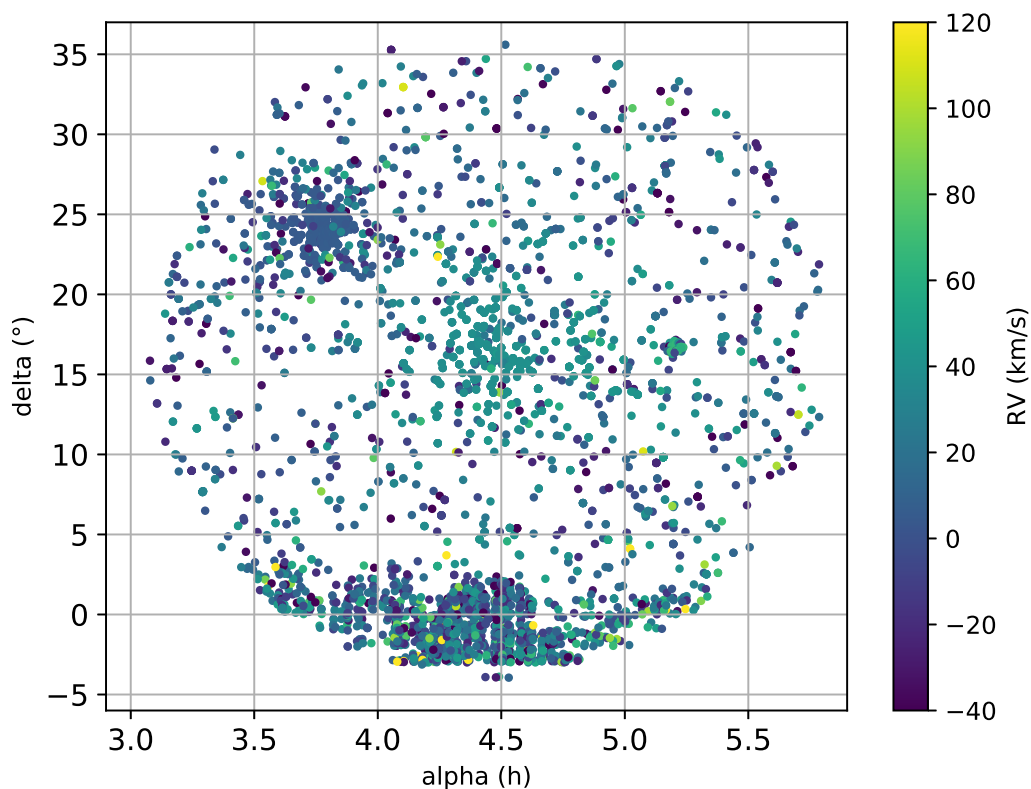


FIGURE 2: Sky map of the compilation with a color code scaled on RV.

enough to be useful for the RVS validation. The sample is dominated by stars within the colour range $0.5 < B-V < 1.5$ which roughly corresponds to F5 to K5 stars where the best results are expected for the RVS.

4 Format and distribution

The compilation described in this TN, is stored on the ESAC disk space created for the GBOG WG : `gbogcom` at `ssh.esac.esa.int, /gbog/cu9/WP947` (password upon request). It can be retrieved by `sftp`. The `ascii` file, described in a `ReadMe` file, includes the HIP, TYC, 2MASS identifiers or an alternate ID, J2000 equatorial coordinates, Johnson B, V, 2MASS JHK magni-

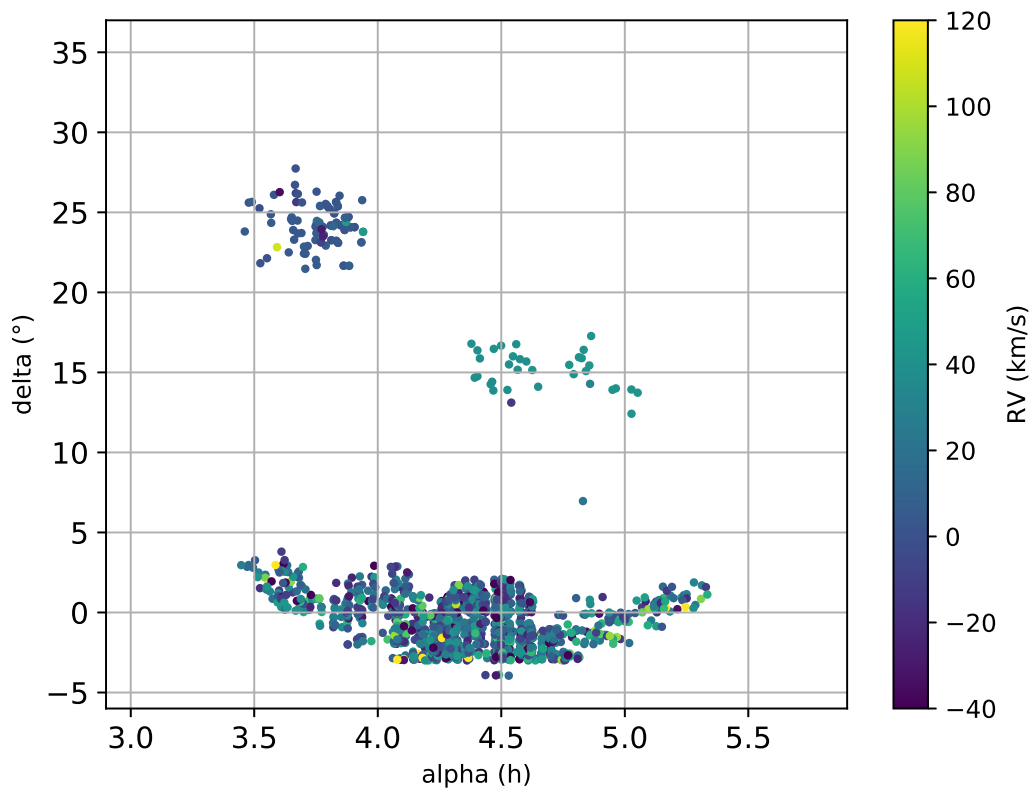


FIGURE 3: Sky map of the RAVE DR5 catalogue in the Hyades-Pleiades field with the same colour code as in Fig. 2.

tudes (-9.99 when not defined), RV and its error (-9.99 when not defined) and the corresponding reference.

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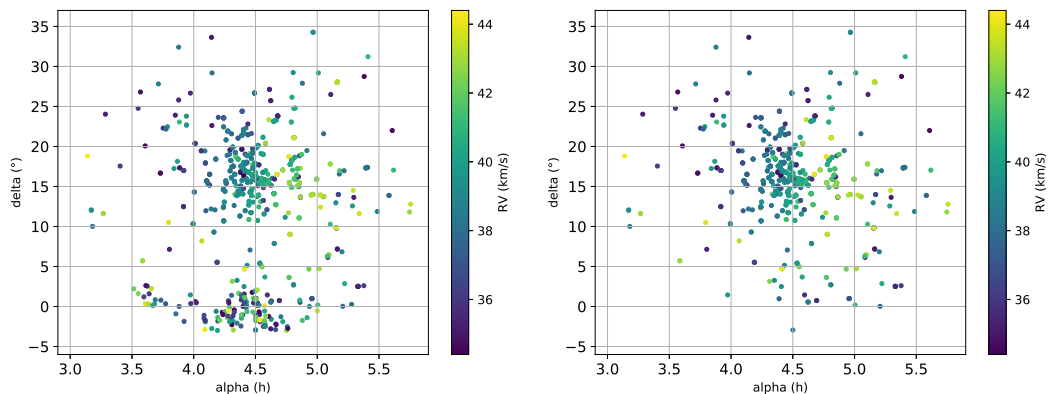


FIGURE 4: Sky map of stars with $RV = 39.4 \pm 5 \text{ km s}^{-1}$, corresponding to the most probable Hyades members. Left : for the whole compilation, right : without RAVE-DR5.

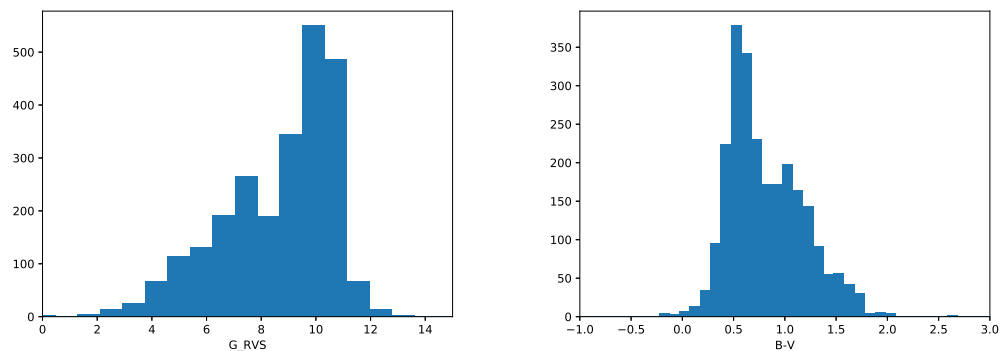


FIGURE 5: Histograms of G_{RVS} magnitudes and of $B-V$ colours of the stars included in the RV compilation

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