Table 1. Description of 519 HiVels catalog

Label	Unit	Description
designation	—	Unique source designation, Gaia DR3
RAdeg	deg	Right ascension, decimal degrees, Gaia DR3 (ICRS at Epoch=2016.0)
DEdeg	deg	Declination, decimal degrees, Gaia DR3 (ICRS at Epoch=2016.0)
plx	mas	Parallax, Gaia DR3
e_plx	mas	Error of plx, Gaia DR3
plx-zp	mas	Parallax zero-point correction, after Lindegren et al. (2021)
pmRA	$\mathrm{mas\,yr^{-1}}$	Proper motion in right ascension direction, Gaia DR3
e_pmRA	$\mathrm{mas\,yr^{-1}}$	Error of pmRA
pmDE	$\mathrm{mas\,yr^{-1}}$	Proper motion in declination direction, Gaia DR3
e_pmDE	$\mathrm{mas\,yr^{-1}}$	Error of pmDE
plx_pmra-corr	—	Correlation between parallax and proper motion in right ascension, Gaia DR3
plx_pmdec-corr	—	Correlation between parallax and proper motion in declination, Gaia DR3
pmra_pmdec-corr	—	Correlation between proper motion in right ascension and in declination, Gaia DR3
ruwe	—	Renormalised unit weight error, Gaia DR3
Gmag	mag	G-band mean magnitude, Gaia DR3 [phot_g_mean_mag]
bp-rp	mag	BP-RP color, Gaia DR3 [phot_bp_mean_mag - phot_rp_mean_mag]
cross-match-sur	—	Cross-match the name of survey id
surveyid	—	Unique ID in the survey [survey_id]
Teff	K	Effective temperature, the cross-match survey
e_Teff	K	Error of Teff
logg	dex	Surface gravity, the cross-match survey
e_logg	dex	Error of logg
FeH	dex	Metallicity, the cross-match survey
e_FeH	dex	Error of metallicity
a/FeH	dex	Alpha abundance, the cross-match survey
e_a/FeH	dex	Error of a/FeH
RVel	$\mathrm{km\,s^{-1}}$	Weighted mean radial velocity, Equation 1
e_RVel	$\mathrm{km\,s^{-1}}$	Error of radial velocity
GGDrlen	—	Corresponding to L in equation 2, after Bailer-Jones et al. (2021)
GGDalpha	—	Corresponding to α in equation 2, after Bailer-Jones et al. (2021)

Table 1 *(continued)*

Label	Unit	Description
GGDbeta	—	Corresponding to β in equation 2, after Bailer-Jones et al. (2021)
Dist	kpc	Heliocentric distance (after Du et al. (2019))
e_Dist	kpc	Lower uncertainty on Dist
E_Dist	kpc	Upper uncertainty on Dist
RGC	kpc	Galactocentric distance (after Du et al. (2019))
e_RGC	kpc	Lower uncertainty on RGC
E_RGC	kpc	Upper uncertainty on RGC
VGC	$\mathrm{km\,s^{-1}}$	Galactocentric total velocity (after Du et al. (2019))
e_VGC	$\mathrm{km\,s^{-1}}$	Lower uncertainty on VGC
E_VGC	$\mathrm{km\,s^{-1}}$	Upper uncertainty on VGC
Vphi	$\mathrm{km\,s^{-1}}$	Rotation velocity, this work
P-ub	—	Unbound possibility, this work
P-disk	—	Probablity of the star tracking back to the disk , this work
P-sgr	—	Probablity of the star tracking back to the Sgr, this work
var-flag	—	Flag indicating if variability was identified in the photometric data, Gaia DR3 [phot_variable_flag]
Pstar	—	Probability from DSC-Combmod of being a single star, Gaia DR3 [classprob_dsc_combmod_star]
RVel-DR3	$\mathrm{km\,s^{-1}}$	Gaia DR3 radial velocity
e_RVel-DR3	$\mathrm{km\,s^{-1}}$	Error of RVel-DR3

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