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Gaia DR3 BPRP spectra of stars from the INDO-US library

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Abstract

Key words: stars: evolution — stars: supergiants — stars: massive

1 Introduction

Recently, Axelrod et al. (2023) have published a list of additional 32 new fainter DAWS ($16.5 < V < 19.5$ mag) which are almost perfect spectrophotometric calibrators (reaching an accuracy < 0.004 mag). DAWS stands for Hot DA white dwarf. The authors used ground-based spectroscopic data to produce synthetic magnitudes in the HST/WFC3 filters and compared the synthetic magnitudes with the HST/WFC3 observations.

They did not calibrate each data point on the existing photometric HST system, but they used the mean of the 32 data points. This approach could be used to define new zero points, as the current HST photometry is based on three DAWS (G191B2B,GD153,GD71).

2 Gaia DR3 source_id

The Gaia DR3 source_ID of the 35 DAWSs (32 new standard calibrators and the three HST milestones) are listed in Table 1.

The Gaia DR3 BPRP spectra were retrieved (XP CONTINUOUS RAW data). The spectra were reconstructed using the default sampling

$$sampling = np.geomspace(330, 1049.9999999999, 361)$$

. Two version of spectra were extracted for each source, the standard and the one with the Truncation option.

$$calibrate(f, output\_file = f2, output\_format = 'csv', save\_file = True, truncation = True)$$

A display page was arranged to display the standard and truncated spectra. Here is the hyperlink for the display page: (https://lamortadella.github.io/BPRPlibraries/DAWDbprp/index.html),

3 Quality control

section**References**

Axelrod, T., Saha, A., Matheson, T., et al. 2023, ApJ, 951, 78

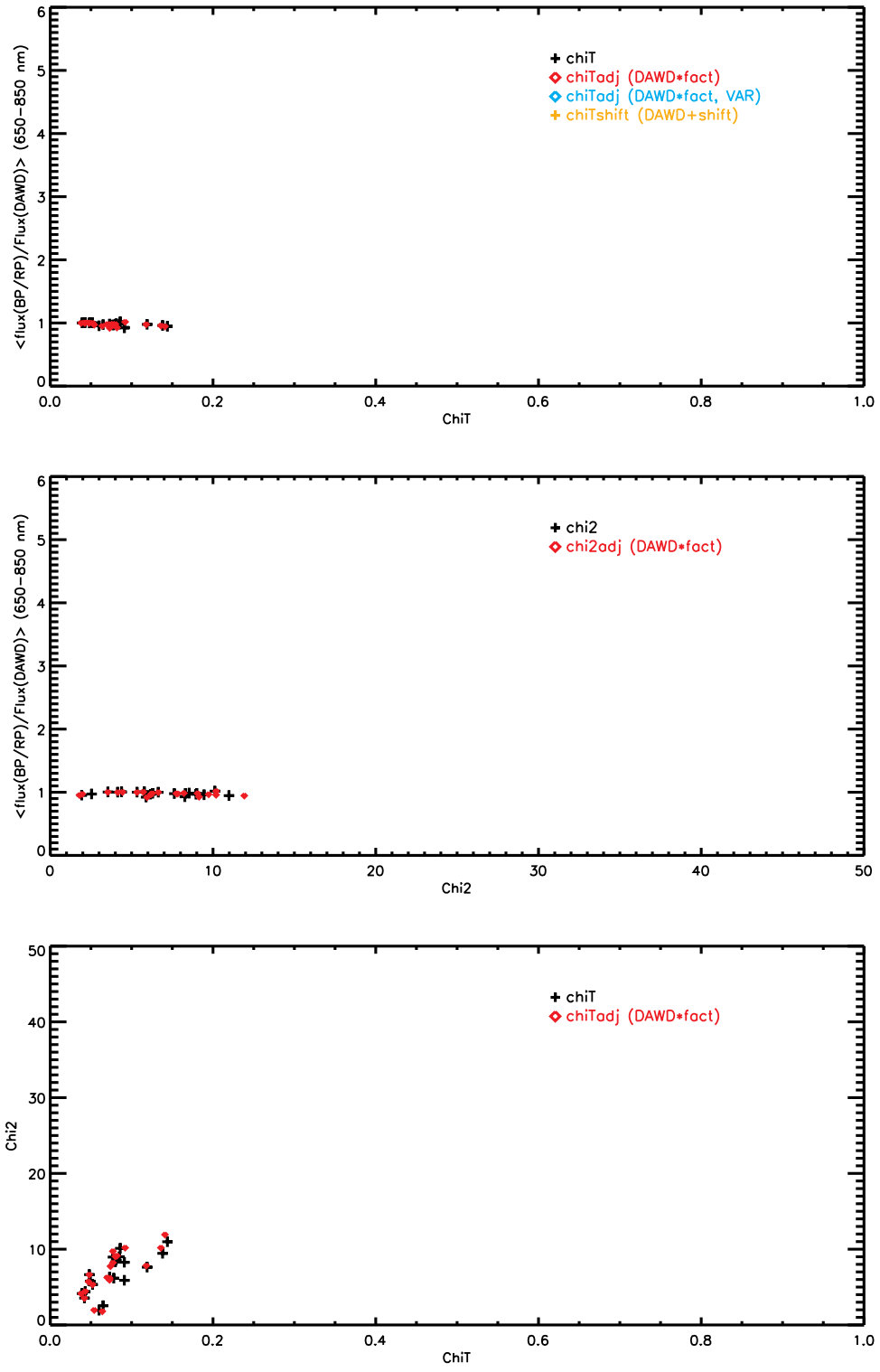


Fig. 1. DAWD library: the fact value, i.e., the average flux ratio between 650 and 850 nm (BP/RP(Dr3)-DAWD) versus the chiT values (black plus signs). A chiTadj value is the chiT of the modified spectrum (DAWD × fact). A chiTshift value is the chiT of the modified spectrum (DAWD + fact). *Middle panel:* DAWD: the fact value, i.e., the average flux ratio between 700 and 750 nm (BP/RP) versus the chi2values (black plus signs). A chi2adj value is the chi2 of the modified spectrum (DAWD × fact). *Lower panel:* DAWD: the chiT versus the chi2 values (black plus signs).

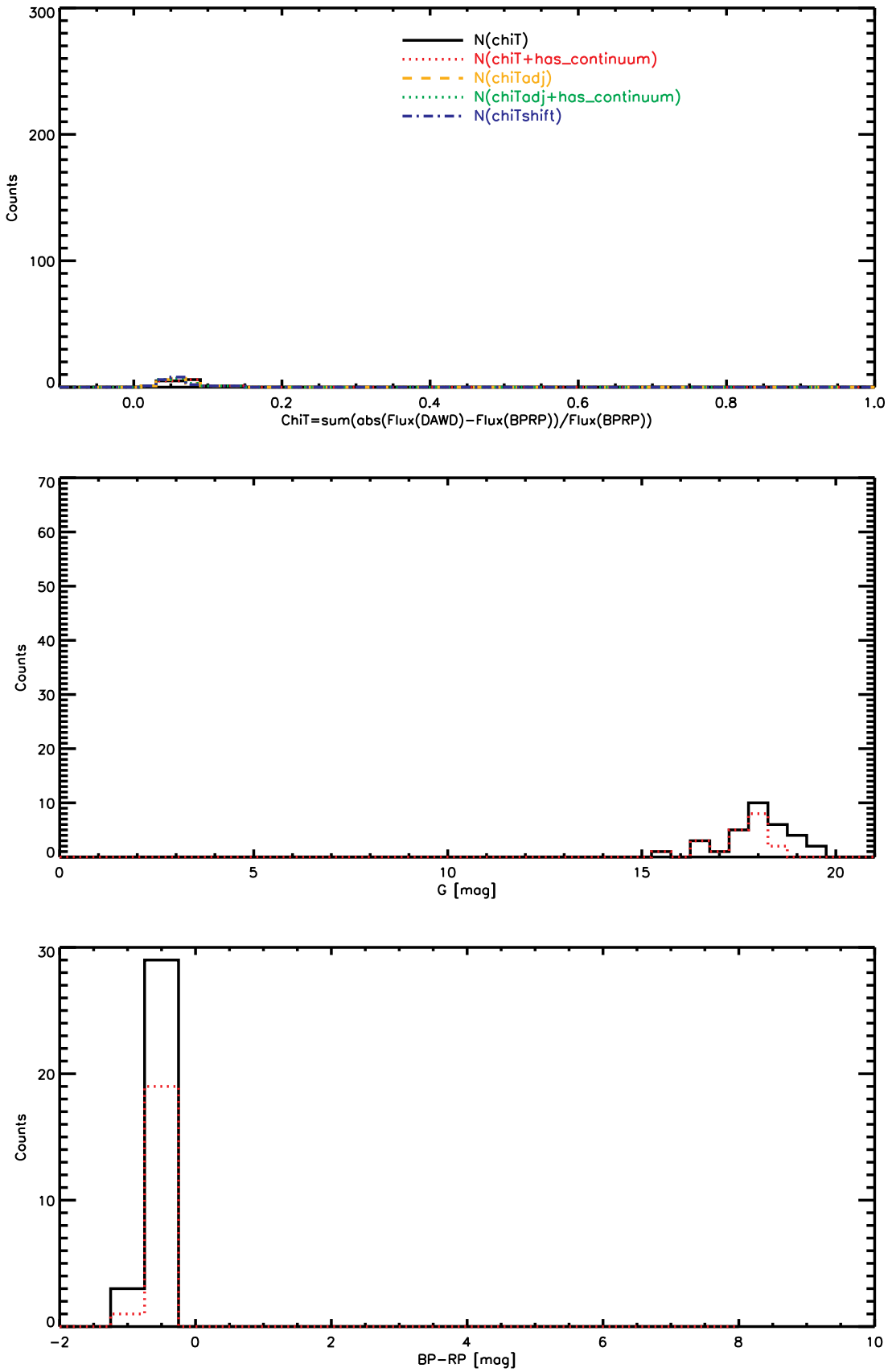


Fig. 2. DAWD spectra: *Top panel:* Histogram of the chiT parameter. *Middle panel:* Histogram of the G magnitudes. *Lower panel:* Histogram of the BP-RP colors. In red the histograms of those sources with has_xp_continuous='True'.

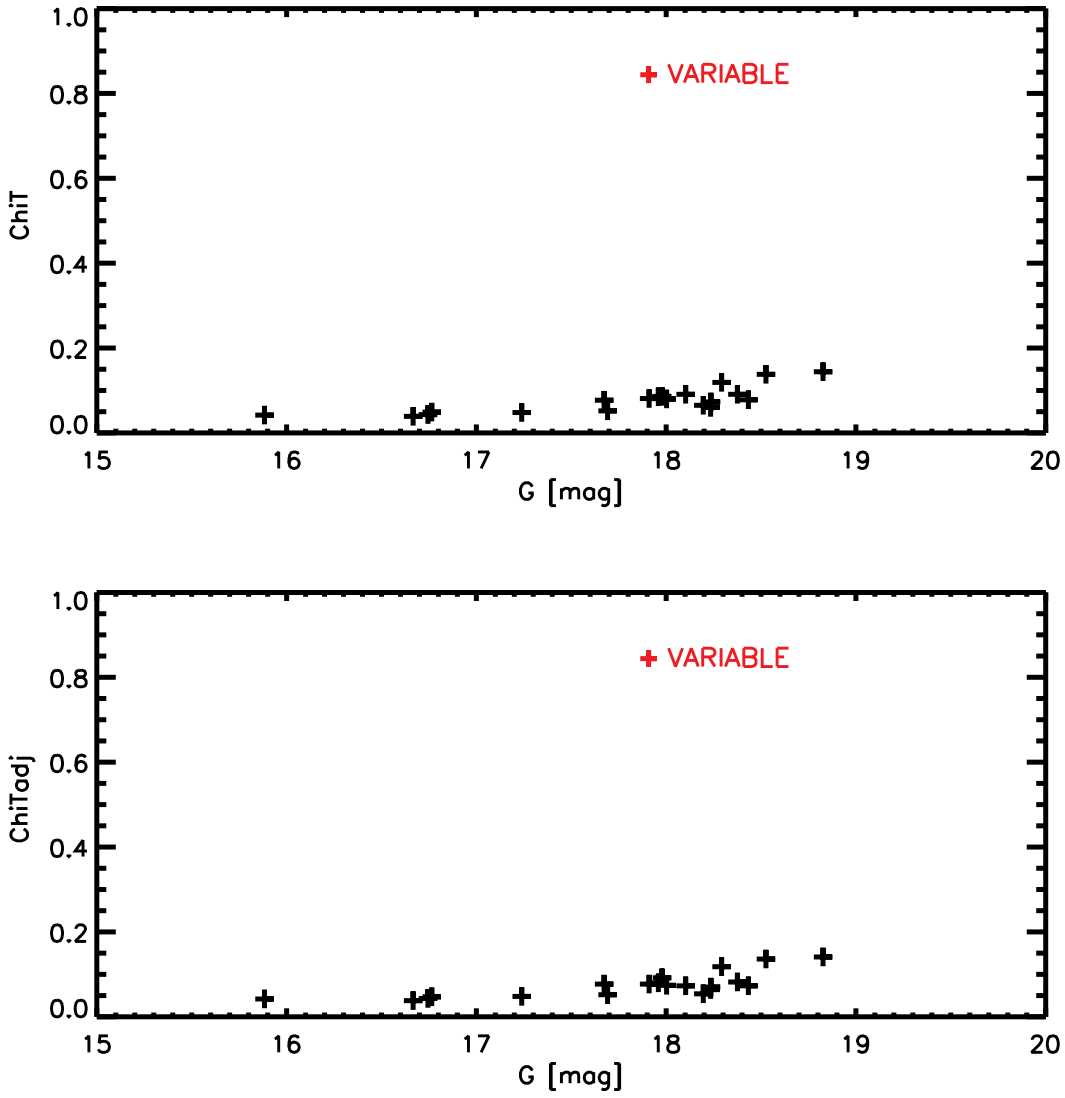


Fig. 3. DAWD spectra: *Upper panel:* chiT versus Gmag of the DAWD stars.

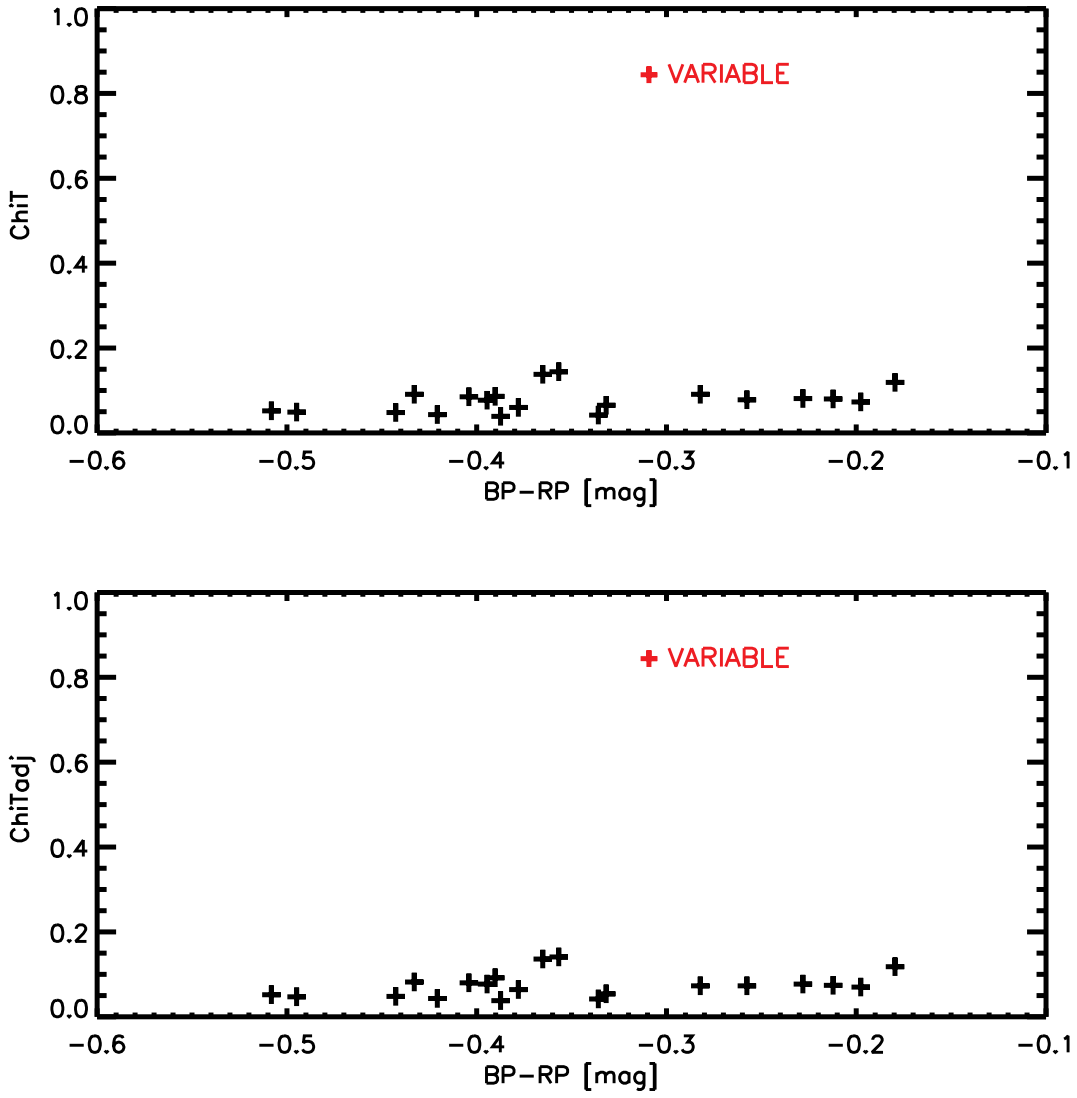


Fig. 4. chiT versus BP-RP mag of the DAWD stars.

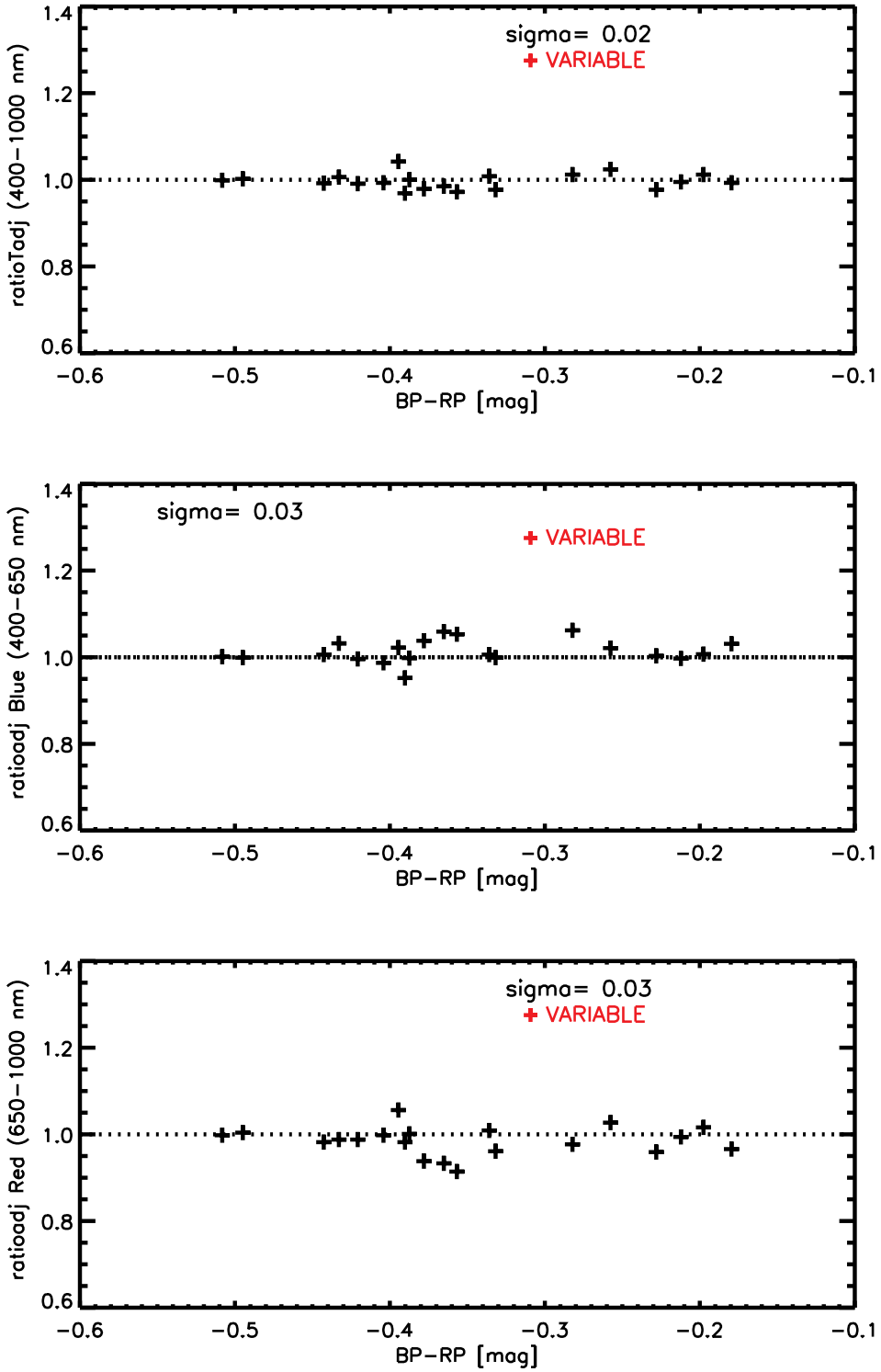


Fig. 5. DAWD spectra: the residual with the Gaia DR3 BP/BP spectra are smaller in the red part of the spectrum (650-1000 nm), giving a smaller chiadj, than in the blue part (400-650 nm).

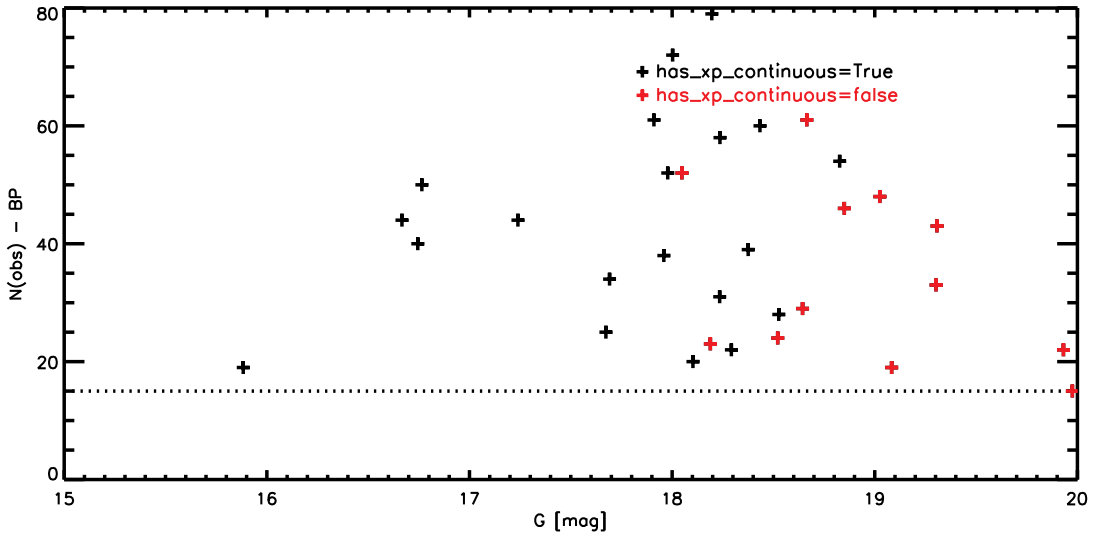


Fig. 6. DAWD stars: Number of observation in BP-band versus Gmag.

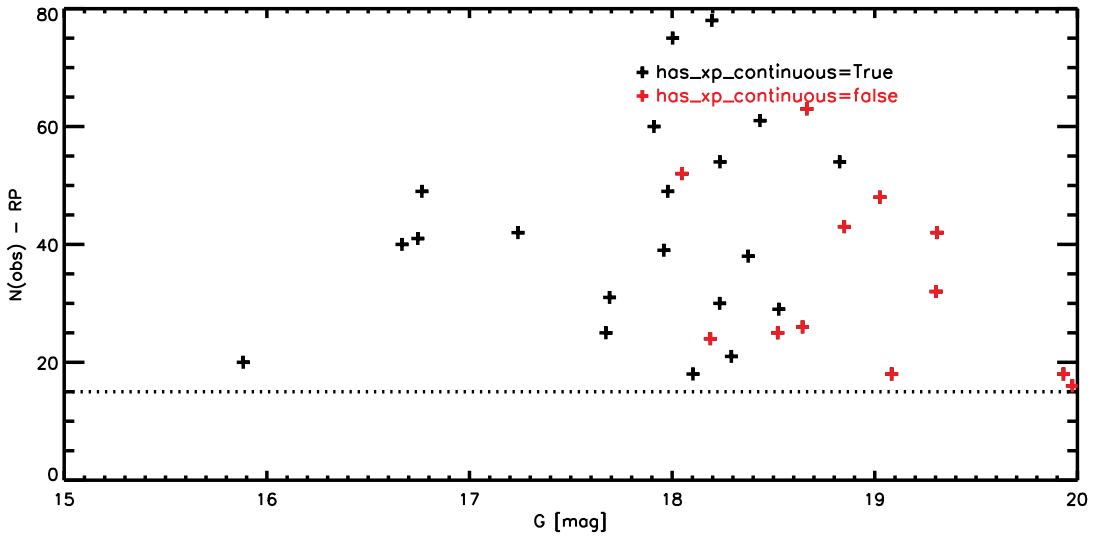


Fig. 7. DAWD stars: Number of observation in RP-band versus Gmag.

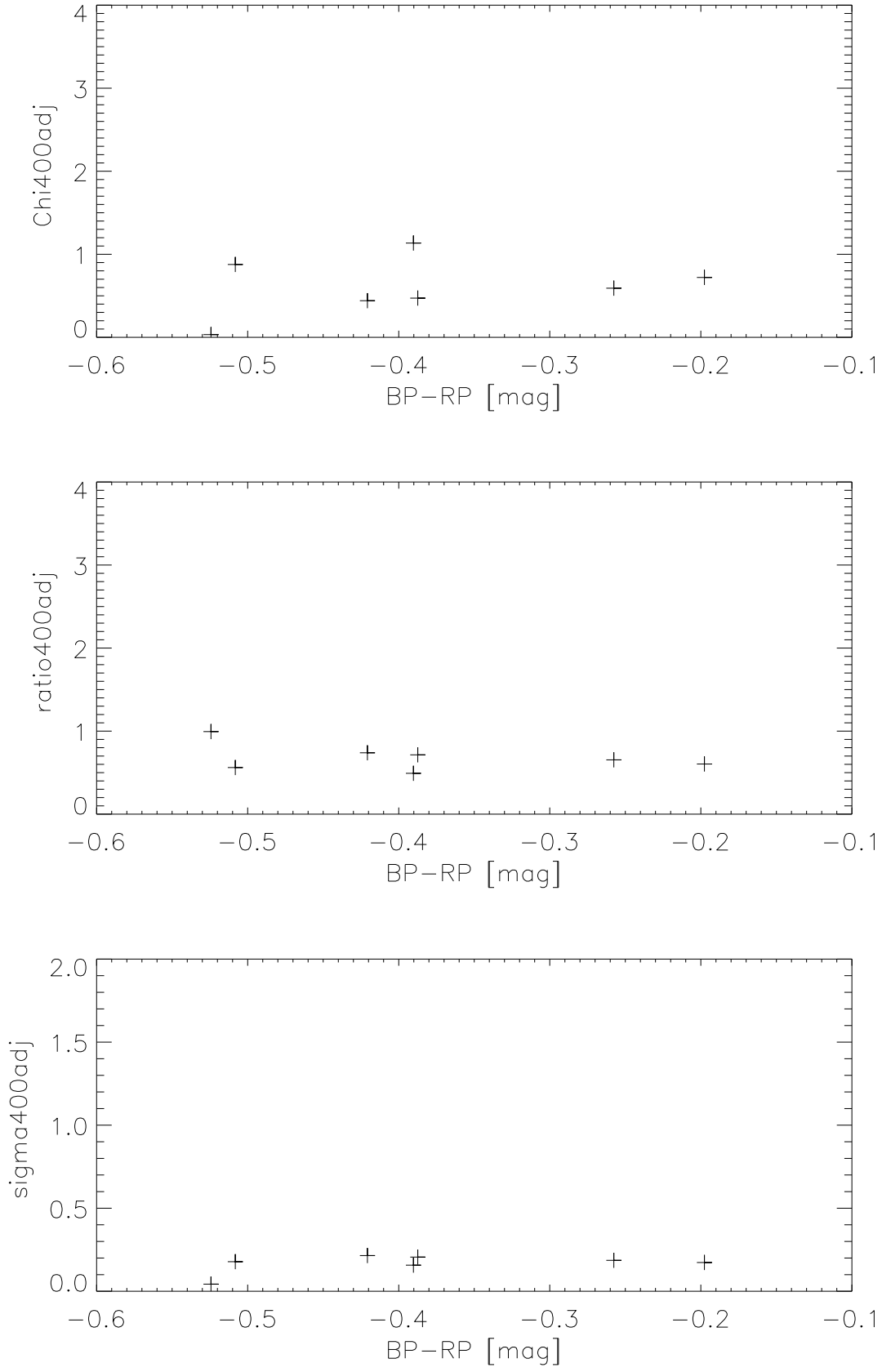


Fig. 8. DAWD stars: Using the best sample of DAWD spectra (with adjusted slope), the performance of the fit below 400 nm is analyzed.

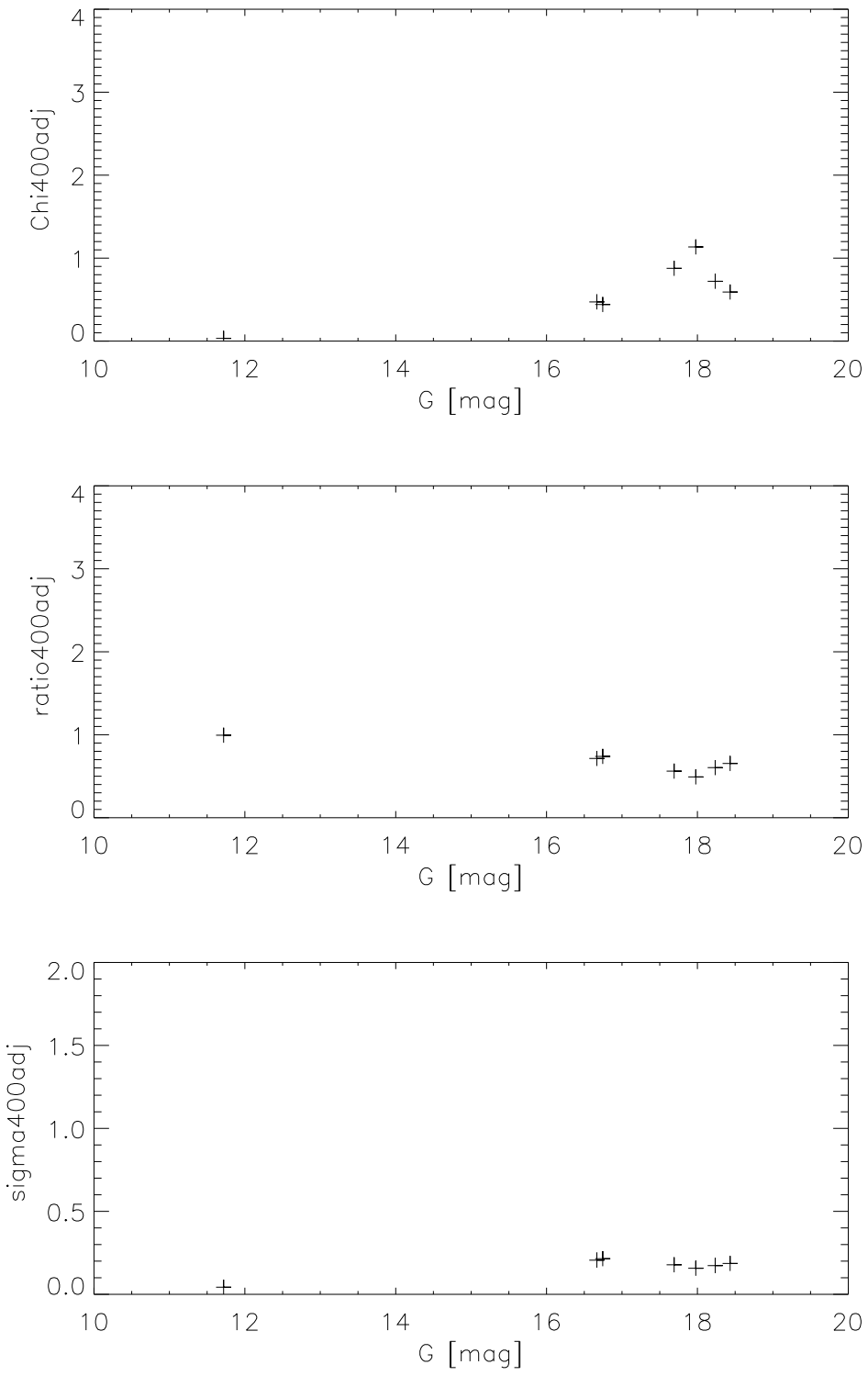
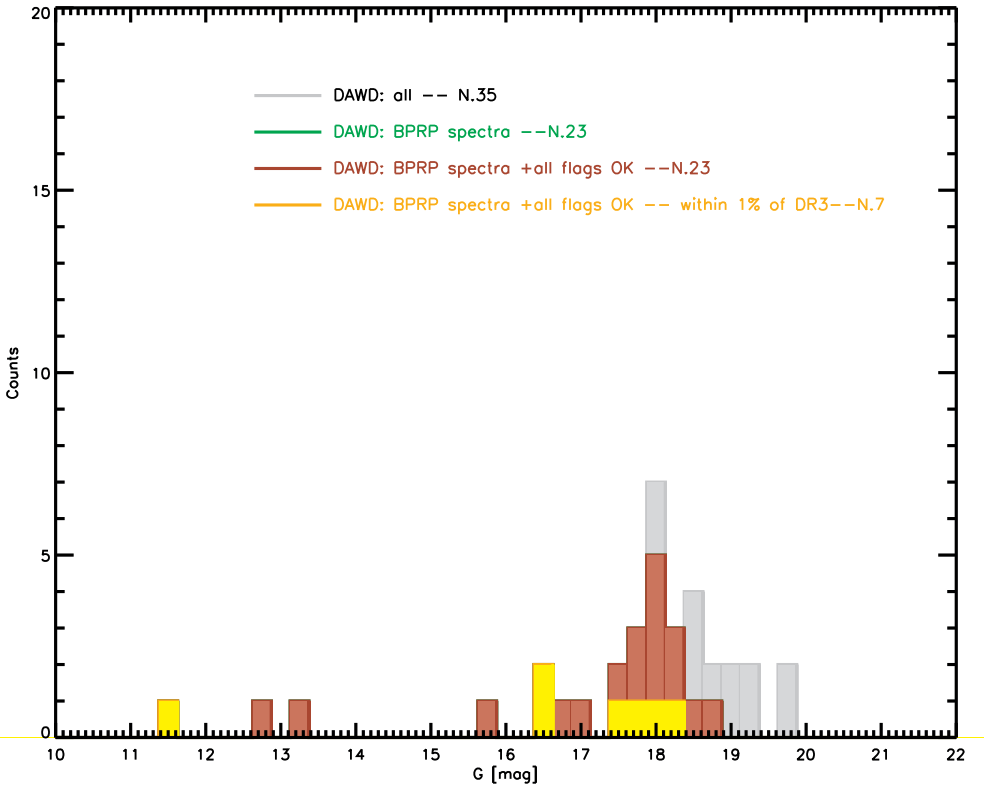


Fig. 9. DAWD spectra.



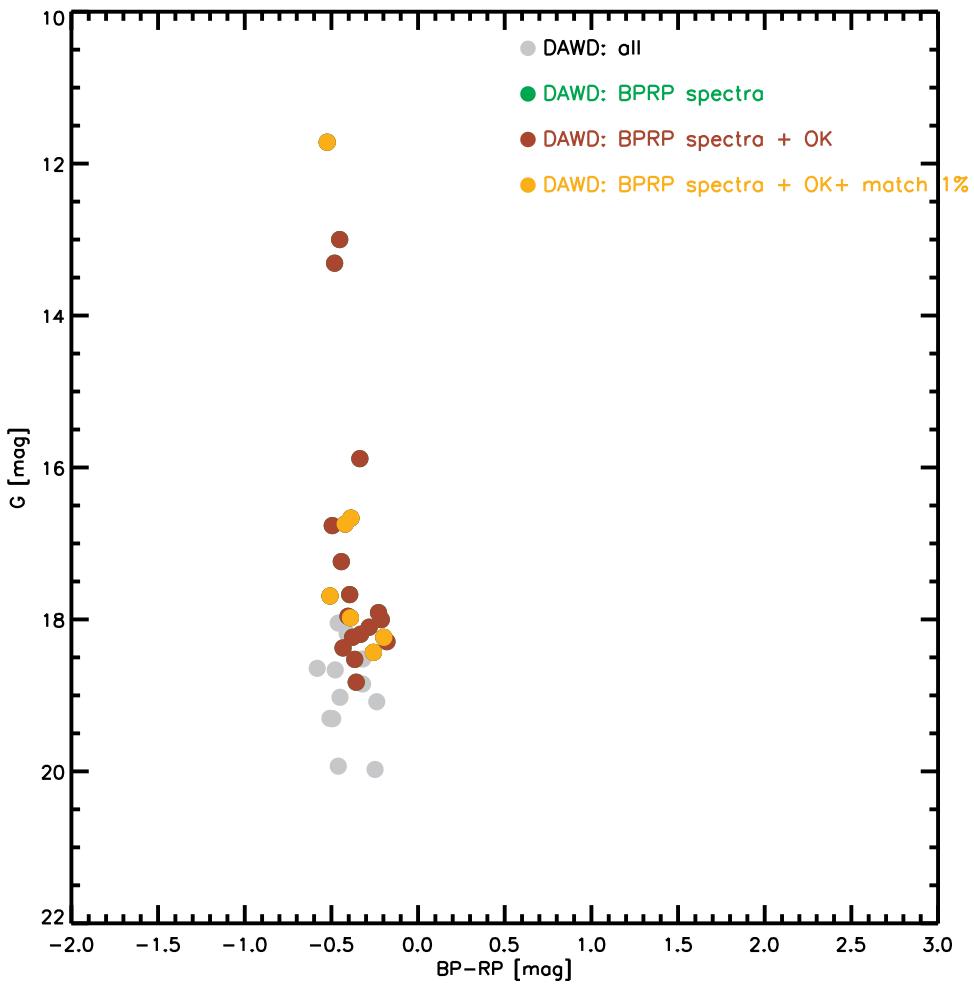


Fig. 10. Distributions of Gmag and BP/RP colors of the DAWS matches with the BP/RP spectra.

Table 1. Gaia DR3 source_ids for the 35 DAWSs.

Num.	Object	source_id	phot_g_mean_mag
0	G191B2B	266077145295627520	11.718442
1	GD153	3944400490365194368	13.310926
2	GD71	3348071631670500736	12.999769
3	WDFS0103-00	2536159496590552704	19.302286
4	WDFS0122-30	5028544686500198144	18.664406
5	WDFS0228-08	5176546064064586624	19.975046
6	WDFS0238-36	4953936951336477440	18.235914
7	WDFS0248+33	139724391470489472	18.521025
8	WDFS0458-56	4764189621230467584	17.958984
9	WDFS0541-19	2967083052984612736	18.433365
10	WDFS0639-57	5484605140287436416	18.375322
11	WDFS0727+32	892231562565363072	18.188688
12	WDFS0815+07	3097940536010212736	19.931236
13	WDFS0956-38	5421579652019276160	18.002356
14	WDFS1024-00	3830980604624181376	19.083263
15	WDFS1055-36	5401230062610609920	18.195625
16	WDFS1110-17	3559181712491390208	18.047983
17	WDFS1111+39	765355922242992000	18.64378
18	WDFS1206+02	3891742709551744640	18.84957
19	WDFS1206-27	3486471764460448512	16.666716
20	WDFS1214+45	1539041748873288704	17.978304
21	WDFS1302+10	3734528631432609920	17.239063
22	WDFS1314-03	3684543213630134784	19.306833
23	WDFS1434-28	6222123588482712832	18.102802
24	WDFS1514+00	4419865155422033280	15.883505
25	WDFS1535-77	5779908502946006784	16.764978
26	WDFS1557+55	1621657158502507520	17.691374
27	WDFS1638+00	4383979187540364288	19.024992
28	WDFS1814+78	2293913930823813888	16.744831
29	WDFS1837-70	6431766714636858240	17.910252
30	WDFS1930-52	6646236009641999488	17.67307
31	WDFS2101-05	6910475935427725824	18.82659
32	WDFS2317-29	2378059688840742912	18.526045
33	WDFS2329+00	2644572064644349952	18.292364
34	WDFS2351+37	2881271732415859072	18.234518