Zenodo doi:10.5281/zenodo.4964818

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

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Received ⟨reception date⟩; Accepted ⟨acception date⟩

Abstract

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

1 Introduction

The INDO-US library contains spectra for 1273 stars. There aren't duplicate spectra of the same star. The spectra were acquired with the 0.9 m telescope at Kitt Peak National Observatory and cover from 3460 to 9464 Å, at a resolution of 1 Å FWHM. The entire spectral region 3400–9500 Å was covered with five grating settings. The slit width was 1.4 ″. For 885 stars the spectra have full coverage. The spectral segments were merged using the continuum shapes of stars from the library of Pickles (1998). As the Pickles' library, the INDO-US spectra are normalised to unity at 5550 Å. The spectra are publicly available in calibrated form, as well as in raw form (the individual segments). There is a volume of proceedings including a short contribution by Rubtsov et al. (2019). It is stated that the authors have fully reassembled and calibrated the spectra.

1254 Gaia counterparts to the 1273 library's stars were found. The 1254 stars were searched in the SIMBAD database. 195 matches are too bright and saturated in Gaia, 195 stars are in binary or multiple systems. 918 of the 1254 Gaia counterparts have BPRP spectra in DR3. Eventually, 723 stars are marked as "OK", and 533 of them have BPRP spectra. Unfortunately, the INDO-US spectra are normalised, and there are gaps in the coverage.

351 INDO-US stars have a full coverage (3460-9464), a BP/RP spectrum, and are flagged as "OK" (which excludes binary from SIMBAD and G-band saturated), see the spectra at this location.
Of this 351 stars, 150 have phot_variable_flag = 'VARIABLE', non_single_star = 0, and ratioT smaller than 5, and have an average ratioR of the flux(INDO-US) over the flux(BPRP) equal to unity within 10%, and the chiT is smaller than 0.125, and chi2 smaller than 30 (Fig. 1), and they are the best sample of matches found.

The stellar G-band magnitudes range from 0 to 11 mag and their BP−RP colors from −1.5 to 3 mag (Fig. 2). Those with non-saturated Gaia BPRP spectra have G-band above 4 mag (Fig. 3) and BP−RP colors from ≈ −0.2 to ≈ 2.0 mag (Fig. 4). The stars with BPRP spectra have more than 15 observations (Figs. 6 and 7).

When analyzing the ratios of the flux densities in the BPRO spectra and INDO-US spectra below 400 nm, there is no apparent trend with BPRP colours of G-band magnitudes (Figs. 8 and 9). However, the BPRP color range is smaller than that of the NGSL and SPSS libraries.

section**References**

Pickles, A. J. 1998, PASP, 110, 863

Rubtsov, E., Chilingarian, I., Borisov, S., & Katkov, I. 2019, in Astronomical Society of the Pacific Conference Series, Vol. 523, Astronomical Data Analysis Software and Systems XXVII, ed. P. J. Teuben, M. W. Pound, B. A. Thomas, & E. M. Warner, 289

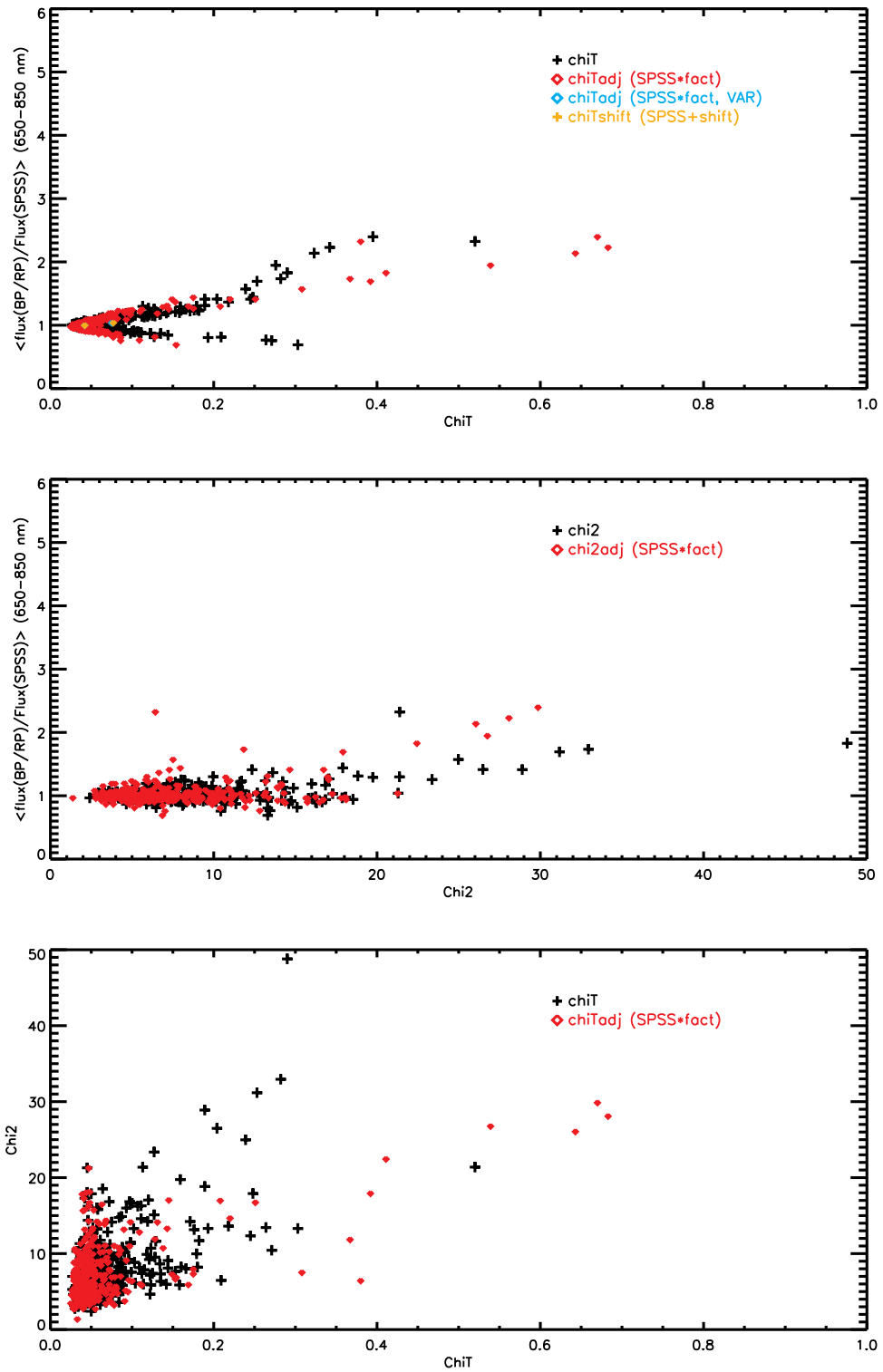

Fig. 1. *Upper panel:* INDO-US: the fact value, i.e., the average flux ratio between 650 and 850 nm (BP/RP-INDO-US) versus the chiT values (black plus signs). A chiTadj value is the chiT of the modified spectrum INDO-US × fact. *Middle panel:* INDO-US: the fact value, i.e., the average flux ratio between 650 and 850 nm (BP/RP-INDO-US) versus the chi2 values (black plus signs). A chi2adj value is the chi2 of the modified spectrum INDO-US × fact. *Lower panel:* INDO-US: the chiT versus the chi2 values (black plus signs). Only datapoints with chiT < -10 and comment="OK" and with full coverage from 3400–9500 Å (flaggap= 0) are used in the three panels.

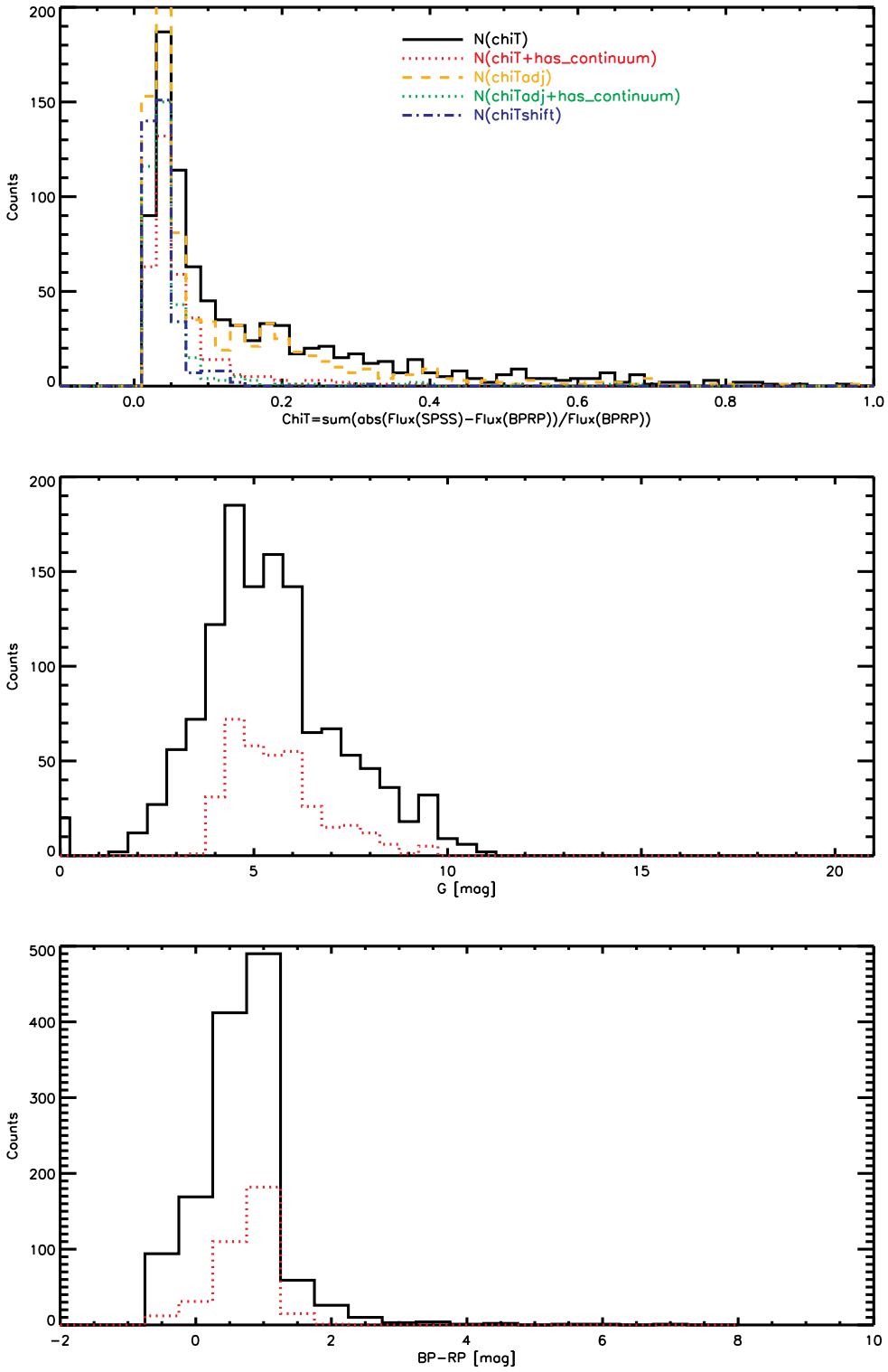

Fig. 2. INDO-US spectra: *Top panel:* Histogram of the chiT parameter in black or in red when only considering the data points with has_xp_continuous='true'. The histogram of the chiTadj parameter is overplotted in orange or green when only considering the data points with has_xp_continuous='true'. *Middle panel:* Histogram of the G magnitudes. In red the histograms of those sources with has_xp_continuous='true'. *Lower panel:* Histogram of the BP-RP colors. In red the histograms of those sources with has_xp_continuous='true'.

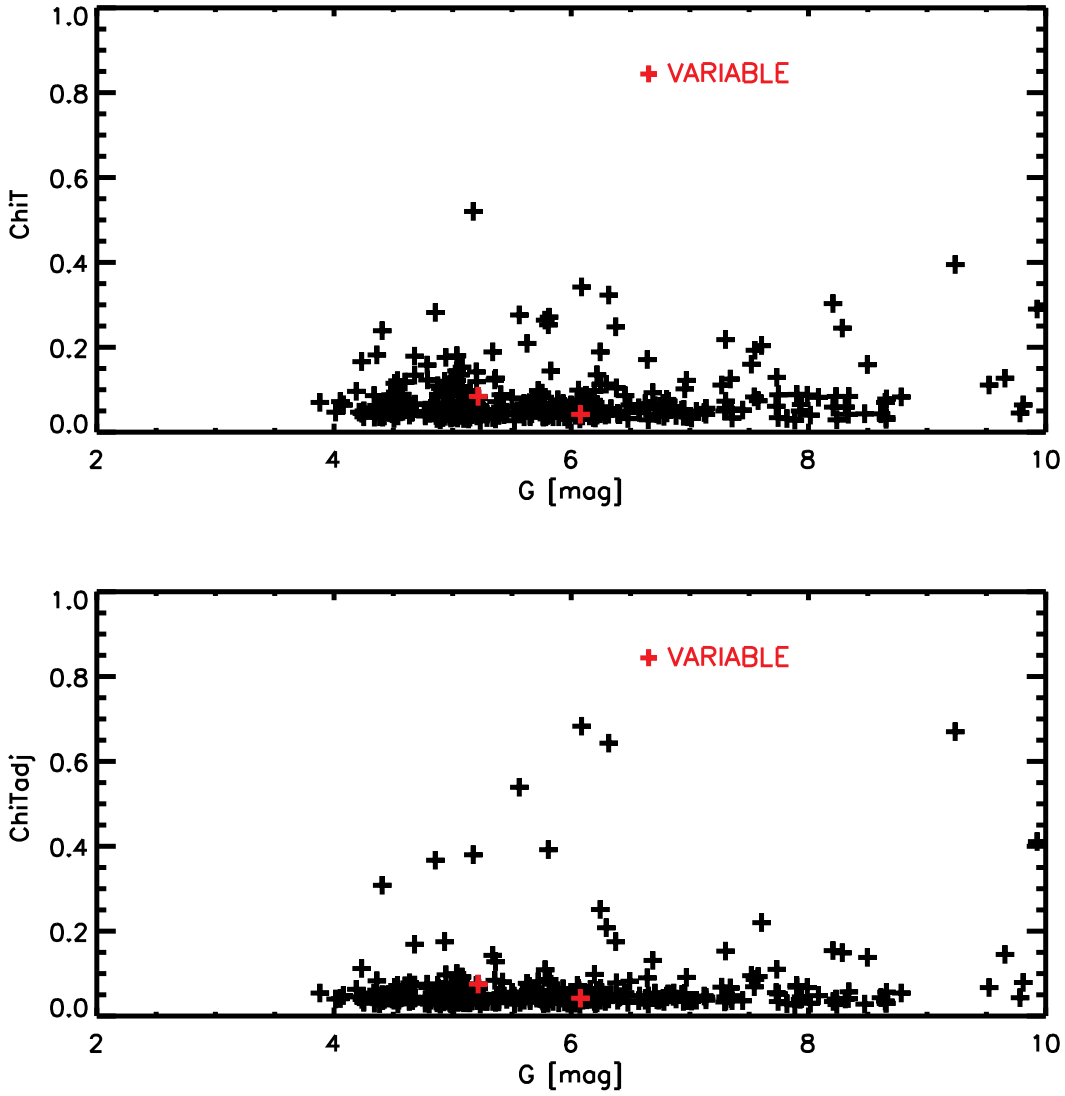

Fig. 3. *Upper panel:* chiT versus Gmag of the INDO-US stars. *Lower panel:* An adjusted chiT, i.e. a chiT run after a small rescaling of the INDO-US spectrum. Only datapoints with comment="OK" and with full coverage from 3400–9500 Å (flaggap= 0) are plotted.

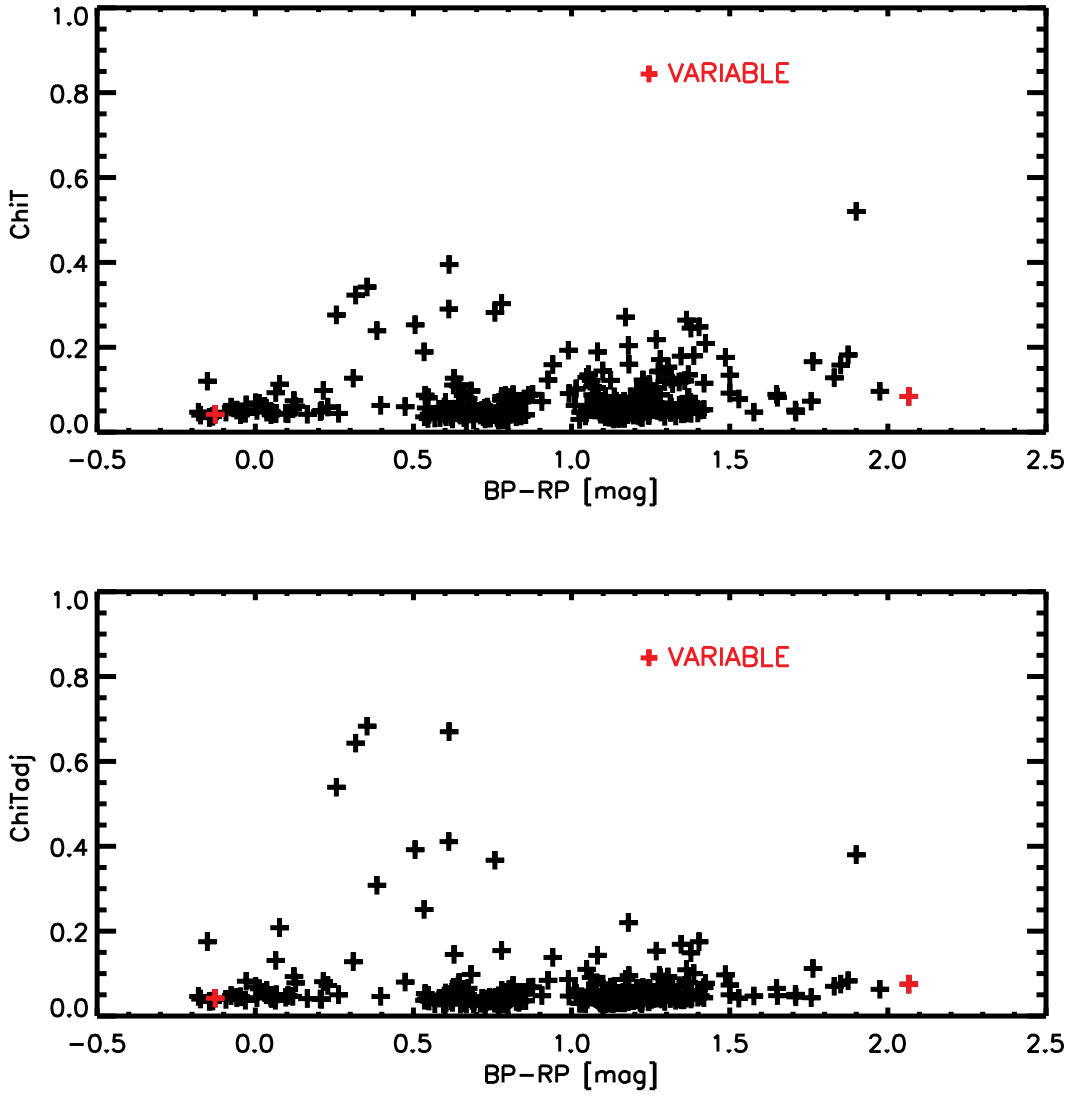

Fig. 4. *Upper panel:* chiT versus BP-RP mag of the INDO-US stars. *Lower panel:* An adjusted chiT, i.e. a chiT run after a small rescaling of the INDO-US spectrum. Only datapoints with comment="OK" and with full coverage from 3400–9500 Å (flaggap= 0) are plotted.

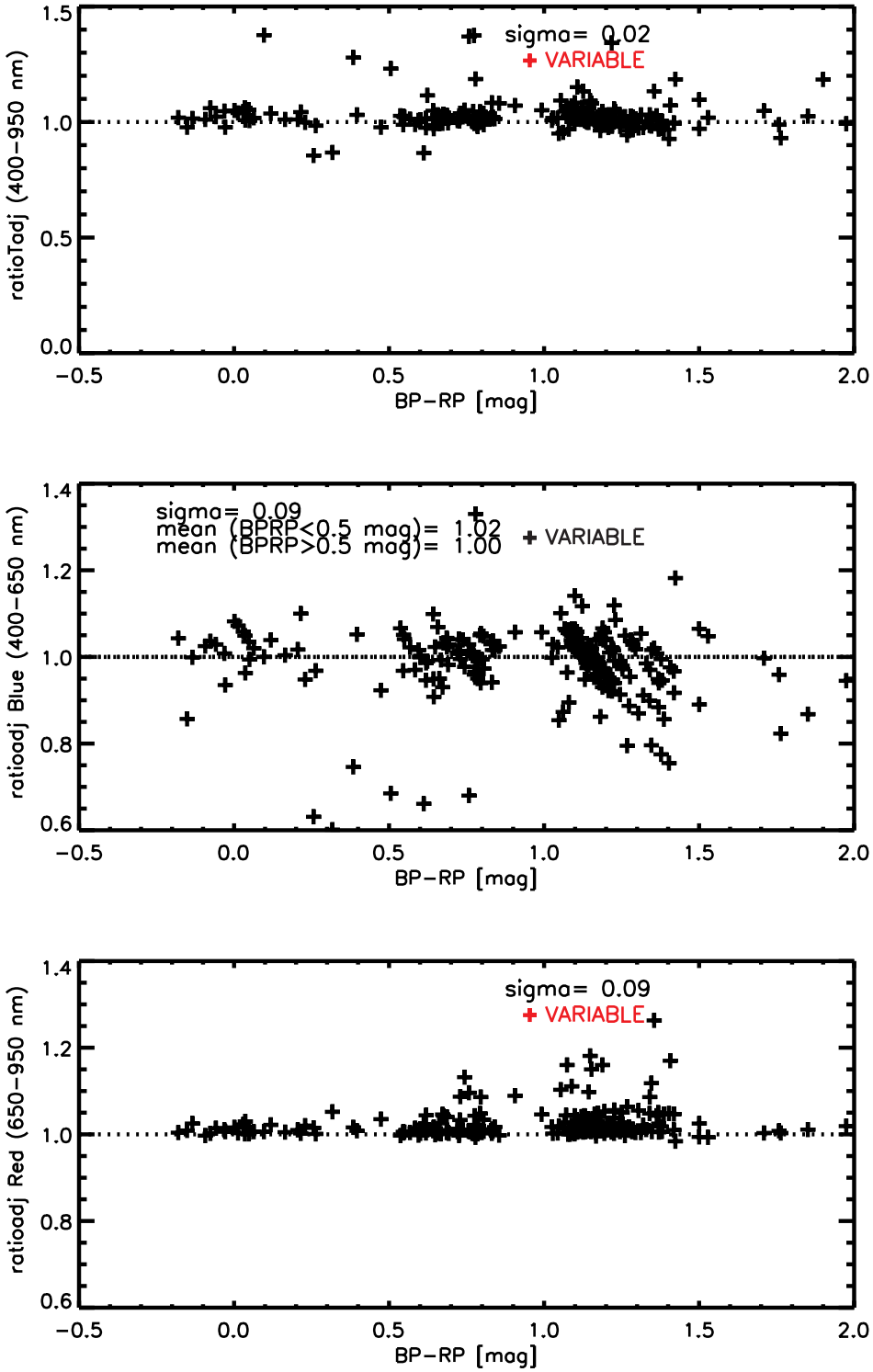

Fig. 5. INDO-US spectra: the residual with the Gaia DR3 BP/BP spectra are smaller in the red part of the spectrum (650-950 nm), giving a smaller chiadj, than in the blue part (400-650 nm). Only datapoints with comment="OK", full coverage from 3400–9500 Å (flaggap= 0), and ratioT smaller than 5 are plotted.

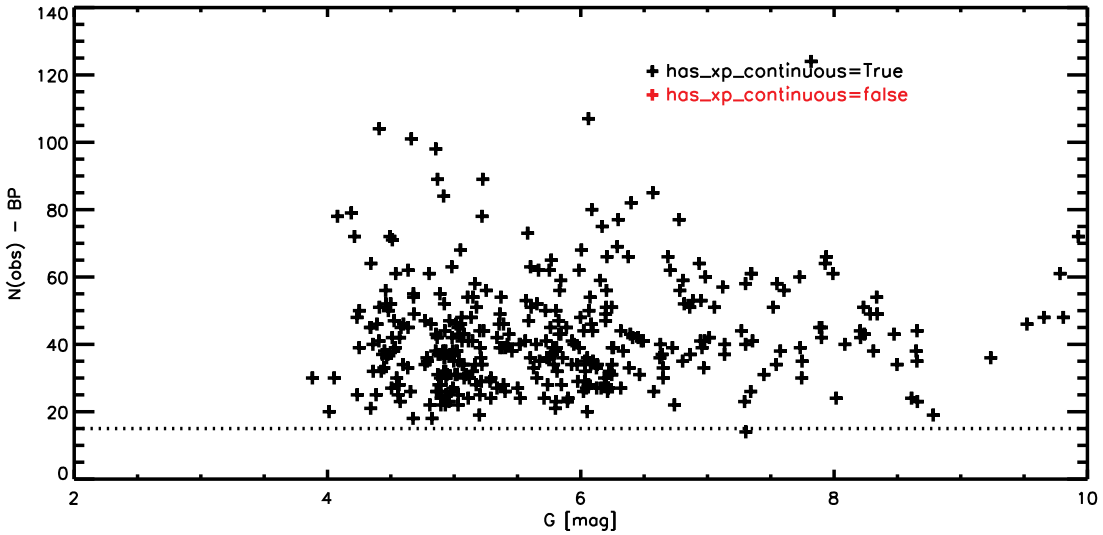

Fig. 6. INDO-US stars: Number of observation in BP-band versus Gmag. Only datapoints with comment="OK" and with full coverage from 3400–9500 Å (flaggap= 0) are plotted.

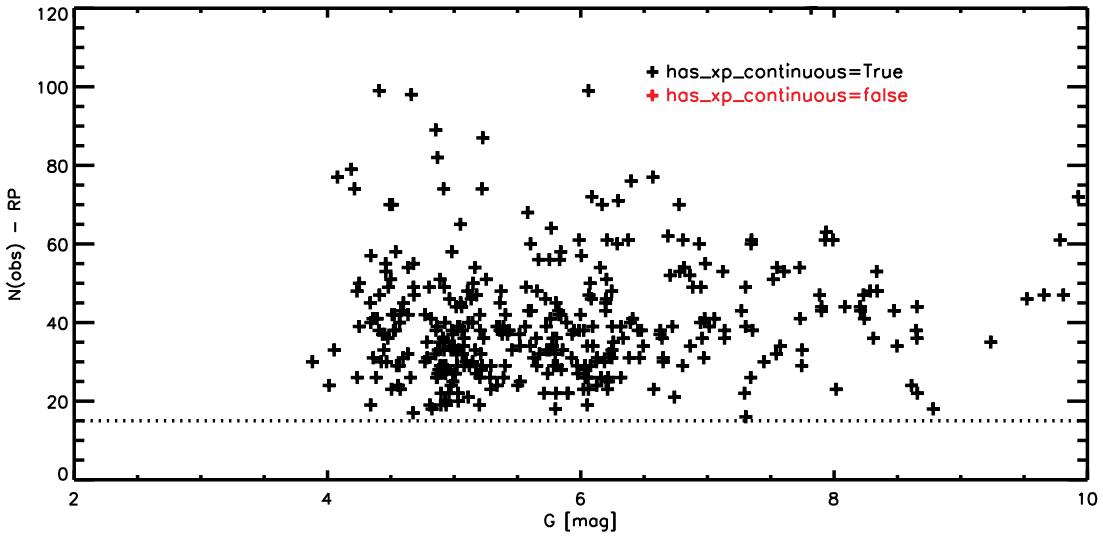

Fig. 7. INDO-US stars: Number of observation in RP-band versus Gmag. Only datapoints with comment="OK" and with full coverage from 3400–9500 Å (flaggap= 0) are plotted.

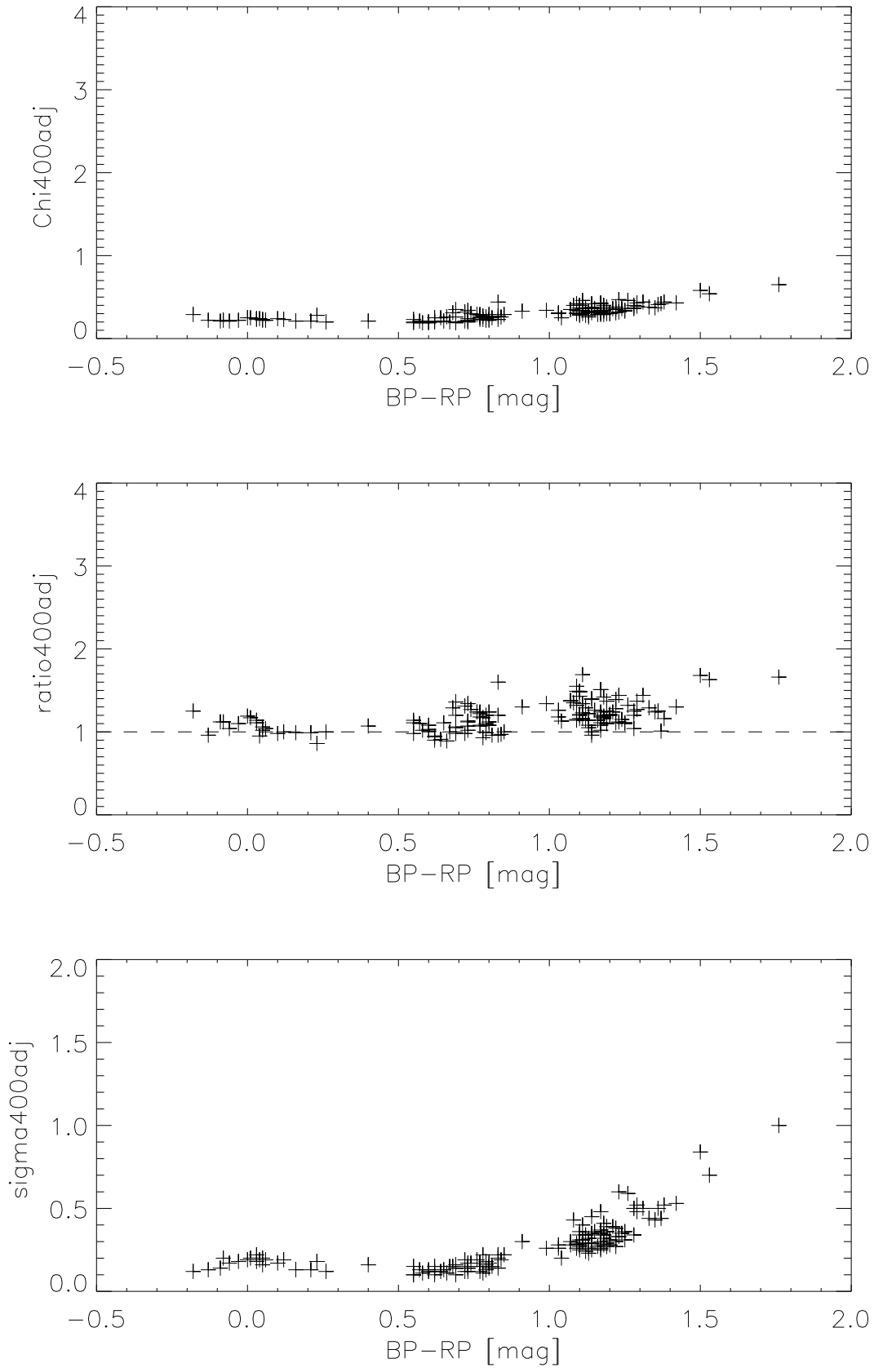

Fig. 8. INDO-US stars: Using the best sample of INDO-US spectra (with adjusted slope), the performance of the fit below 400 nm is analyzed.

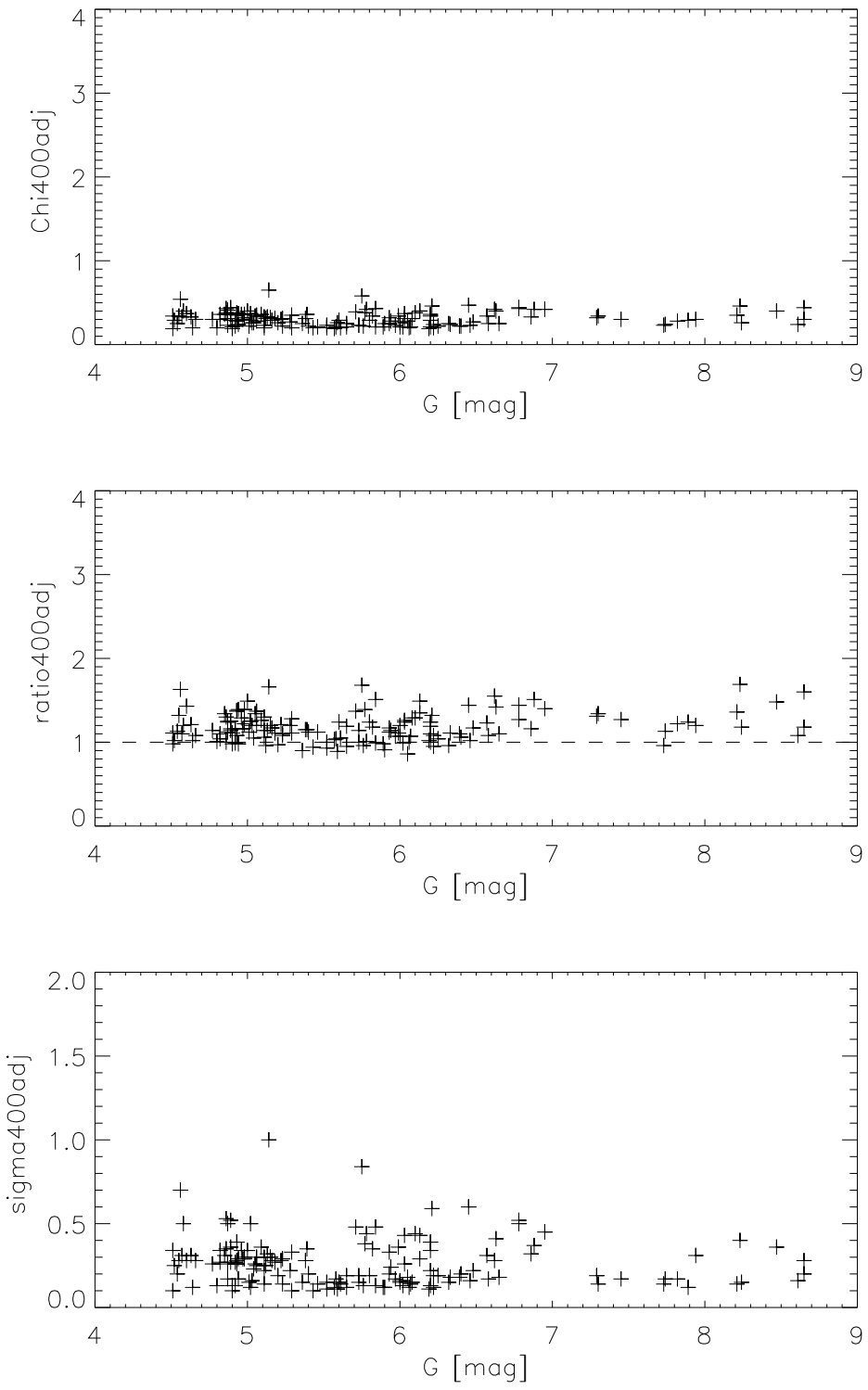

Fig. 9. INDO-US spectra.

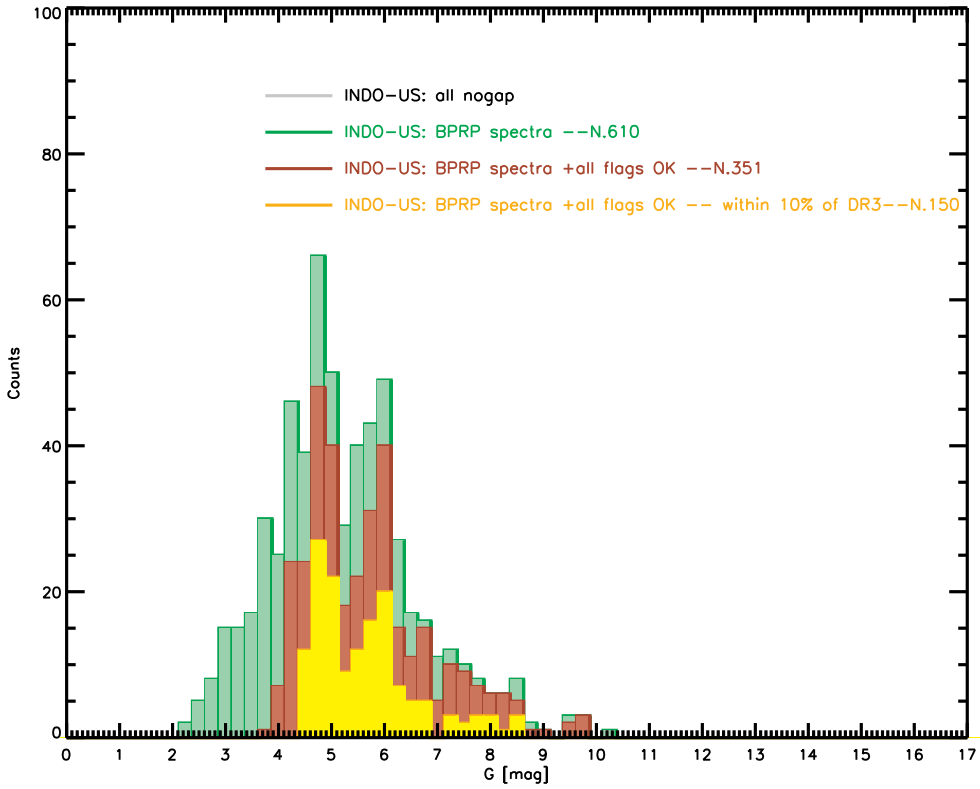

Fig. 10. INDO-US spectra.

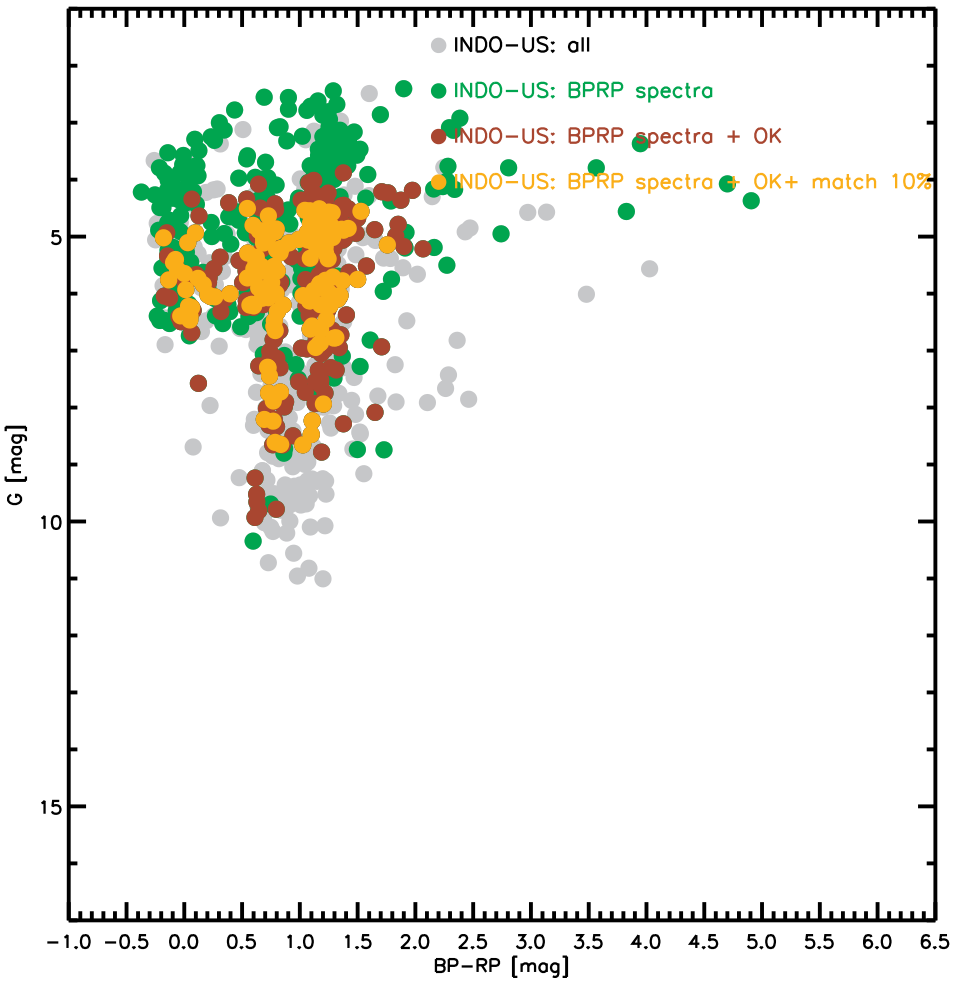

Fig. 11. INDO-US spectra.