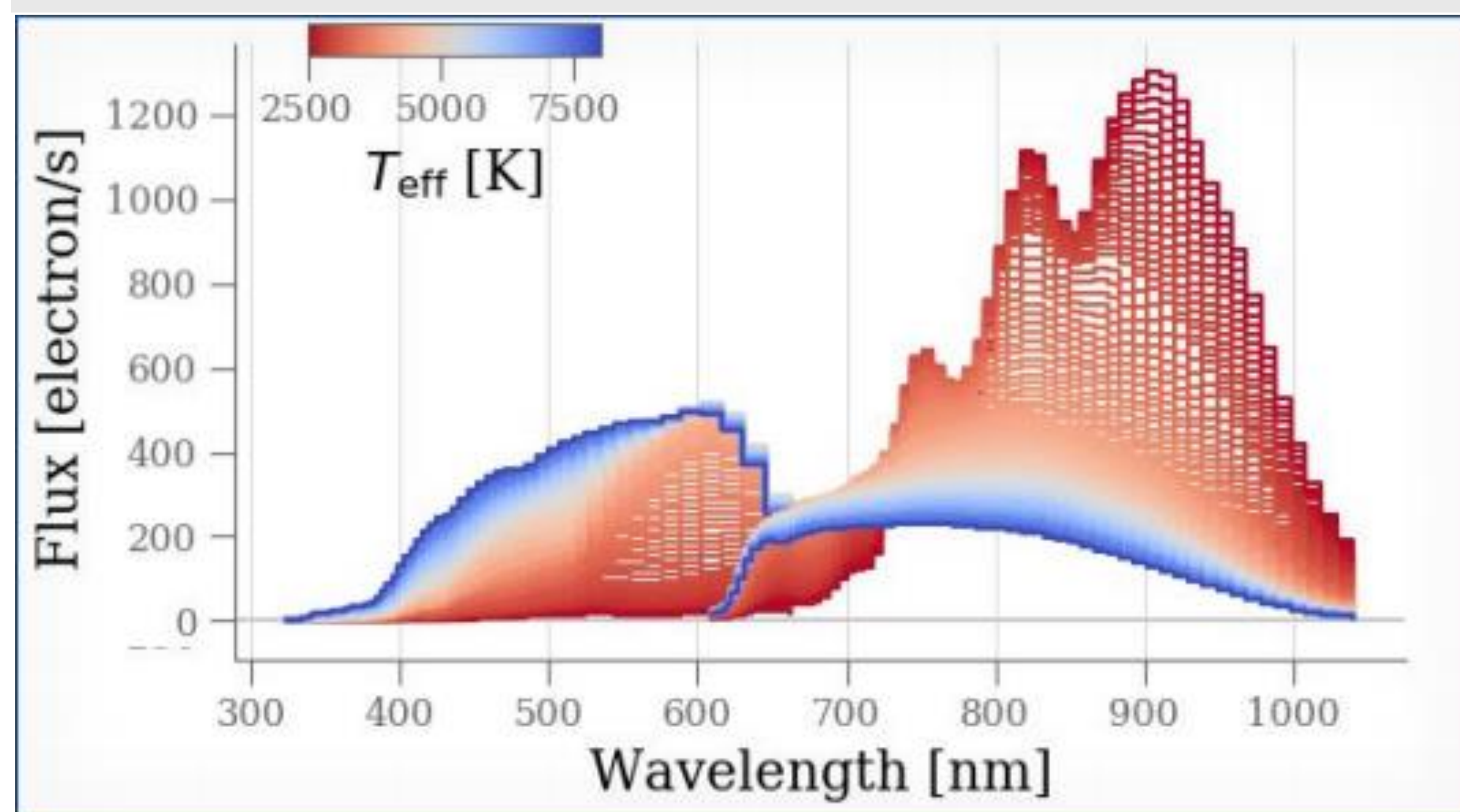


Detecting UCD Subdwarfs in Gaia DR3

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Problem / Question

Can you use Gaia RP spectra to identify ultracool subdwarf candidates?

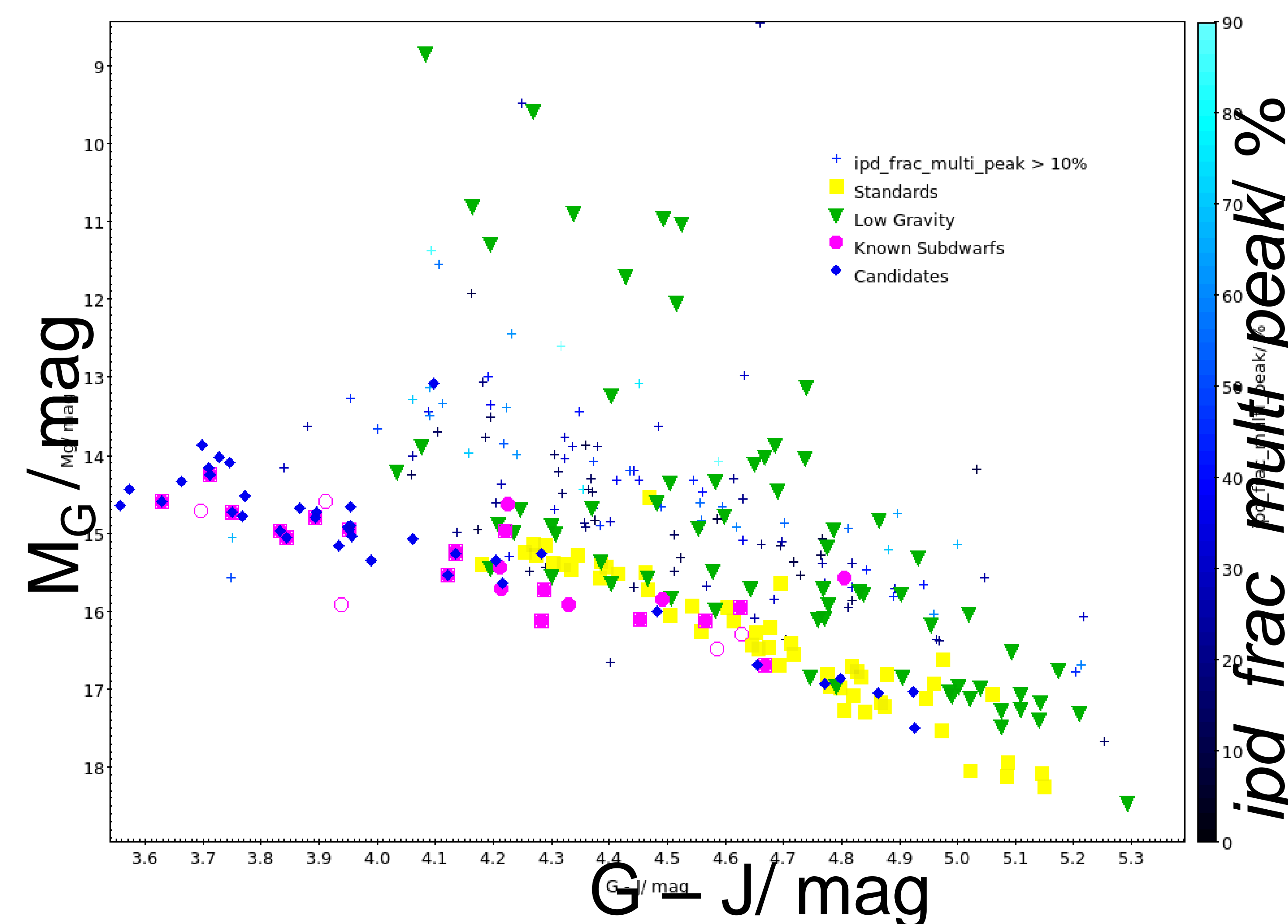


BP/RP spectra courtesy of Gaia-DPAC, from O. Creevey [EAS slide 4](#)

Method

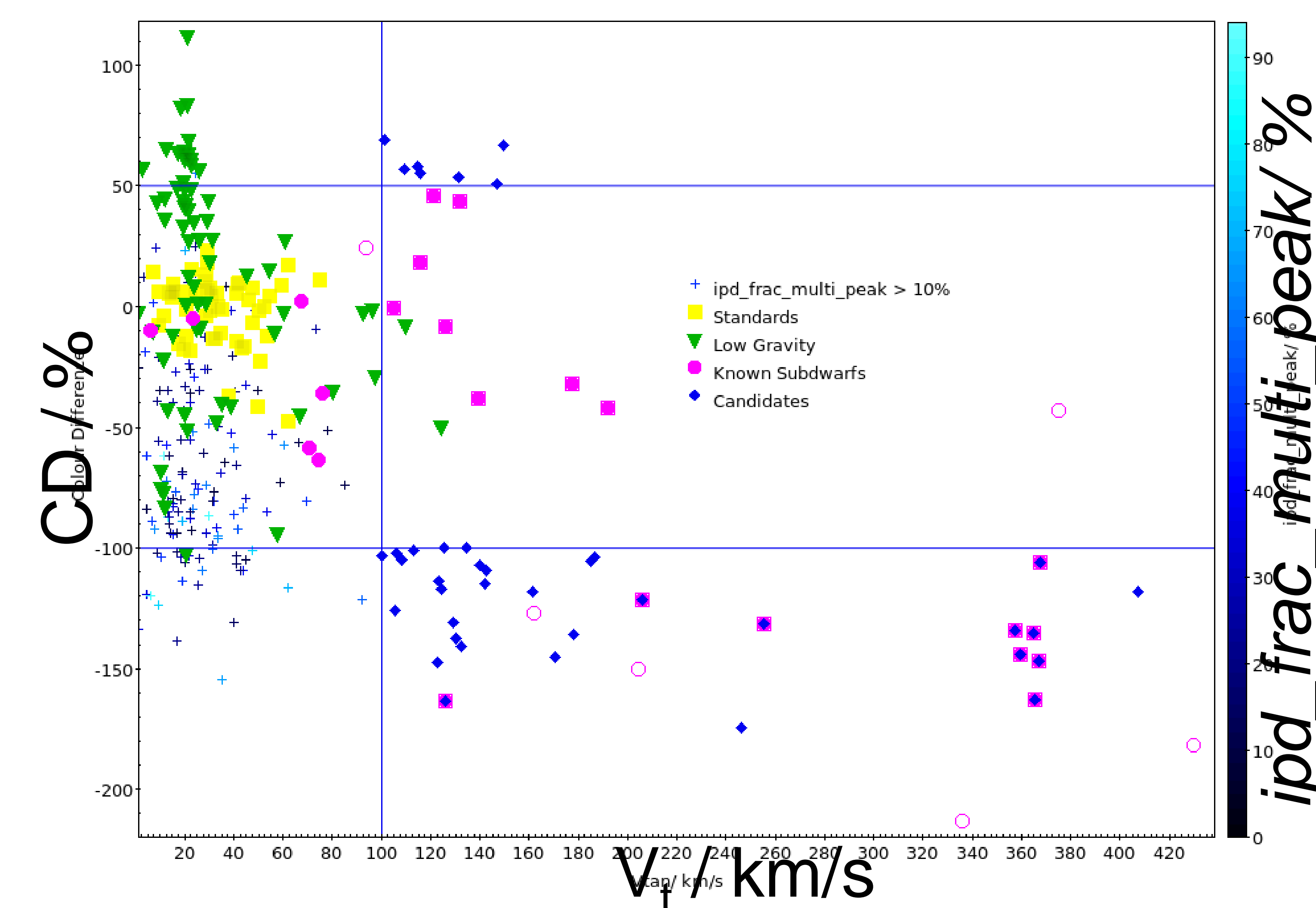
- Using Gaia RP spectra, we define a narrow band colour.
- This colour is compared to the same colour for the set of spectral standards.
- The spectral standards are also used to derive a polynomial relating effective temperature (from Gaia) to our colour comparison (Colour Difference, CD).
- This polynomial is then applied to the full data set in an attempt to account for the effective temperature bias, and isolate the difference corresponding to metallicity & gravity.
- Candidates are then flagged if they are outside the range $-100 < CD < 50$; pass a spectral quality flag check; have effective temperatures within the same range as the standards; and have a tangential velocity > 100 km/s.

Validation

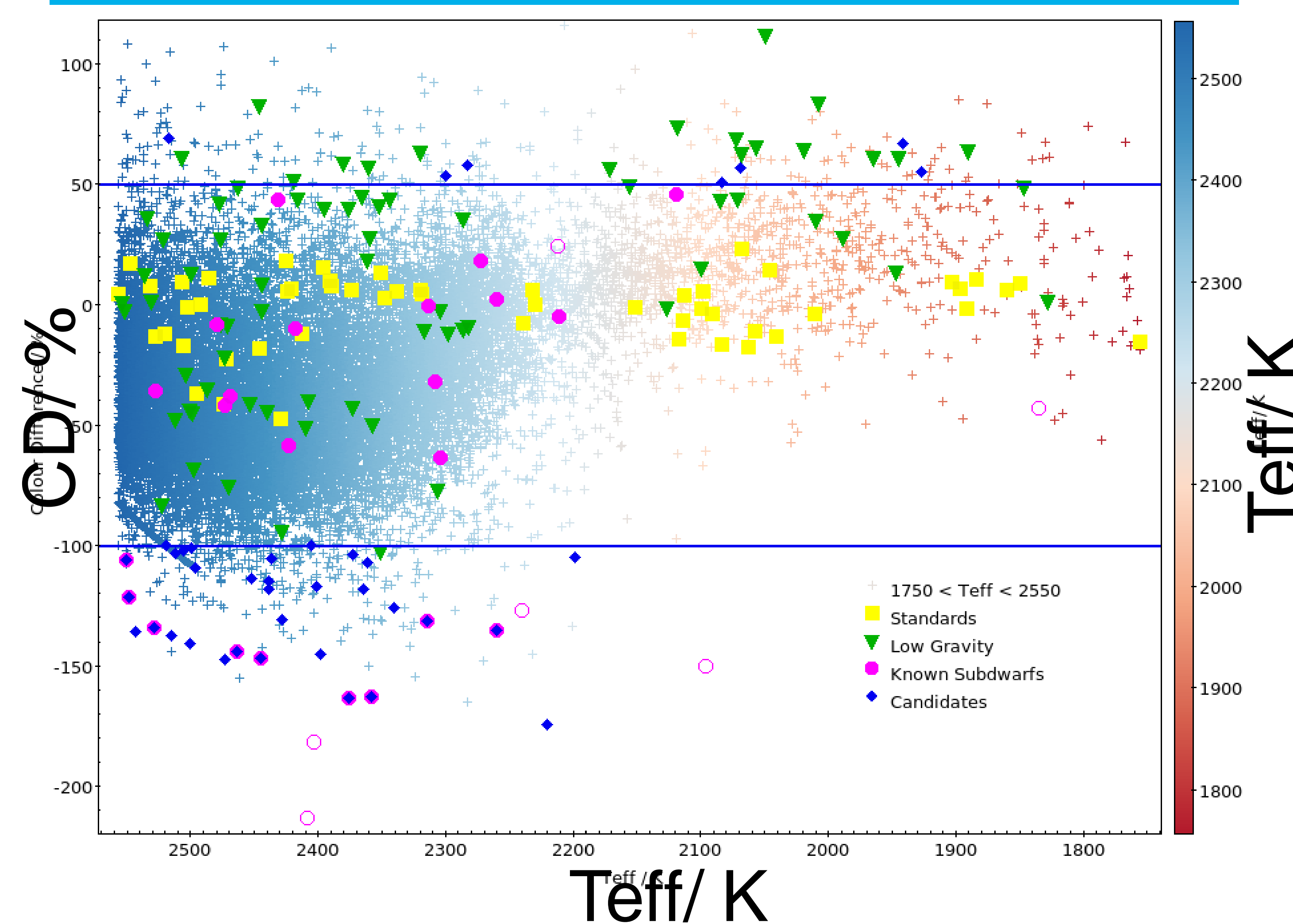


Diagrams demonstrating how the potential binary sample is a separate population to our selected candidates and that there is a temperature bias. We plot from dark to light blue plus signs the Gaia *ipd_frac_multi_peak* (%) or effective temperature measure; which is correlated with binarity. Over-plotted are our standards as yellow squares; low gravity objects as green downwards triangles; known subdwarfs as magenta circles (filled if they pass our spectral quality flag check & surrounded by a square if they have $V_t > 100$ km/s); our candidates are the blue diamonds. Horizontal blue lines are used to denote the cuts beyond which an object is flagged as a candidate ($-100 > CD > 50$).

Results



Issues



Conclusion

- Promising results, candidates include the majority of known subdwarfs, especially ultra/ extreme subdwarfs.
- Issues still remain, e.g: an effective temperature bias towards hotter objects; some low gravity objects & binaries are high or low CD values respectively.
- Won't be included as part of Gaia DR3 release but will be a downstream project with intentions to improve results using DR4 & community feedback.