

Studies of hot hydrogen deficient stars with UVIT

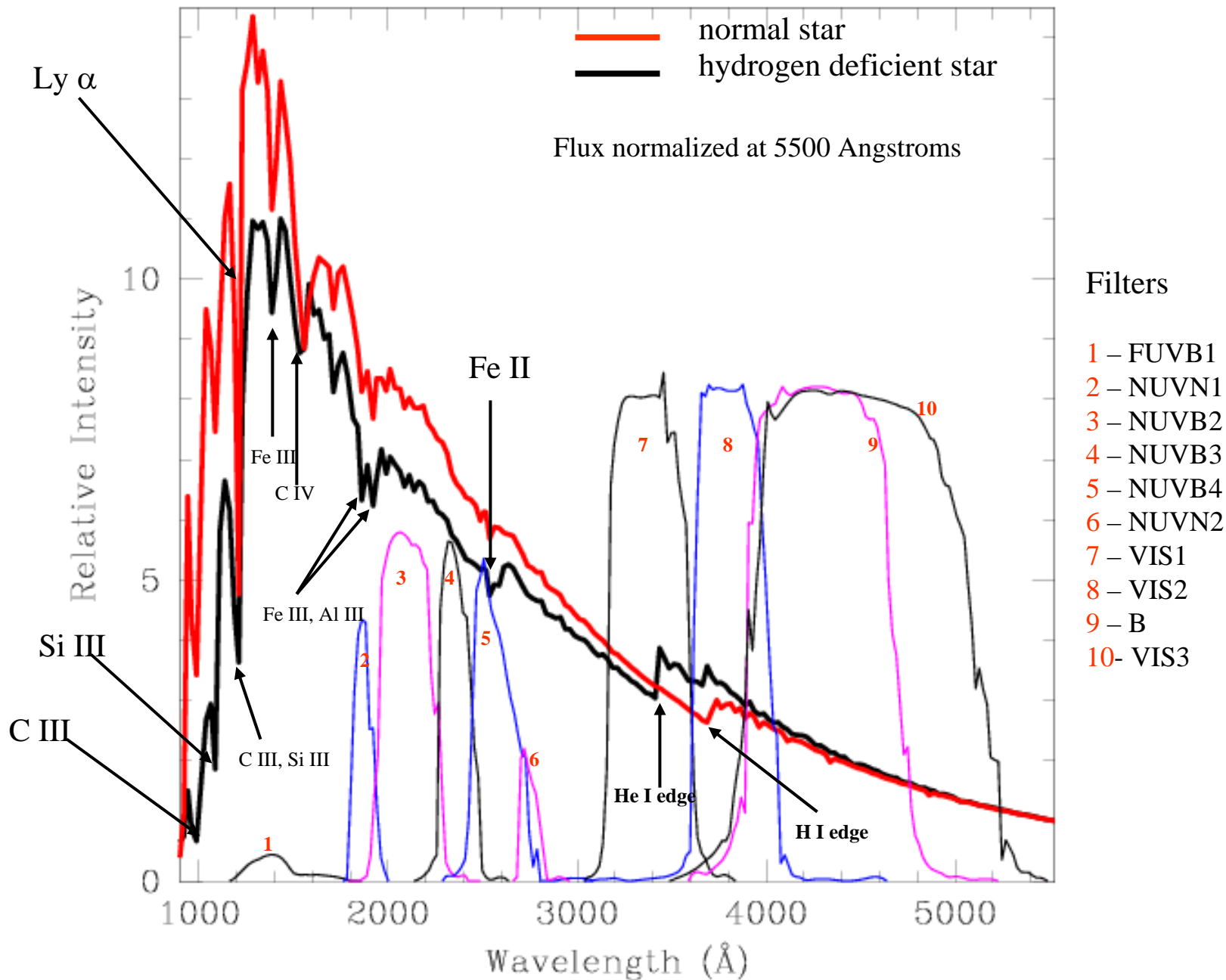
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Just about 20 extreme helium (EHe) stars are known, and these were identified from optical studies. EHes are hydrogen deficient supergiants, and their origin and evolution is a mystery (Pandey et al. 2006). EHes span a range in effective temperature: 8000 - 30,000 K, and in surface gravity: $\log(g) = 0.5 - 3.0$ (cgs). We explore the possibility of distinguishing hydrogen deficient stars from normal stars (hydrogen rich) using UVIT colours.

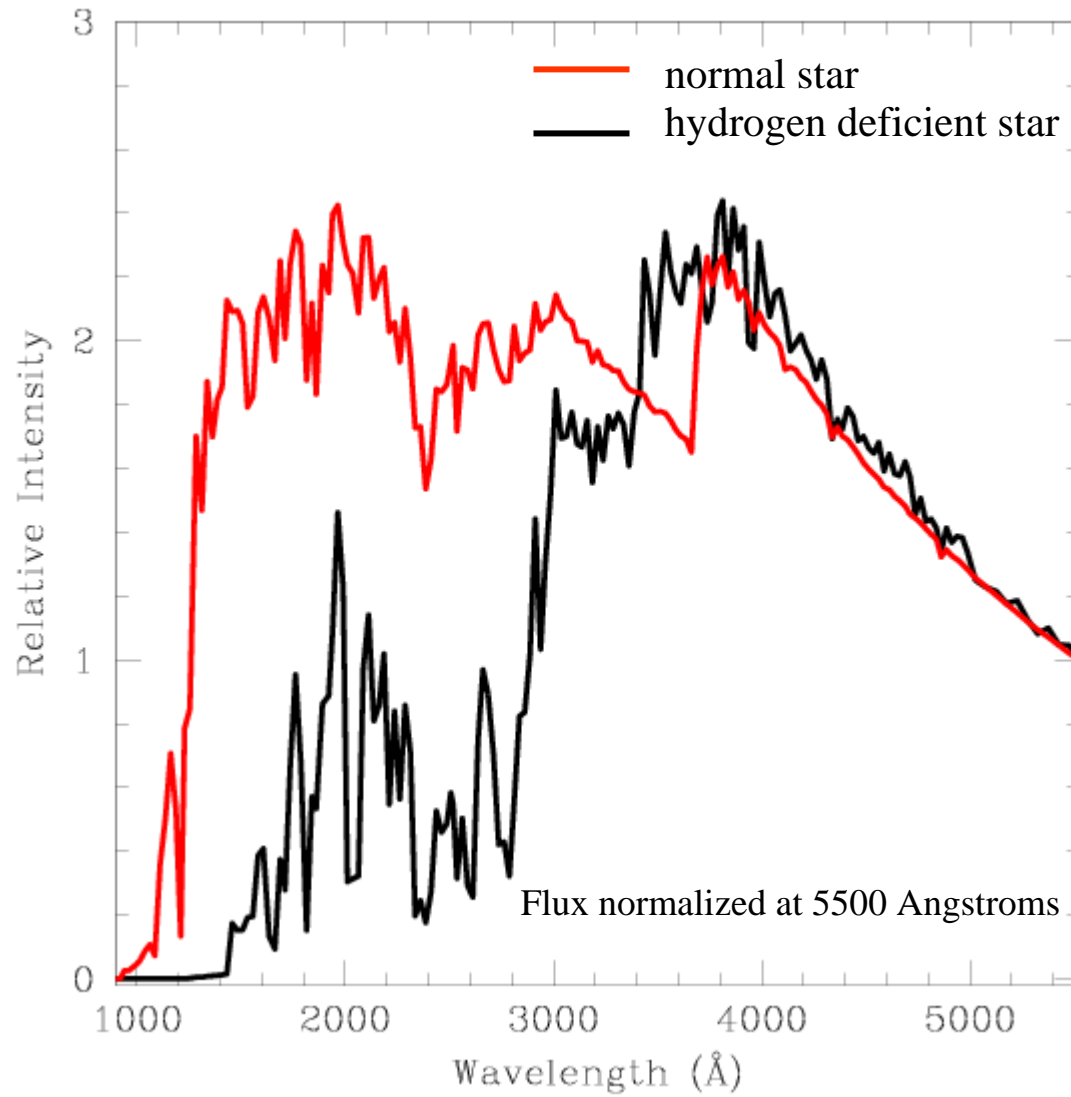
Predicted spectral energy distribution (SED), for the known T_{eff} and $\log(g)$ of an EHe, is compared with that of a normal star with the same T_{eff} and $\log(g)$. The adopted SEDs are from Armagh Cosmogrid (Jeffery, Woolf & Pollacco 2001).

These SEDs are convolved with the effective area of the UVIT filters to get the colours. Examples for $T_{\text{eff}} = 16,000\text{K}$, $\log(g) = 2(\text{cgs})$ and $T_{\text{eff}} = 10,000\text{K}$, $\log(g) = 1.0(\text{cgs})$ with UVIT windows are shown in the following figures.

$T_{\text{eff}} = 16,000\text{K}$, $\log(g) = 2.0(\text{cgs})$



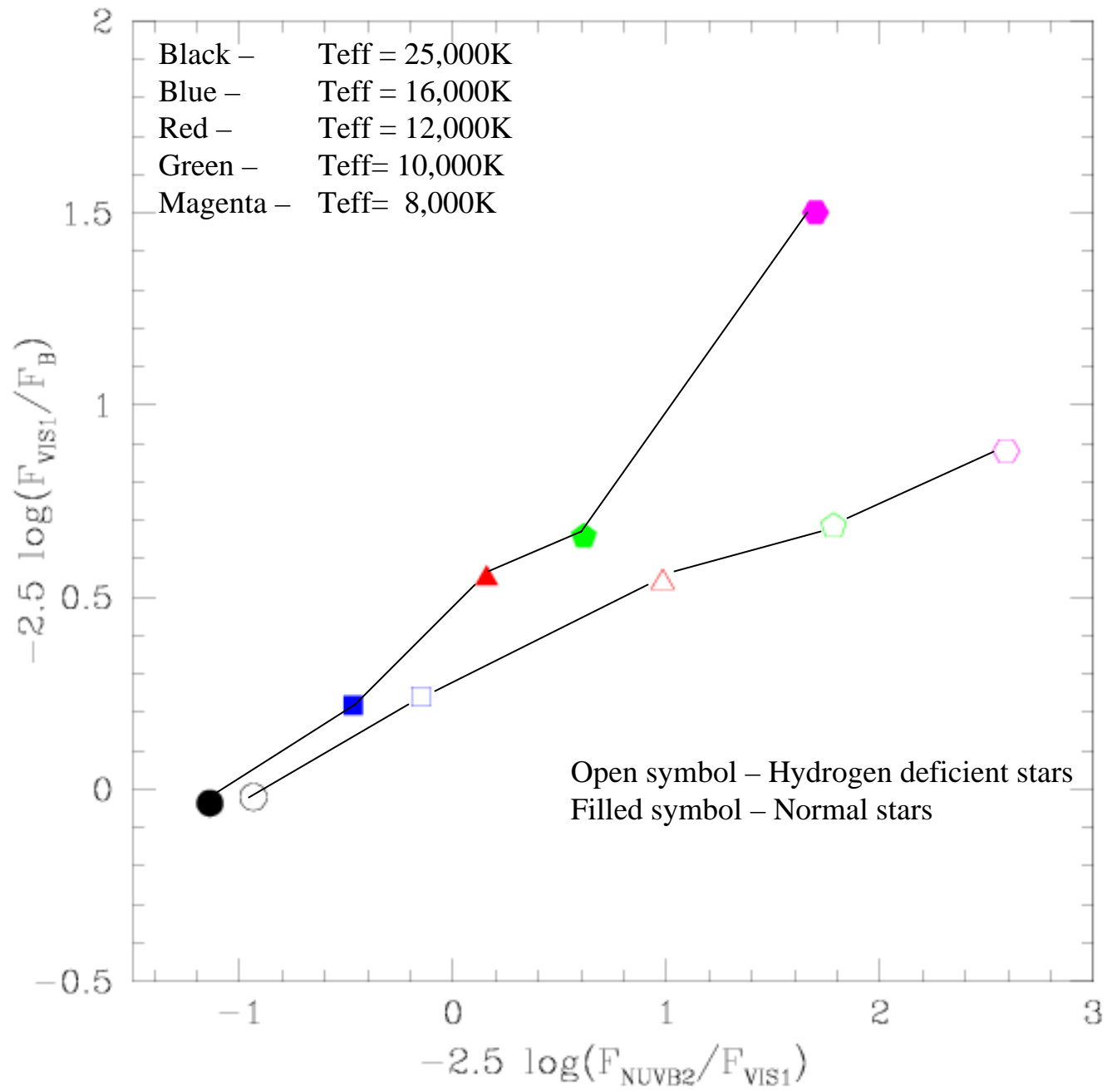
$T_{\text{eff}} = 10,000\text{K}$, $\log(g) = 1.0(\text{cgs})$

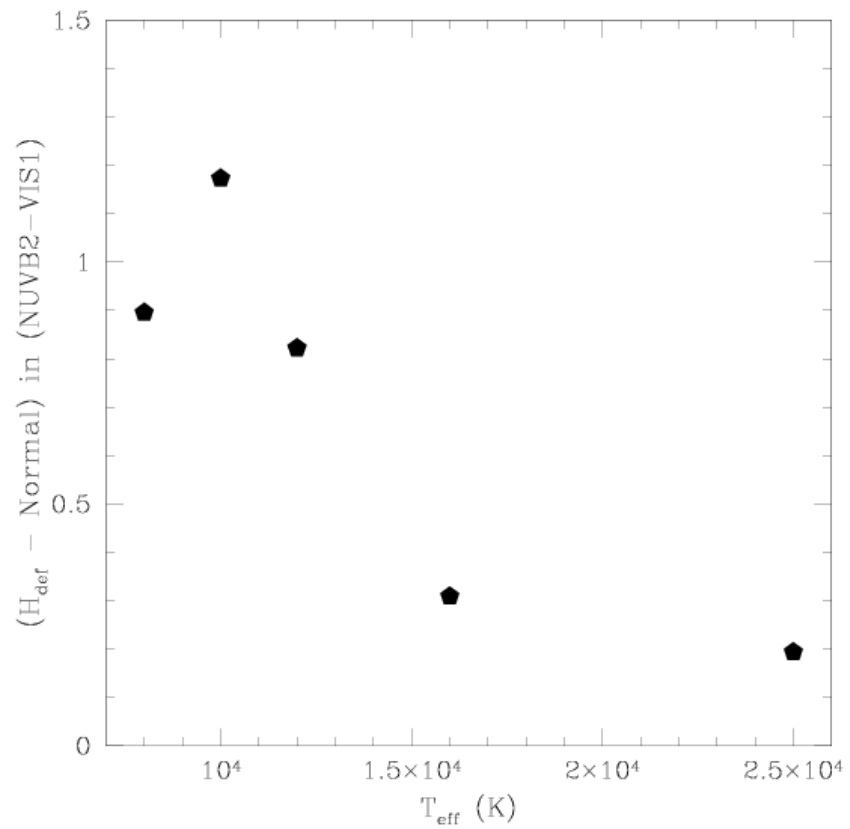
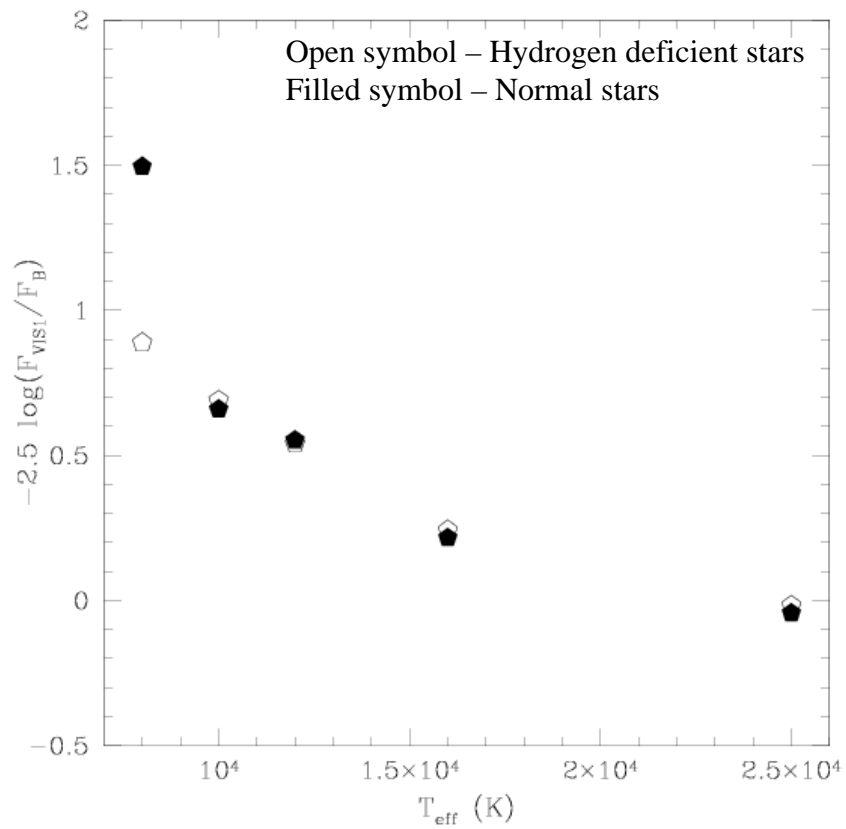


The derived $\log(T_{\text{eff}})$ and $\log(g)$ of some of the observed EHes

EHes	$\log(T_{\text{eff}})$	$\log(g)$
HD168476	4.146	1.5
BD+10 2179	4.225	2.55
HD124448	4.2	2.2
BD-9 4395	4.356	2.55
LSE78	4.255	2.0
LSS3184	4.367	3.35
LS IV+6 2	4.5	4.05
LSS4357	4.207	2.0
LSII+33 5	4.208	2.0
LSS99	4.185	1.9
HD160641	4.531	2.8

The following figures show the difference in colours, for normal and hydrogen deficient stars that have the same stellar parameters:
 T_{eff} , $\log(g)$





In the temperature range, 10,000K – 30,000K $F_{\text{VIS1}}/F_{\text{B}}$ remains roughly the same for normal and hydrogen deficient stars, but note the appreciable change in $F_{\text{NUVB2}}/F_{\text{VIS1}}$.

The colour-colour plots shown, fairly well distinguishes normal stars from hydrogen deficient stars in the temperature range, 10,000K – 30,000K

References:

Jeffery, C. S., Woolf, V. M., Pollacco, D. L., 2001, *A&A*, 376, 497

Pandey, G., Lambert, D. L., Jeffery, C. S., Rao, N. K., 2006, *ApJ*, 638, 454