

# Studies of hot hydrogen deficient stars with UVIT

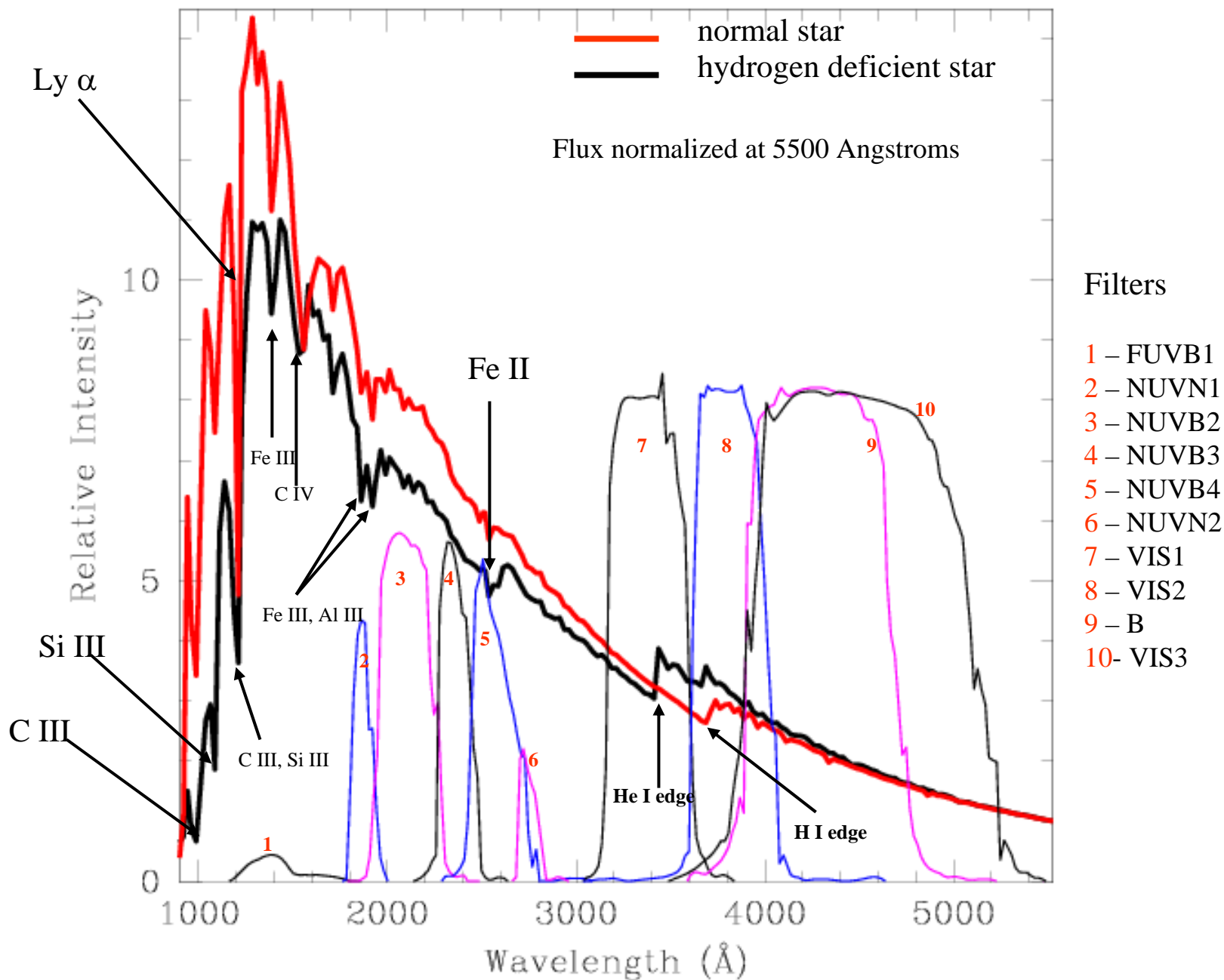
Gajendra Pandey, N. Kameswara Rao  
Indian Institute of Astrophysics, Bangalore

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.

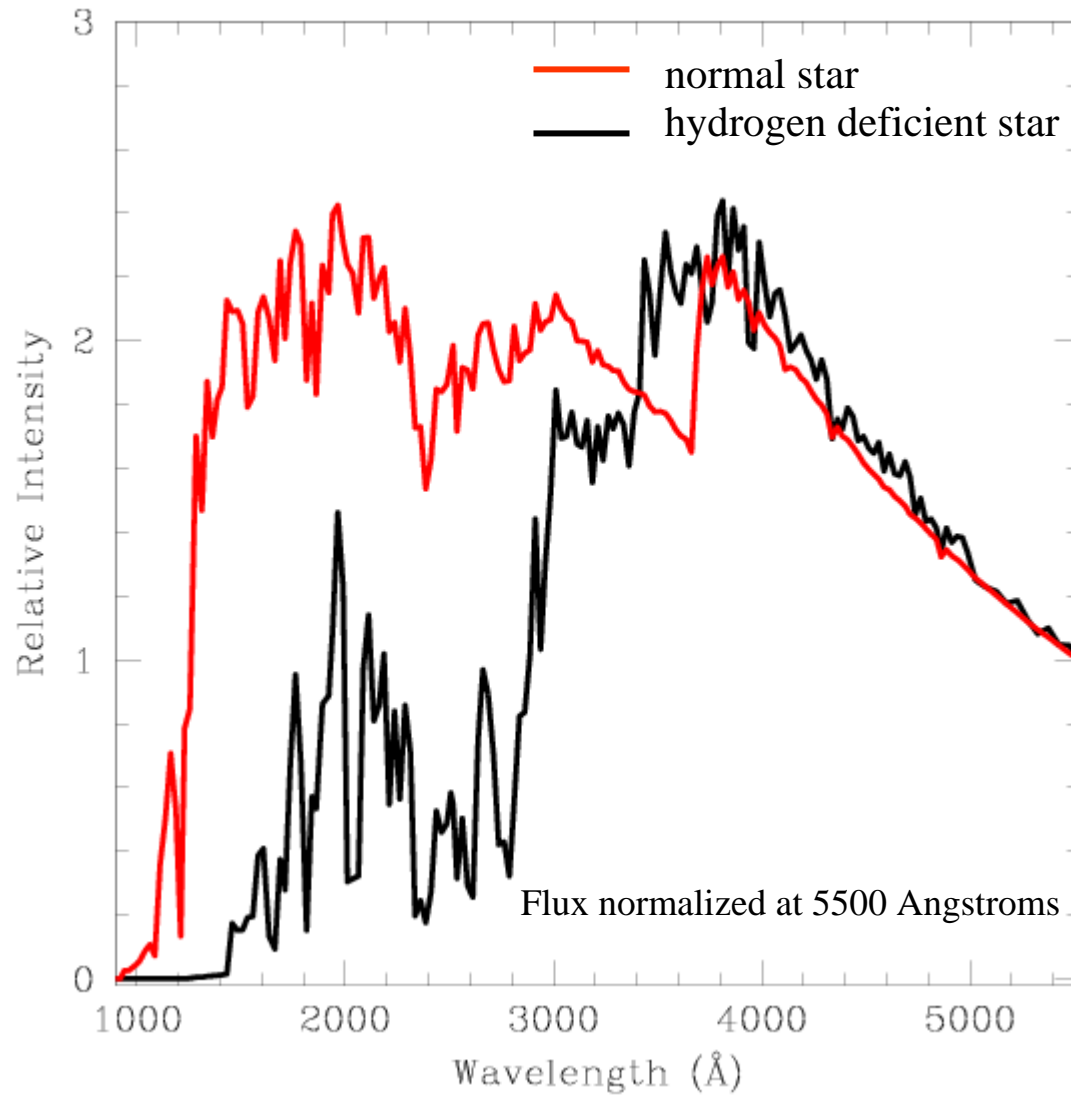
Predicted spectral energy distribution (SED), for the known  $T_{\text{eff}}$  and  $\log(g)$  of an EHe, is compared with that of a normal star with the same  $T_{\text{eff}}$  and  $\log(g)$ . The adopted SEDs are from Armagh Cosmogrid (Jeffery, Woolf & Pollacco 2001).

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.

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



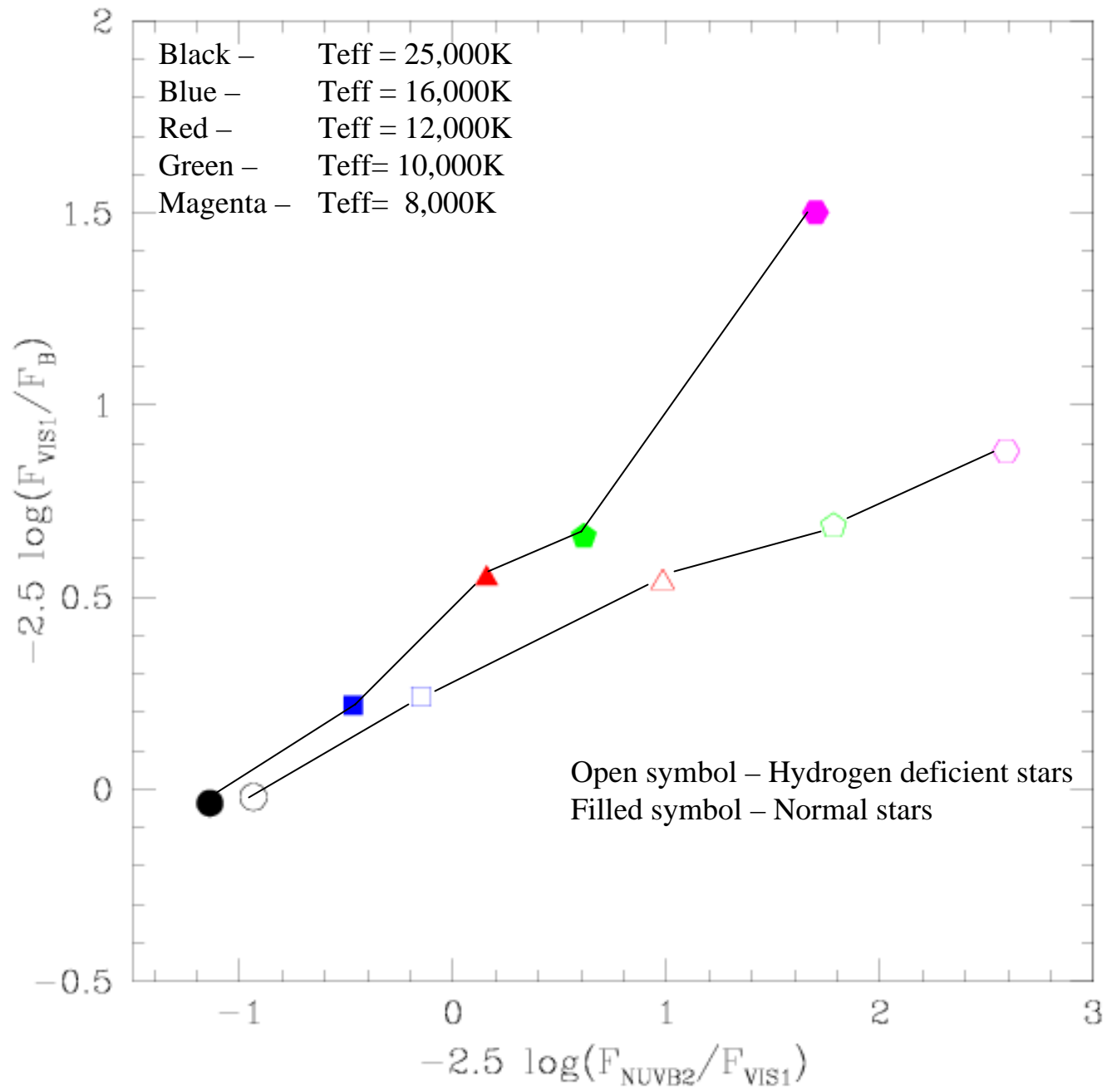
$T_{\text{eff}} = 10,000\text{K}$ ,  $\log(g) = 1.0(\text{cgs})$

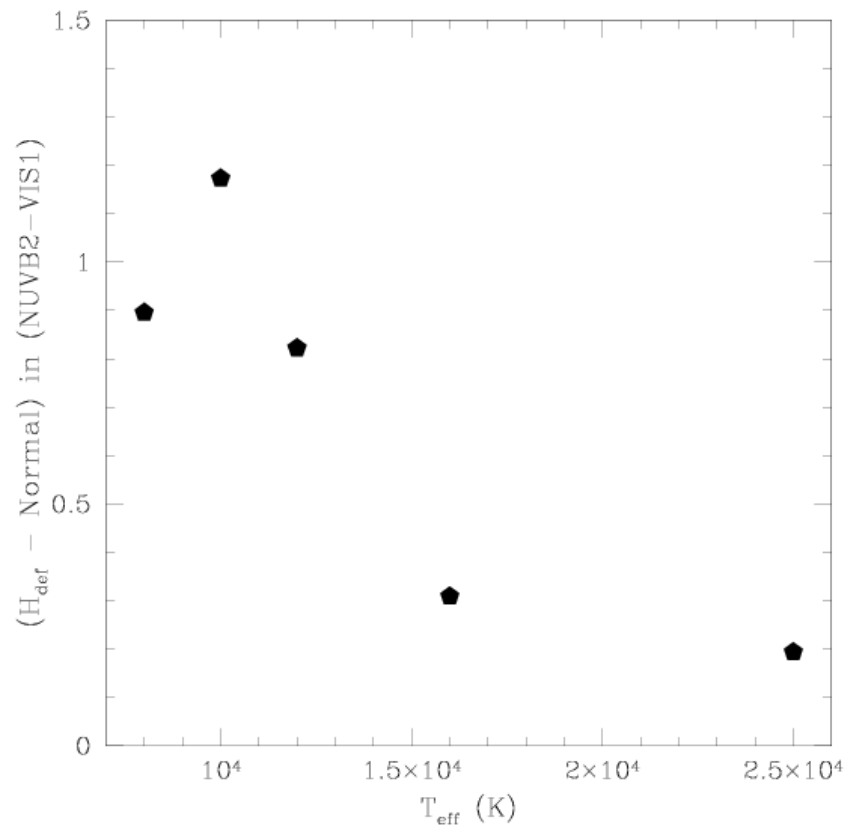
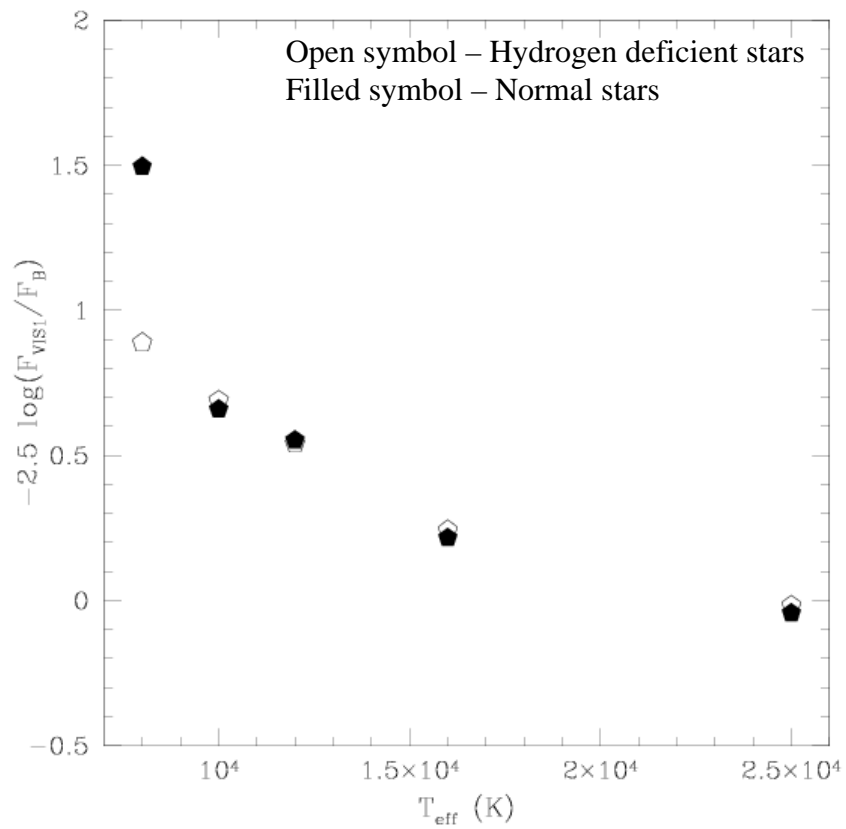


The derived  $\log(T_{\text{eff}})$  and  $\log(g)$  of some of the observed EHes

<b>EHes</b>	<b><math>\log(T_{\text{eff}})</math></b>	<b><math>\log(g)</math></b>
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:  
 $T_{\text{eff}}$ ,  $\log(g)$





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