THE ABUNDANCES AND GRAVITIES OF THE δ SCUTI, AI VELORUM AND RR LYRAE STARS

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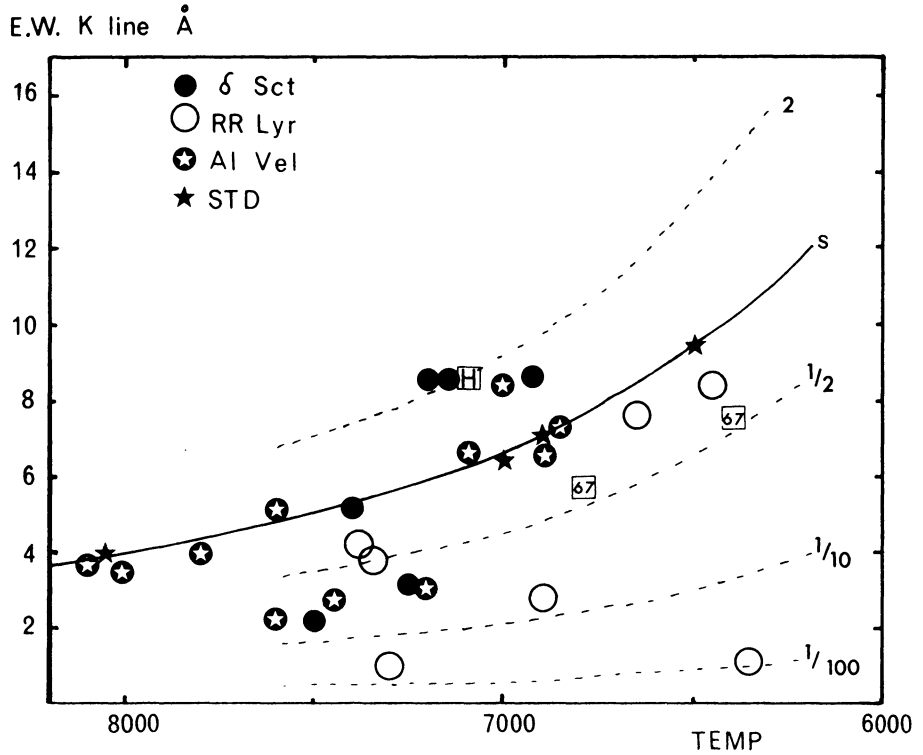
Abstract. A comparative investigation of the temperatures, gravities and abundances of the AI Velorum stars and some selected δ Scuti stars and RR Lyrae stars has been carried out at Mount Stromlo during the past few years. Eleven AI Velorum stars, 6 δ Scuti and 6 RR Lyrae stars together with 6 established standard stars have been observed. The eleven AI Velorum stars comprise almost all those accessible from the Southern Hemisphere. The RR Lyrae stars were selected as examples of the weakest and strongest line stars of type a and c, and the 6 δ Scuti stars observed also represent the strongest and weakest line stars of the group.

Spectra covering the region from λ3800–λ4600 have been taken with an RCA 33016 image tube at 10 Å mm^{-1} dispersion. From these spectra, Hγ and Hδ profiles and the Ca K line equivalent widths have been measured. In the accompanying figure is



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shown the equivalent width of the K line plotted against the effective temperature derived from the hydrogen lines. The continuous line represents the locus for solar composition stars and the dashed lines the loci for indicated multiples of the solar composition. The symbol *H* corresponds to a Hyades cluster member and 67, to two blue stragglers in M67. This figure shows clearly that there is no distinction in Ca abundance between the δ Scuti stars and the AI Velorum stars, and that the strongest line RR Lyrae stars have almost solar abundance. Photoelectric scans from λ3300 to λ7500 have also been obtained for all these stars. The effective gravities derived range from $\log g = 4.0$ to 3.2 and show that the δ Scuti stars and AI Velorum stars with period longer than 0.05 days are pulsating in the fundamental mode with values of $Q_0 \simeq 0.032$. There is again no separation between these two groups in the period $\sim \log g$ diagram. The RR Lyrae stars however do separate clearly, all having gravities between $\log g = 3.0$ and $\log g = 2.5$. In conclusion, on the basis of measured abundance, gravity and temperature there appears to be no clear distinction between the AI Velorum stars and the δ Scuti stars.

DISCUSSION

Breger: HD 24550 seems to be the star furthest down from your $\log P \log g$ line. Derek Jones reobserved it and found a larger period which would put it on the line.

Bessell: Yes, and then the next year he observed it again and got it back below the line (laughter). There's just an interesting point that's got nothing to do with what I said before, but this star is 24550B and that's 24550, so there's a binary star in which one component is 2 times overabundant and the other component is normal. Derek Jones found this out also a couple of years ago, it is rather interesting.

McNamara: You do find the log of the gravities for the dwarf Cepheids varying between about 4 and about 3.5, is that about right?

Bessell: Yes, I found BS Aqr was the lowest with $\log g$ about 3.4.

McNamara: Do you have any comments about the possibility of a period luminosity relationship? Do you feel strongly about them?

Bessell: None of them are in clusters, we've only got a luminosity for SX Phe and if Eggen twists my arm a lot, I can take SX Phe up to 4.1 and get 1.2 solar masses on a 1/10th abundance star as a blue straggler; that's twisting everything to the extreme, but it is possible that that would fit in quite well.

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