Selective Depletion of Elements in Stellar Atmospheres: A Unified Picture?

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We have investigated stars which show abundance patterns resembling that of gas in the interstellar medium: the abundances of the elements in the stars' atmospheres correlate with condensation temperature. Critical to the detection of this pattern is the measurement of S and Zn, which are only slightly depleted in the interstellar environment and are not likely to be altered significantly by dredge-up episodes in low-mass stars.

The three groups of stars showing this pattern are:

1:	binary post-AGB stars	4 objects	<[Fe/H]>	= –3.6
2:	field Type II Cepheids:			
	a) RV Tau stars	5 objects	<[Fe/H]>	= –1.3
	b) W Vir stars	1 object	[Fe/H]	= –1.5
3:	λ Boötes stars	4 objects	<[Fe/H]>	= –1.7

where [Fe/H] is the iron abundance relative to the solar value.

The first two groups of stars have two things in common: (*a*) their evolutionary time scale is short, and (*b*) almost all stars (there are two exceptions) show a pronounced infrared excess with temperatures < 1000 K. We propose that in ALL these metal-depleted stars (the three groups identified) the fractionation process takes place in a circumbinary disk, implying that the RV Tauri stars with metal-depleted abundance pattern may be binaries with periods of the same order as the post–AGB binaries: 1 to 2 years.

For the third group of stars, the λ Boötes stars, a disk may be a remnant of the star formation process and binarity is not needed to explain the observed phenomena.

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