ON THE MASS AND LUMINOSITY OF V348 SGR

D. Schönberner
Institut für Theoretische Physik und Sternwarte
der Universität Kiel
Olshausenstr. 40, 2300 Kiel, F.R.G.

In this short note, an attempt has been made to estimate mass and luminosity of the unique object, V348 Sgr, which appears to be a "Rosetta Stone" for our understanding of late stages of stellar evolution, as

i) its photosphere is virtually hydrogen-free and carbon-rich as with an extreme helium star,
ii) it fades irregularly as does a R CrB-star and
iii) it is surrounded by a nebular shell similar to that surrounding Planetary Nebulae.

We know a great deal more about the above-mentioned objects than about V348 Sgr and this knowledge can be used to obtain estimates on mass and luminosity of the latter.

The UV-spectrum taken with the IUE-satellite reveals that V348 Sgr must be a supergiant as are other extreme helium stars (Heber et al., 1984). Together with its galactic coordinates ($l = 11°$, $b = -8°$) and its large radial velocity ($V_r \approx 160$ km/s), it is thus tempting to assume that it lies in the galactic bulge (see also Webster and Glass, 1974). Assuming therefore a distance $d = 9$ kpc, or $(V_o - M_v) = 14.8$, we get from the observations (with $V \approx 12$, $A_v \approx 2$) $V_o \approx 10$, $M_v \approx -4.8$. With BC = - 1.7, as follows from $T_{eff} \approx 20000$ K (Schönberner and Heber, this volume), we arrive at $M_{bol} \approx -6.5$ or $\log L/L_\odot \approx 4.5$. This value is consistent with that normally assigned to extreme helium or R CrB-stars ($\log L/L_\odot \approx 4$).

Coming next to the mass, some analogies are helpful. It has already been mentioned that IUE-spectra of V348 Sgr show its similarity to B-type supergiants (Heber et al., 1984), which in turn have $\log(L/M) \approx 4$ (in solar units). Central stars of planetary nebulae also have $\log(L/M) \approx 4$ and, last but not least, extreme helium and R CrB-stars have $\log(L/M) = 4.1 \pm 0.5$ Assuming also for V348 Sgr a luminosity to mass ratio of this size, its mass must then be of the order of 1 $M_\odot$.

The above estimates of mass and luminosity for V348 Sgr are consistent with its observed properties and place it well into the category of peculiar low mass stars in a very advanced stage of their evolution. Further investigations of the properties of V348 Sgr will

K. Hunger et al. (eds.), Hydrogen Deficient Stars and Related Objects, 221–222.

certainly also improve our knowledge of the origin and evolution of extreme helium and R CrB-stars.

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https://doi.org/10.1017/S0252921100090813 Published online by Cambridge University Press

DISCUSSION

TUTUKOV: You said that there is something like a planetary nebula connected with the star. Could you give some parameters of this nebula, and some possible evolutionary scenarios?

SCHÖNBERNER: The nebular shell is of very low excitation since the star is cool. Probably only a very small part of the shell is ionized. I think it is premature to say anything about possible scenarios.

POTTASCH: Is anything known about the abundances in the nebula?

SCHÖNBERNER: Yes and no. The nebula is supposed to have normal abundances. We need better observations to clarify the situation concerning the nebular abundances.

LIEBERT: What is known about the abundances of the star V348 Sgr?

SCHÖNBERNER: Photospheric absorption lines of hydrogen are not detectable in the present observational material. The C II lines (especially in the UV) appear unusually strong. It is reasonable to assume that the photosphere is extremely hydrogen-deficient and somewhat carbon-rich, i.e. comparable in composition to the Extreme Helium Stars.

POTTASCH: The determination of the distance from the radial velocity is very uncertain. Planetary nebulae are known in similar directions with similar velocities and which are much closer.

SCHÖNBERNER: Agreed, it is only an estimate.

POTTASCH: Is there any other method of getting the distance?

SCHÖNBERNER: I don't think so.

FEAST: What is the absorption, is the interstellar absorption reasonable for the distance?

SCHÖNBERNER: The star is well out of the galactic plane and hence the interstellar absorption gives only a lower limit to the distance.

LYNAS-GRAY: Would the inclusion of amorphous carbon (circumstellar) absorption make any difference to the MV Sgr effective temperature determination?

SCHÖNBERNER: We will certainly have to investigate this in the future. However, if I remember correctly, in the case of MV Sgr there appeared no need for the introduction of an additional circumstellar absorption.

KILAMBI: Your estimate of 0.15 magnitude of circumstellar absorption is the result of fitting the energy distribution, or is there any other confirmation for that?

SCHÖNBERNER: Yes. This particular circumstellar extinction was necessary to match the UV energy distribution. I don't know of other confirmations.

FEAST: Observations of $\lambda 4430$ will also give limits on the interstellar absorption.

SCHÖNBERNER: Yes, but you need spectra with very good signal to noise ratio, which are presently not attainable.

https://doi.org/10.1017/S0252921100090813 Published online by Cambridge University Press