SESSION 8

X-RAY DATA - MISCELLANEOUS TOPICS - GENERAL DISCUSSION

Chairmen: N. PANAGIA and V. NIEMELA

Introductory speaker: C. FIRMANI

1. D. KUNTH: Wolf-Rayet stars in emission line galaxies.
2. A.B. UNDERHILL: Comments on the significance of the positions of population I Wolf-Rayet stars in the HR diagram.
3. A.F.J. MOFFAT, C. FIRMANI, I.S. MC LEAN and W. SEGGEWISS: Time dependent X-ray observations of Wolf-Rayet stars with O-type and with suspected compact companions.
4. G.F. BISIACCHI, C. FIRMANI and F. DE LARA: Line profile variations and binarity in Wolf-Rayet stars.
5. W.T. SANDERS, J.P. CASSINELLI and K.A. VAN DER HUCHT: X-rays from Wolf-Rayet stars observed by the Einstein observatory.

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WOLF-RAYET STARS FEATURED IN EMISSION-LINE GALAXIES.

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Emission-line galaxies contain a large number of hot stars responsible for the emissive gas. They offer the opportunity of investigating the initial mass function of stars in regions of active star formation. So far, only integral properties of the ionizing complexes in giant H II regions or emission-line galaxies have been used (Lequeux et al., 1981) but no direct emission-line stellar feature has been thoroughly analyzed.

In the galaxy Tololo 3 (NGC 3125) recent observations by myself and Sargent (1981) have revealed the presence of an unusual strong and broad He II 4686 emission (see Fig.1). The origin of this line together with some nitrogen lines (e.g. NV 4620 and N III 4638) is attributed to Wolf-Rayet stars, mostly of WN types.

1) On the assumption that we are dealing with classical Wolf-Rayet stars evolving from early type stars and that the remaining O stars are responsible for the gas emission (hence for the Hß emission) we reach the conclusion that the ratio WR/O stars is equal to about 1. Such a high ratio is not expected under a continuous star formation regime but instead leads to the conclusion that star formation in Tololo 3 proceeded through a burst which ended up about 10^6 years ago, so that most of the stars have evolved.

2) A second explanation would appeal for high luminosity WR still on the main sequence and responsible for the ionisation. Only a small number is now enough to explain the observed line strength and thus high statistical fluctuations would be expected.
Indeed some of the recently discovered WR stars in NGC 604 by Conti and Massey (1981) may have $-8 > M_V > -9$. R 136 has $M_V = -10$ unless it is a small cluster. The difficulty with this interpretation is the moderate effective temperature of 38000 °K we derived for the ionizing star from the [O III]/Hß ratio.
As regard to the first explanation there are also several difficulties:

C. W. H. de Loore and A. J. Willis (eds.), Wolf-Rayet Stars: Observations, Physics, Evolution, 569–570.

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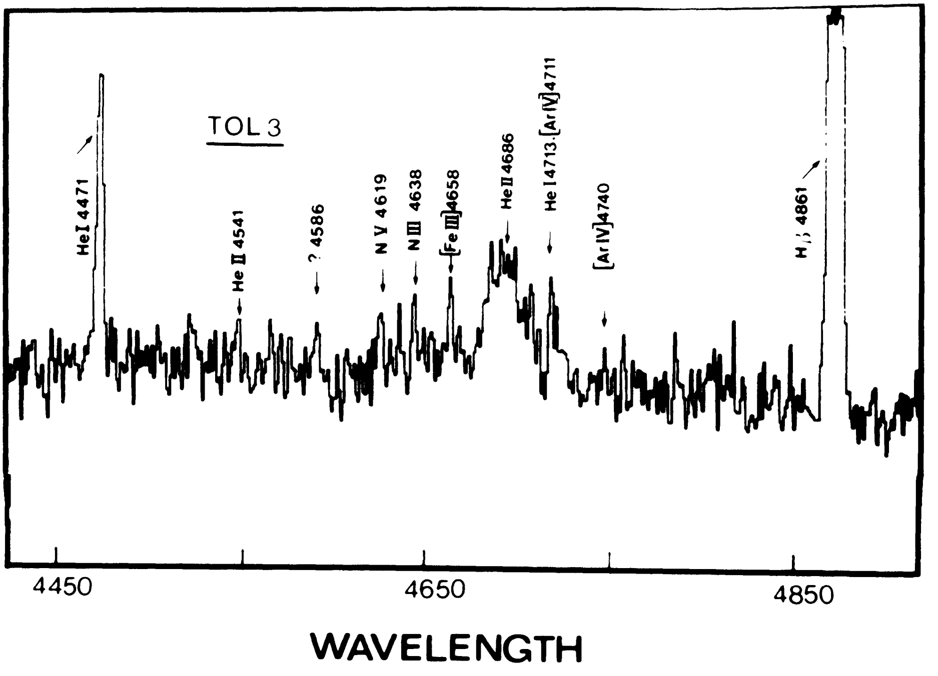

Fig.1 : Optical spectrum of the emission-line galaxies Tololo 3. This is a delimited part of the total spectrum showing the characteristic broad-band WR features.

First it implies a coherent evolution scenario for the O stars need to evolve simultaneously from the main sequence. Indeed the decline of the burst must be short and at least no longer than the lifetime of the WR stars namely 10^5 yrs. Such a time scale is indeed rather short, shorter or comparable to a typical collapse time.

Second it means that we are picking up a galaxy at a very peculiar phase in its evolution. Statistics seem to indicate indeed that WR features of that strength are very rare in these galaxies. On the other hand a good statistics on the occurrence of such an event could set limits on the mean duration of a burst in blue emission-line galaxies. Clearly a systematic search for WR emission in emission-line galaxies ought to be done and we are planning to do so. This needs to be combined with similar search in H II regions of external galaxies.

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