illustrated by Figure 5, in the far ultraviolet part of the spectrum, permitted Fe II lines are still present (and in fact quite strong) and show beautiful P Cygni line profiles! Other sections of the UV spectrum contain many more P Cygni profiles or blue-shifted absorption lines of many different ions ranging from Mg I to C IV, proving that the outflowing circumstellar envelope is still present in the minimum state. However, a closer look showed that only envelope lines of relatively low excitation potential could be detected (throughout the spectrum). From a comparison of the different line strengths we found for the envelope a rather cool excitation temperature of only about 6,000 K. This obviously explains the absence of the permitted metallic lines in the photographic minimum state spectrum, since all these lines in the photographic wavelength range originate from energy levels not significantly populated at such low temperatures.

Since forbidden lines are emitted only from highly rarefied gases, it is clear that the [Fe II] lines shown in Figure 4 must originate at a considerable distance from the stellar photosphere. A simple analysis of the observed line strengths indicates for this region a distance of about 100 stellar radii. Therefore, we can use the width of the [Fe II] lines to estimate the expansion velocity of the envelope at this distance to 78 ± 6 km s^{-1}. On the other hand, from the P Cygni profiles (which can be formed only within a few stellar radii from the star) of the permitted UV Fe II lines, we can estimate the expansion velocity close to the stellar surface to about 127 km s^{-1}. Thus, R 71 seems to have a *decelerated* expanding circumstellar envelope, which is thought to be rather unusual for luminous early-type stars. By comparing the observed P Cygni profiles of the Fe II lines to model computation we furthermore estimated the minimum state mass loss rate of R 71 to 3×10^{-7} solar masses per year, compared to a maximum state mass loss of the order of 5×10^{-5} solar masses per year. On the other hand, we found the expansion velocity of the envelope to be about the same at maximum and minimum state. This can be understood only under the assumption that the density of the envelope at maximum light is higher by a factor of the order of 100 or more. This suggests that the density of the circumstellar envelope is probably the main difference between the minimum and maximum state of R 71. The higher visual brightness of the maximum state would then simply be due to the fact that more of the photospheric ultraviolet radiation is absorbed by the envelope and reradiated at visual wavelengths. An excellent test of this hypothesis would be a direct comparison with IUE spectrograms of R 71 obtained at maximum state. Unfortunately, as noted above, the last maximum had just ended when the IUE satellite was launched, and a comparison of the average duration of the minimum state of R 71 and of the estimated life expectancy of the IUE satellite makes it questionable whether such observations will ever become possible.

Applications for Observing Time at La Silla

Period 29

(April 1 to October 1, 1982)

Please do not forget that your proposals should reach the Section Visiting Astronomers **before October 15, 1981.**

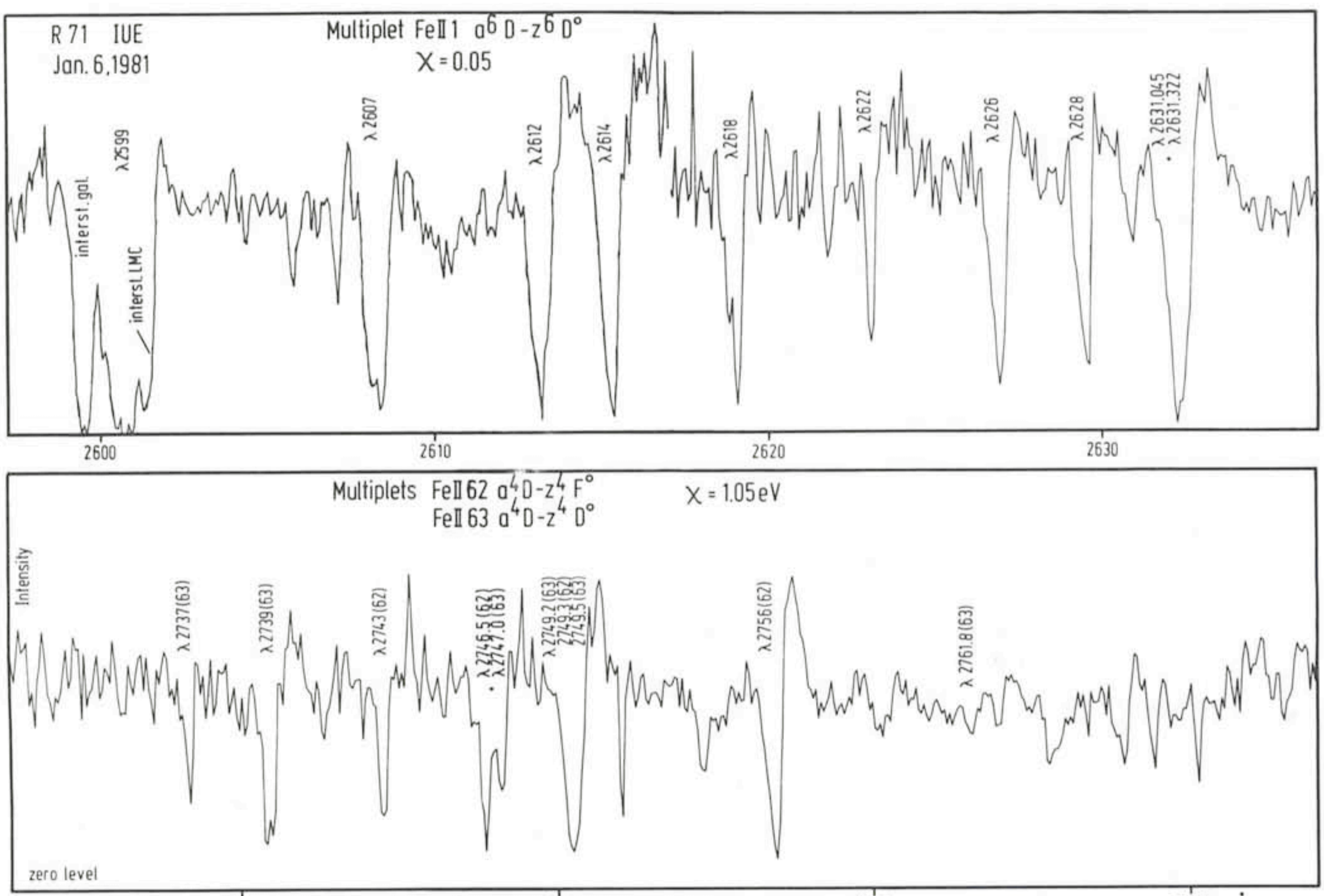

Fig. 5: *Sections of the minimum state UV spectrum of HDE 269006, showing examples of the P Cygni profiles of the low excitation Fe II l*