The Cepheid Instability "Wedge"

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For the most part it had been assumed that the red and the blue edges of the Cepheid Instability region were parallel. However, previous work by Pel and Lub (1978) and recent work by Fernie (1990) seems to reveal a rather interesting structure to the shape of the Cepheid Instability region. Figure 1 shows the shape defined using the data from Fernie (1990) and the observational data of Gieren (1989). It is apparent that the edges defined by the distribution of these points are not parallel.

I have calculated a series of pulsation models that included varying values of the mixing length to try and produce a distribution of Cepheids as seen in Figure 1. Calculations were done using the methods outlined by Castor (1971) with a Linear Non Adiabatic pulsation code to determine the characteristics for a given model. The masses range in value from 5 to 12 $M_{\odot}$, while the luminosities extended over a range of 3.0 to 4.8 in $\log L/L_{\odot}$. Each series of models was calculated over a temperature range of 4500 to 7000 K or until the blue edge of the Cepheid Instability Region was obtained. It is found that for different masses of Cepheids, different values of the mixing length are required to produce the empirical red edge. Values for the mixing length are close to $2.2H_p$ for the low mass Cepheids, and they are near $1.4H_p$ for the higher mass Cepheids.

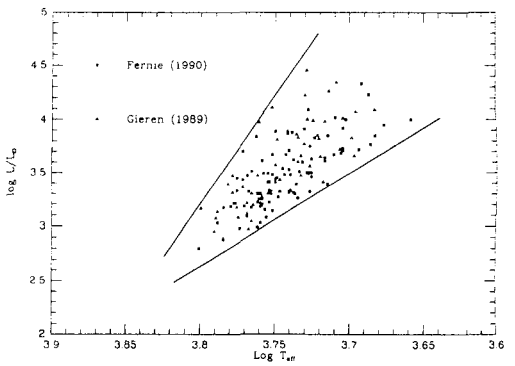

Figure 1 Cepheids from Fernie (1990) and Gieren (1989) are shown along with the approximate location of the red and blue edges of the Instability region.

References:

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Gieren, W. P. 1989, Astron. Astrophys., **225**, 381.
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