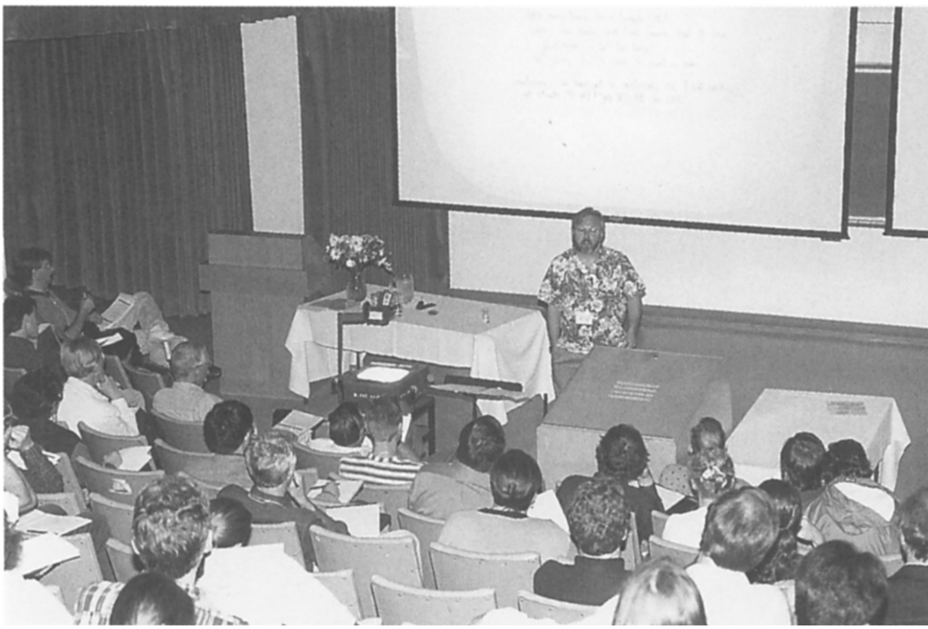
# Part 8. Cepheids and Distances

## Section B. Poster Papers

https://doi.org/10.1017/S0074180900118819 Published online by Cambridge University Press



Ed Olszewski reviewing properties of older LMC stellar populations.

https://doi.org/10.1017/S0074180900118819 Published online by Cambridge University Press

*New Views of the Magellanic Clouds*
*IAU Symposium, Vol. 190, 1999*
*Y.-H. Chu, N.B. Suntzeff, J.E. Hesser, and D.A. Bohlender, eds.*

# The Theoretical PLC Relations of Classical Cepheids

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**Abstract.**
On the basis of an extensive grid of Cepheid, nonlinear, nonlocal, time-dependent convective models by Bono et al., analytical Period-Color-Luminosity (PLC) relations as a function of chemical composition were evaluated and compared with observations in LMC and SMC. I provide an analysis of PL and PLC residuals and suggestions for disentangling the effects of reddening and metallicity on the Cepheid distance scale.

## 1. Comparison between the Theoretical PLC Relations and the Observations in the Magellanic Clouds

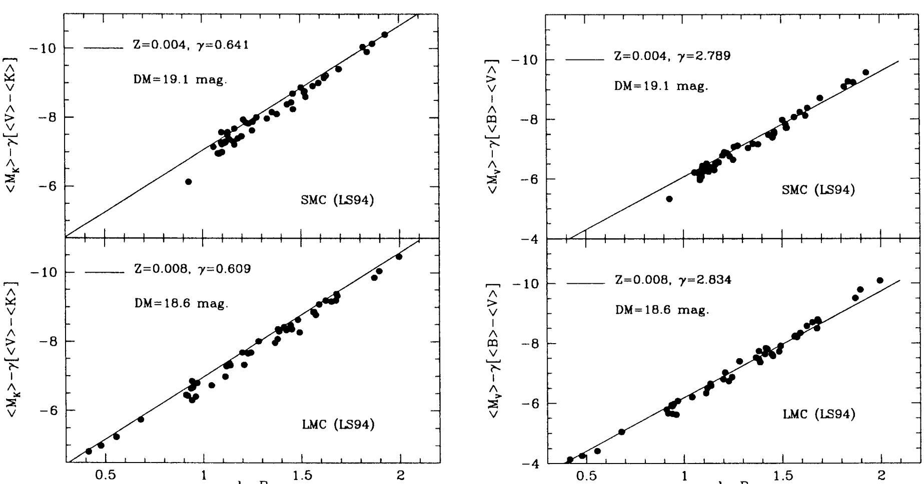


Figure 1. The comparison between the LMC (bottom) and the SMC (top) data by LS94 and our theoretical PLC relations.

The left panel of Figure 1 shows the comparison between the LMC (bottom) and the SMC (top) data by LS94 and the planar projections of the theoretical near-infrared PLC relations (Bono et al. 1998, ApJS, 122, 167, and reference therein) for Z=0.008 and Z=0.004, respectively. The right panel of the same figure shows the comparison in the optical bands. In both cases a quite good agreement is obtained adopting the labeled values of the distance moduli (18.6 mag for the LMC and 19.1 mag for the SMC).

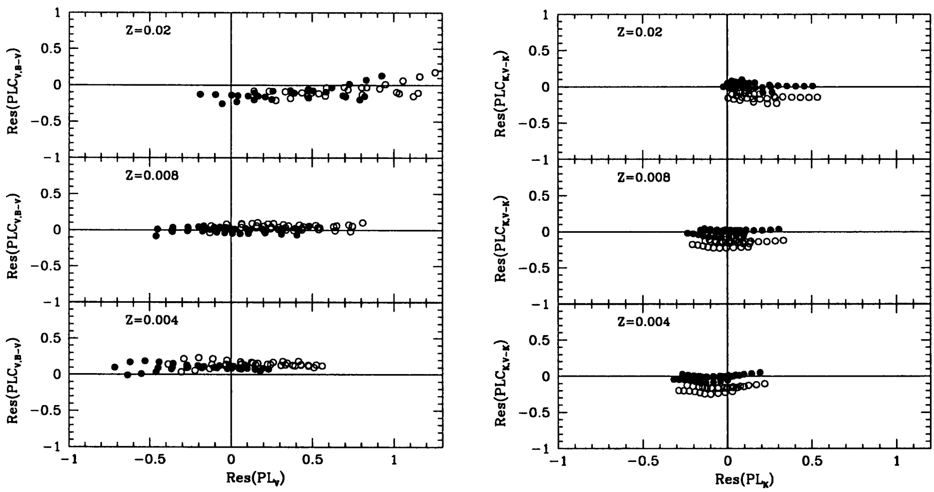


Figure 2. The optical (left) and near-infrared (right) PLC residuals versus the corresponding PL relation residuals.

## 2. Analysis of Residuals: A Tool to Evaluate Reddening and Metallicity

Assuming the Z=0.008 model set as the reference sample, one may compute the Z=0.008 PL and PLC residuals for model sets of different chemical compositions. In Figure 2 filled circles show the PLC residuals versus the PL relation residuals for models with Z=0.004 (bottom), Z=0.008 (middle) and Z=0.02 (top). As expected, for models with Z=0.008 the PL and PLC residuals are perfectly symmetric around the zero. For a metallicity larger (lower) than the value corresponding to the adopted PL and PLC relations, the optical PLC residuals tend to become negative (positive) and the optical PL residuals become larger (lower) than zero. Adding an artificial reddening $E(B-V) = 0.10$ mag. and a corresponding optical extinction $A_V = 0.33$ mag. (see open circles in Figure 2), the optical PL residuals increase but the optical PLC residuals are almost unchanged. In the case of infrared relations (see right panel), only the PL residuals are significantly affected by metallicity differences, while the PLC residuals are remarkably invariant. On the other hand, an artificial reddening ($E(V-K) = 0.30$ mag. and $A_K \simeq 0.03$ mag.; see open circles) now produces a vertical shift toward negative PLC residuals but leaves the PL residuals practically identical. Therefore we may conclude that, once the metal abundance is estimated through examination of the optical PLC residuals and near-infrared PL residuals, the information provided by the near-infrared PLC residuals allows us to evaluate the sample reddening.

**Acknowledgments.** It is a pleasure to thank Nino Panagia, who suggested a critical investigation of theoretical PL and PLC residuals.