JHK OBSERVATIONS OF MAGELLANIC CLOUD CEPHEIDS

D.L. Welch, B.F. Madore
Department of Astronomy, David Dunlap Observatory
University of Toronto, Toronto, Ontario, Canada M5S 1A1

ABSTRACT

The pioneering work of McGonegal et al. (1982), originally employing random-phase data for the LMC near-infrared period-luminosity (P-L) relation, is refined to mean light and extended to the SMC using new observations. We use a procedure for reducing single-phase infrared observations to mean light to obtain JHK magnitudes for Magellanic Cloud Cepheids. The new <H> P-L relations are presented and discussed.

INTRODUCTION

New JHK observations of Cepheids in the LMC and SMC obtained on the 2.5m Dupont reflector at Las Campanas in Jan. 1983 have been combined with previous observations in an effort to determine intensity-weighted mean magnitudes at H(1.6 μm). As the amplitude at H is only one-third that at V, and metallicity, duplicity, and extinction effects are very small in the infrared, we expect the dispersion of the points about the <H> P-L relation to reflect only intrinsic width and depth.

DISCUSSION

Full H lightcurves obtained for 23 galactic Cepheids from Welch et al (1984) have been used to reduce random-phase observations of LMC and SMC Cepheids to mean light by a procedure described in that paper. We have done this for 40 LMC and 27 SMC Cepheids and obtain the following mean-light P-L relations:

$$\langle H \rangle = 15^{m}.89 - 3.06 \log P \qquad \sigma = 0^{m}.22 \qquad \text{(LMC)}$$

$$\langle H \rangle = 16.48 - 3.25 \log P \qquad \sigma = 0.18 \qquad \text{(SMC)}$$

S. van den Bergh and K. S. de Boer (eds.), Structure and Evolution of the Magellanic Clouds, 221–222.

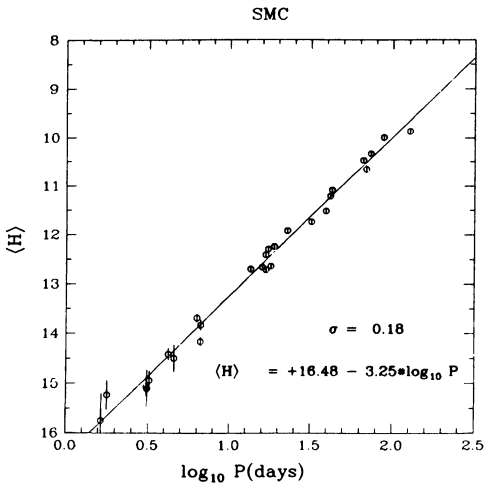

Figure 1. The <H> P-L relation for 27 Cepheids in the SMC. Observations were obtained at CTIO and MWLCO.

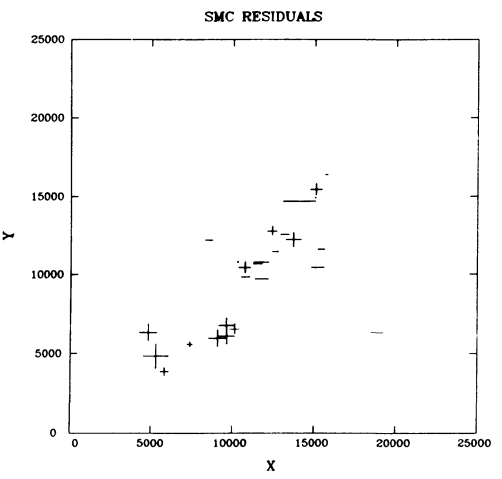

Figure 2. (O-C) residuals from the SMC <H> P-L relation. X and Y are in arcseconds from Payne-Gaposchkin and Gaposchkin (1966).

The SMC <H> P-L relation is displayed in Fig. 1. The small dispersion of the points about the least-squares regression line illustrates the advantages of the infrared approach. This small dispersion is even more remarkable when it is found that the residuals from the mean P-L relation correlate strongly with position on the sky (see Fig. 2). One is forced to conclude that depth effects are important and that the intrinsic dispersion of the <H> P-L is even smaller than that reported above. These points will be discussed more fully in a future paper.

REFERENCES

McGonegal, R., McLaren, R.A., McAlary, C.W., and Madore, B.F. 1982, Astrophys. J. (Letters), L33.

Payne-Gaposchkin, C. and Gaposchkin, S. 1966, Smithson. Contr. Astrophys. 9.

Welch, D.L., Wieland, F., McAlary, C.W., McGonegal, R., Madore, B.F., McLaren, R.A., and Neugebauer, G. 1984, Astrophys. J. Suppl. (submitted).

https://doi.org/10.1017/S0074180900040213 Published online by Cambridge University Press