RECENT TRIGONOMETRIC PARALLAXES FROM TWO HEMISPHERES

Philip A. Ianna
Department of Astronomy
The University of Virginia
Charlottesville, VA 22903-0818
U.S.A.

ABSTRACT. Both southern and northern hemisphere parallax results are reported for a number of stars including several white dwarfs, the central star of NGC7293, Barnard's star, and several other red dwarfs. The 1 meter astrometric reflector of the McCormick Observatory is described and some preliminary results are briefly discussed.

1. INTRODUCTION

Stellar parallax programs have almost exclusively been carried out with long-focus refractors, once among the largest telescopes in the world, but small aperture telescopes by current standards. Modern ground-based astrometric programs have now been extended to reflectors, several of specialized design, and some effort is also being directed toward implementing non-photographic detector systems of high quantum efficiency for astrometric applications. The new detectors are resulting in high accuracy results to magnitudes much fainter than heretofore practical.

2. SOUTHERN HEMISPHERE RESULTS

We first present a number of new parallaxes from our program with the 66 cm Yale-Columbia photographic refractor at the Mt. Stromlo Observatory. Recent measurements with the PDS 1010A at MSSSO yield a positional accuracy of about $\pm$ 0.0015 mm (s.e.) and parallaxes with standard errors $\pm$ 0".003 for series with about 100 exposures. Relative parallaxes reported include NGC7293 (0".004 $\pm$ 0".003), EG141 (0".039 $\pm$ 0".003), CD-42° 14462 (0".006 $\pm$ 0".003), CD-38°10980 (0".065 $\pm$ 0".004), BPM 24601 (0".028 $\pm$ 0".003), Gr406 (0".072 $\pm$ 0".004), and LHS 288 (0".220 $\pm$ 0".008). The binary LHS 1047, resolved by speckle interferometry, is found to have one of the lowest mass companions known. These results will be reported in more detail elsewhere.

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3. NORTHERN HEMISPHERE RESULTS

3.1 Fan Mountain Reflector

The 1 meter astrometric reflector was built under the direction of L. W. Fredrick. It is an f/13.5 flat-field Schmidt cassegrain Baker-design with a 1.1 m f/7.5 ULE primary, a 0.45 m ULE secondary, and a 1 m UBK-7 corrector. Both primary and secondary are aspherical. The unvignetted field is 40 arcmin in diameter; with useable field of 50 arcmin. There is no detectable aberration flare over at least a one degree field.

Primary-secondary separation is maintained by three invar spacing rods. Tests show the collimation to be maintained to less than a few arcseconds of secondary tilt in all practical orientations of the instrument, and to be stable over several years.

The 200 program stars fall into several categories: Hyades members, white dwarfs, subdwarfs, and very low luminosity red dwarfs. The stars have a wide range in apparent magnitude, the bulk falling between 11th and 16th magnitude. Unhypersensitized Kodak 103a-G + GG495 plates reach a threshold apparent magnitude of 16.4 in 40 minutes; we use a variety of plate-filter combinations.

3.2 Preliminary 1 Meter Results

The plate scale was determined from 7 exposures of 36 stars in the Russell Praesepe test region on IIIa-J plates behind a GG455 filter. The plates were measured on the MSSSO PDS and fit to the standard coordinates of the cluster stars corrected for proper motion. No significant magnitude or coma terms were present and the plate adjustment used a three constant model. The reductions performed by B. McNamara yield a plate scale of $15''.003 \pm 0''.003$ per mm.

A preliminary study of Barnard's star by McNamara used 39 plates measured on the McCormick Grant engine. The mean error of unit weight was $\pm$ 0.0022 mm in x and y, typical of the Grant machine. The solution employed 3 linear plate constants, as no significant additional terms were found. We find a relative parallax of $0''.556 \pm 0''.012$ and an annual proper motion of $10''.327$ in good agreement with other results. Most images were obtained with parallax factors 0.5 or less, leading to the low weight for the parallax.

4. BARNARD'S STAR RESULTS FROM THE McCORMICK 67 cm REFRACTOR

The reality of the small amplitude perturbation for Barnard's star remains questionable. Measurement of a selected sample of the best McCormick plates on the MSSO PDS does not support the Sproul perturbation.

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