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THE 2001 US NAVAL OBSERVATORY DOUBLE STAR CD-ROM. III. THE THIRD CATALOG OF INTERFEROMETRIC MEASUREMENTS OF BINARY STARS

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ABSTRACT

The Third Catalog of Interferometric Measurements of Binary Stars includes all published measures of binary and multiple star systems obtained by high-resolution techniques (speckle interferometry, photoelectric occultation timings, etc.), as well as negative examinations for duplicity, as of 2001 January 1. This catalog is one of four USNO double star catalogs to be included on a new CD-ROM. A brief summary and statistical analysis of the contents of the catalog are presented.

Key words: binaries: general — binaries: visual — catalogs — techniques: interferometric

1. INTRODUCTION

The Third Catalog of Interferometric Measurements of Binary Stars began in 1982 as an internal database at Georgia State University's Center for High Angular Resolution Astronomy (CHARA), tabulating binary star observations made using the technique of speckle interferometry by that group's speckle camera. The "Speckle Catalog" soon grew to encompass other published speckle efforts, then all published astrometric and photometric data for binary stars (and single stars observed in duplicity surveys) obtained by other high angular resolution techniques, as well (lunar occultations, adaptive optics [AO], eyepiece interferometry, *Hipparcos*, etc.). This extended the catalog's baseline of observations back by nearly a century, to the efforts of Schwarzschild & Villiger (1896). Two printed editions were published in the 1980s (McAlister & Hartkopf 1984, 1988), and a World Wide Web version has been available since the early 1990s (Hartkopf, McAlister, & Mason 2001).[1] After the speckle efforts at CHARA were suspended in the late 1990s (in order to devote more resources to their long-baseline interferometry project), one of the authors (W. I. H.) transferred the catalog (still called the Speckle Catalog in honor of its origins) to the US Naval Observatory, whose own speckle efforts had begun earlier in the decade.

2. CATALOG DESCRIPTION

Tables 1 and 2 summarize the contents of the catalog as of 2001 January 1. In addition to the astrometric totals presented in the table, the catalog includes 9425 observations of photometric data only. The third Speckle Catalog is over 14 times the size of the first catalog and 6 times the size of the second. Figures 1–3 illustrate the distribution of catalog data with time, separation, and declination, respectively.

The catalog is divided into 24 bands of 1^h in right ascension. Entries for each system comprise two parts: an identification line containing designations from various catalogs, followed by individual measures sorted in order of observation date. Each observation includes a reference code linked to a reference file. Similarly, systems having notes are flagged with links to a notes file.

The Web version of the Speckle Catalog is updated on a regular basis. For convenience, however, this catalog, together with three other USNO double star catalogs, has been copied to CD-ROM using a publication cutoff date of 2001 January 1. Copies of this CD-ROM are available free of charge from the authors. Updates to this CD-ROM will be forthcoming every few years.

TABLE 1
CATALOG TOTALS

Property	Value
Number of resolved systems	25076
Number of never-resolved stars	3623
Number of interferometric binaries (excluding occultation pairs)	5641
Median separation (arcsec)	0.81
Papers included in catalog	359

TABLE 2
BREAKDOWN OF CATALOG DATA BY METHOD

Method	Resolved	Unresolved	Total
CHARA speckle	18582	6476	25058
Hipparcos	13453	2	13455
Tycho	12746	0	12746
USNO speckle	11012	196	11208
Other speckle, AO, etc.	4482	2,105	6587
Eyepiece interferometry	2820	611	3431
Occultation	762	18	780
Multiaperture interferometry	516	0	516
Hubble Space Telescope	406	12	418
Total	64779	9420	74199

[1] See http://ad.usno.navy.mil/wds/int3.html.

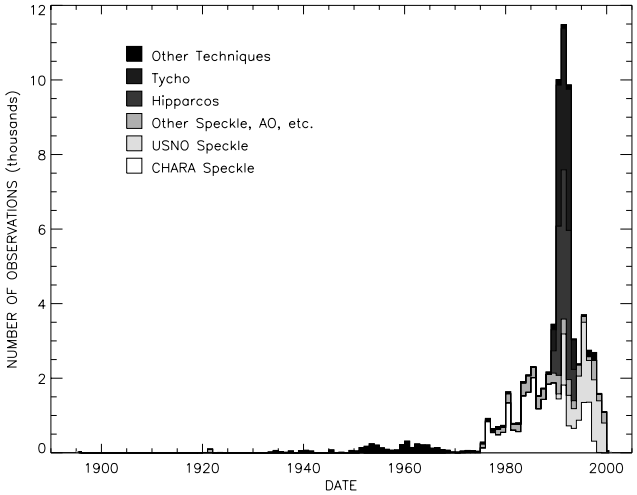

FIG. 1.—Distribution of measures with time. In order to avoid a large "spike" corresponding to the effective dates of the *Hipparcos* and Tycho observations, these data were spread over the mission's duration. Barely visible are the 1895 observations of Schwarzschild & Villiger (1896), followed two decades later by the 1919–1921 data obtained using the famous 20 foot (6 m) beam interferometer with the Mount Wilson 100 inch (2.5 m) Hooker Telescope by Anderson (1920) and Merrill (1922).

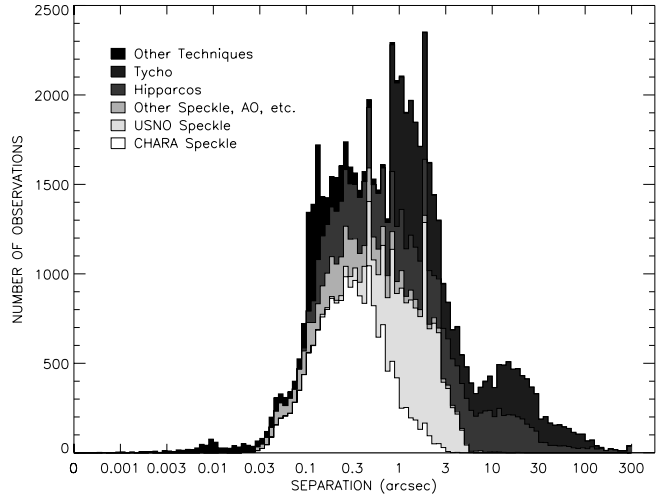

FIG. 2.—Distribution of measures with separation. The major item to note here is the contribution made at the smallest separation regime (under 0″.1) both by the Mark III interferometer and Navy Prototype Optical Interferometer and by occultation techniques. This figure clearly indicates that occultation timings could play an important role in binary star astrometry and photometry with greater coordination of observing efforts (to overcome the limitation of one-dimensional coverage) and through the use of standard filters. Unfortunately, Fig. 1 illustrates a steady decline in published occultation results.

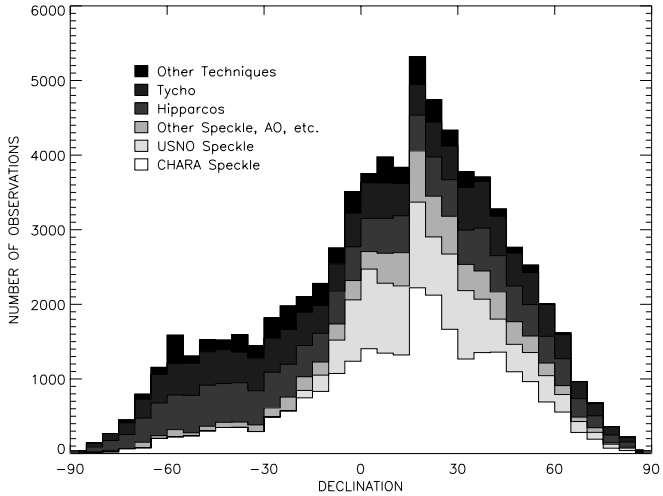

FIG. 3.—Distribution of interferometric measures with declination. Historically, interferometric observations have mostly been restricted to equipment in the Northern Hemisphere, although this disparity has been reduced somewhat by *Hipparcos* and Tycho, by the CHARA southern speckle program from 1989 to 1996 (cf. Hartkopf et al. 1996), and by the more recent speckle efforts of Horch and colleagues (cf. Horch, Franz, & Ninkov 2000). Recent and planned Cerro Tololo speckle runs by the USNO speckle group should further improve matters, although a large-scale dedicated interferometric observing program for the Southern Hemisphere is still sorely needed.

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