THE ASTRONOMICAL JOURNAL VOLUME 94, NUMBER 3 SEPTEMBER 1987

A CATALOG OF STELLAR ANGULAR DIAMETERS MEASURED BY LUNAR OCCULTATION

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Received 9 April 1987; revised 4 June 1987

ABSTRACT

A catalog of 348 published measurements (124 stars) of stellar angular diameters by the lunar-occultation method is presented. The overall precision and accuracy are discussed.

INTRODUCTION

Despite its dependence on the Moon and the resulting limitations in sky coverage, the lunar-occultation technique has produced a large number of direct measurements of stellar angular diameters. However, the reported results are widely dispersed in the literature and in time. This interim catalog is intended to facilitate use of the published occultation data, as well as to provide a basis for assessing its quality as a group and individually.

All occultation angular diameters published through 1986 are included. The catalog is not culled such as those used for special analysis of effective temperature or surface-brightness calibrations (Barnes *et al.* 1978; Ridgway *et al.* 1980a). All entries are taken from the original publications in an effort to limit the propagation of errors. The useful list compiled by Fracassini *et al.* (1981) includes all stars with angular diameters measured by any technique; however, only a diameter value is given. Necessary data such as effective wavelength, limb-darkening assumptions, and estimated errors are included in this new catalog.

Various reduction techniques have been used to derive angular diameters from the occultation light curves. This is an important topic since occultation reduction methods require particular care to avoid systematic errors; however, the subject will not be addressed directly here except for the following references. The method most frequently applied is some variation of the nonlinear least-squares model fitting described by Nather and McCants (1970; see also Dierchs and Hunger 1952; Evans 1952). Direct deconvolution of the star's strip brightness distribution was suggested by Scheuer (1962) but has not been routinely used because of its susceptibility to noisy data common at visible wavelengths (Abramyan 1983; White and Kreidl 1984).

The accuracy of the listed angular-diameter measurements (external error) is difficult to determine since only about 13% of the stars have four or more independent observations. The relation between formal error determined from the least-squares fitting and accuracy has been discussed by Ridgway *et al.* (1977, 1980b) and Evans *et al.* (1985) based on multiple measurements of particular stars. Our analysis indicates that the formal errors show a tendency to be less than the estimated external errors when all measurements are compared, including stellar diameters having only a single measurement.

THE CATALOG

Stellar angular-diameter measurements are basic data in the broad studies of stellar evolution, stellar atmospheres and interiors, circumstellar shells, and mass loss. The purpose of this catalog and its future supplements is to facilitate the use of lunar-occultation angular-diameter data by compiling the scattered published results and to put the data into relative perspective.

Table I is a cross-reference listing of the stars by spectral class. Contained in Table I from left to right are the star names (as used in the original publication), various catalog identifications, the V magnitude and $B-V$ color primarily from *The Bright Star Catalogue* (Hoffleit 1982), the I magnitude from the *Two-Micron Sky Survey* (IRC, Neugebauer and Leighton 1969), and spectral types with a reference code. Spectral types by P. C. Keenan (Keenan 1985; Keenan and Pitts 1980) were the first choice when available. It is clear from the number of references to Table I that a homogeneous classification of stars with measured angular diameters is needed. The IRC I magnitude ($\approx 0.85\ \mu$m) is included because of its homogeneity and availability for nearly all the stars in the catalog. The I magnitude has a smaller range of variation than the V magnitude for the very cool stars, which is an advantage in a normalization procedure explained later.

Table II contains the catalog of angular-diameter measurements. It is ordered by spectral class, as in Table I. All data were taken from the original publications, with a few obvious misprints corrected. The date (UT) of the occultation event is given. If an observation was made in several colors, an entry is made for each. A star with multiple entries having identical dates of observation indicates multitelescope and/or multicolor observations of the same event. The aperture of the telescope used for the observation is given in column four. Identical entries for date, telescope aperture, and site indicate simultaneous multicolor observations. Thus, totally independent observations of a particular star are indicated by either different dates, different sites, and/or different telescope apertures.

The central wavelength of the observation, in micrometers, is that given by the authors or is the usual approximate value for the standard filter designations (B, V, b, y, etc.). If this information is critical to the user, we suggest referring to the original source because of the numerous nonstandard filter and detector combinations often used in occultation observations.

The published angular-diameter measurements are listed in columns six and seven of Table II. The two values are based on uniformly illuminated stellar disk (UD) or fully limb-darkened disk (LD) assumptions in the reductions (see Nather and McCants 1970; White 1978). Blanks in either one of the two columns show a general lack of agree-

TABLE I. Names of angular-diameter stars.

Name	BS	SAO	IRC	HD	V	B−V	I(IRC)	Spectral Class	Ref
α Leo	3982	098967	10226	87901	1.35	−0.11		B7 V	4
ς Gem	2650	079031	20169	52973	3.79	0.79	3.25	F7–G3 Ib	4
χ^1 Ori	2047	077705	20126	39587	4.41	0.59	4.03	G0 V	6
ξ^1 Cet	649	110408	10028	13611	4.37	0.89	3.77	G6 II–III CN−2 Ba0.3 CH−1	6
BD+27°888	2013	077625		39004	5.56	0.97		gG7	4
ε Gem	2473	078682	30164	48329	2.98	1.40		G8 Ib	6
43 Sgr	7304	162413	−20550	180540	4.96	1.02	4.15	G8 II–III	5
κ Gem	2985	079653	20188	62345	3.57	0.93	2.86	G8 IIIa	6
57 Gem	2808	079352		57727	5.03	0.90		G8 III	4
κ Cap	8288	164593	−20607	206453	4.73	0.88	4.13	G8 III	4
υ Leo	4471	138298	00209	100920	4.30	1.00	3.59	G8+ IIIb	5
γ Lib	5787	159370	−10323	138905	3.91	1.01	2.99	G8.5 III CN−1	6
45 Sgr	7344	162521		181645	5.87	1.06		gG9	4
γ Tau	1346	093868	20074	27371	3.65	0.99	2.95	K0− IIIab CN 1	6
β Cap	7776	163481	−10537	193495	3.08	0.79	2.33	K0 II–III + B8 V	2
BD+22°756	2978	079641		62141	6.21	0.93		K0 III	4
δ Cnc	3461	098087	20205	74442	3.94	1.08	3.13	K0 III–IIIb	5
θ^1 Tau	1411	093955	20081	28307	3.84	0.95	3.05	K0 IIIb Fe−0.5	5
ξ^2 Sgr	7150	187504	−20530	175775	3.51	1.18	2.54	K1 III	4
λ Sgr	6913	186841	−30386	169916	2.81	1.04		K1+ IIIb	5
κ Aqr	8610	146210	00521	214376	5.03	1.14	4.25	K1.5 IIIb CN 0.5	5
75 Tau	1407	093950	20079	28292	4.97	1.13	4.14	K2 III	4
42 Lib	5824	183686	−20291	139663	4.96	1.33	3.98	K2.5 III CN 1	5
6 Leo	3779	117751	10207	82381	5.07	1.37	4.01	K2.5 IIIb Fe−0.5	5
3 Cnc	3128	097472	20194	65759	5.55	1.32	4.74	gK3	4
BD+15°430	924	093260		19080	6.5			K3 III	4
κ Vir	5315	158427	−10300	124294	4.16	1.35	3.05	K3 III	4
μ Psc	434	109926	10017	9138	4.84	1.37	3.68	K3 III	5
ν Psc	489	110065	10020	10380	4.44	1.36	3.27	K3 IIIb	5
1 Cnc	3095	097399	20191	64960	5.78	1.28	4.90	K3+ III	5
87 Leo	4432	138238	00206	99998	4.77	1.54	3.42	K3.5 III Fe−1	5
31 Leo	3980	098964	10225	87837	4.37	1.45	3.18	K3.5 IIIb Fe−1	5
33 Cet	347	109715	00015	7014	5.95	1.51	4.74	K4 III	4
δ Psc	224	109474	10007	4656	4.43	1.50	3.04	K4 IIIb	5
BD+24°571		076206	20064	23712	6.45	1.70	4.75	K4.5 Ve	4
60 Cnc	3550	098235	10197	76351	5.41	1.46	4.40	gK5	4
ν Lib	5622	159028	−20279	133774	5.20	1.58	3.80	K5− III	5
187 B. Gem	2951	079607	20186	61603	5.89		4.65	K5	4
BD−18°4320		160080	−20327	151011	6.89		4.71	K5	1
BD−18°4489		160458	−20355	156637	7.90		5.70	K5	1
θ Cnc	3357	097881	20200	72094	5.35	1.56	3.84	K5 III	4
BD+23°1518	2533	078816	20161	49968	5.65	1.45	4.55	K5 III	4

TABLE I. (continued)

Name	BS	SAO	IRC	HD	V	B−V	I(IRC)	Spectral Class	Ref
BD−11°6032	8836	165578	−10594	219279	6.12	1.49	4.95	K5 III	4
74 Gem	2938	097120	20185	61338	5.05	1.56	3.61	K5 III Fe−0.5	5
α Tau	1457	094027	20087	29139	0.85	1.54		K5+ III	5
BD−16°5440		163005	−20575	187082	8.6		5.76	M0	1
BD−15°4221		159598	−20301	142804	6.56	1.78	4.57	M0 III	4
56 Gem	2795	079328	20178	57423	5.10	1.52	3.72	M0 IIIab	4
τ^2 Aqr	8679	165321	−10587	216032	4.02	1.57	2.45	M0+ III	6
TV Gem	2190	078092	20134	42475	6.56	2.25	4.17	M0–M1 Iab	5
IRC−20445			−20445		9.78		6.22	M1	3
ν Vir	4517	119035	10245	102212	4.03	1.51	2.49	M1 IIIab	5
BD+16°625		094019	20086	29051	7.10		4.74	M1.0 II	9
α Sco	6134	184415	−30265	148478	0.96	1.83		M1.5: Iab	5
ϕ Aqr	8834	146585	−10593	219215	4.22	1.56	2.50	M1.5 III	5
82 Vir	5150	139490	−10293	119149	5.01	1.63	3.21	M1.5 III	5
46 Leo	4127	099172	10231	91232	5.46	1.68	3.71	M1.5 IIIb Ca−1	5
π Leo	3950	118044	10224	86663	4.71	1.60	3.02	M2- III	5
BD−19°4708		160832	−20388	161849	8.3		5.75	M2	1
119 Tau (CE Tau)	1845	094628	20112	36389	4.38	2.07		M2 Iab–Ib	5
υ Cap	7900	163779	−20592	196777	5.10	1.66	3.32	M2 III	4
BD+12°271	601	092763	10024	12479	5.94	1.59	4.04	M2 III	4
WW Psc	284	109581	10008	5820	6.11	1.67	4.32	M2 III	5
BD−15°3817	5301	158401	−20265	123934	4.80–5.	1.72	3.14	M2 IIIa	5
ψ Vir	4902	139033	−10274	112142	4.79	1.60	2.74	M2.5 III Ca−1	5
λ Aqr	8698	146362	−10588	216386	3.74	1.64		M2.5 III Fe−0.5	5
η Gem	2216	078135	20139	42995	3.28	1.60		M2.5 IIIa	5
BD−11°5756		164866	−10575	209950	7.00		4.96	M3	1
BD+13°1994		098143	10194	75156	6.61	1.67	4.61	M3 II–III	5
χ Aqr	8850	146612	−10597	219576	5.06	1.60	2.52	M3 III	4
47 Cap (AG Cap)	8318	145648	−10570	207005	5.90–6.	1.66	4.00	M3 III	4
μ Gem	2286	078297	20144	44478	2.88	1.64		M3 IIIab	5
BD+01°2519		118655	00202	96274	7.4		5.23	M3	1
BD−20°5118		186750	−20471	168988	7.63	2.10	5.36	M3	1
BD+15°635		093969	20083	28484	7.90		5.44	M3	1
IRC−20418			−20418		14.0		8.72	M3ep	1
BD−19°5250		162033	−20531	175929	8.7		5.95	M3	1
BD+5°168		109810	10015	8019	8.90		5.58	M4	1
GG Gem			20168		12–13p		6.88	M4	1
IRC−20529			−20529		9.8		6.50	M4	3
BD−19°5134	7023	161754	−20510	172816	6.0–6.6	1.75	2.96	M4 III	4
110 Gem (NP Gem)	2631	096407	20166	52554	5.94	1.63	3.74	M4.0 III	9

TABLE I. (continued)

Name	BS	SAO	IRC	HD	V	B−V	I(IRC)	Spectral Class	Ref
BD−24°14219	6861	186699	−20468	168574	6.25	1.84	3.28	M4.1 III	9
BD−19°5255		162049	−20532	176124	6.70		4.11	M4.2 III	9
XZ Psc	9047	146973	00535	224062	5.61	1.59	3.12	M4.6 IIb	9
BD−19°5077		161635	−20497	171394	6.8	1.77	3.93	gM5	4
BD−11°3841		158929	−10308	132112	7.1–7.5	1.6	3.68	gM5	1
V774 Sgr			−20397		12.5–14		5.61	M5	3
BQ Ori		077756	20129	39983	8.0		4.49	M5 III	1
GI Ori			20138		11–13 p		6.09	M5	1
S Psc		109789	10014	7773	8–15		7.58	M5–9.2	7,8,9
W Tau			20078	28236	9–13		5.69	M6	1
IRC 00233			00233		9.9		5.8	M6	3
RZ Ari	867	093189	20051	18191	5.91	1.47	1.92	M6− III:	5
R Leo	3882	098769	10215	84748	5.9–10	1.30		M6.0–9.2	7,8
Z Sgr			−20555		8.4–16		6.77	M6.0–9.0	7,8
S Vir	5101	139403	−10290	117833	6.0–12		5.70	M6.5–9.0	7,8
DV Tau		094604	20111	36231	8.4–10		4.95	M6	1
BD+13°2045		098383	10203	78420	8.80		4.30	M6	1
IRC−20370			−20370		12.4		6.68	M7	3
IRC−20504			−20504				6.54	M7	3
IRC−20507			−20507				7.81	M7	3
IRC−20578			−20578				6.75	M7	3
SW Vir		139236	00230	114961	7.8–9.0		2.29	M7 III:	6
IRC−20321			−20321		11.4		6.82	M7.5	8
IRC−20324			−20324		11.0		6.34	M7.7	8
IRC−20379			−20379		12.0		7.27	M7.8	8
U Ari			10040		7.2–15.		6.07	M7.8–9.5	7,8
U Ori	2063	077730	20127	39816	5.4–12.		4.91	M7.9–9.6	7,8
IRC-20424			−20424				7.21	M8.0–9.9	3,8
IRC−20563			−20563		11.1		6.00	M8.3	8
VV Sgr			−20403		12–15 p		6.09	M8e, M3	10
IRC+10011			10011		>20		9.23	M9:(shell),M10	1,8
IRC+10216			10216				7.46	C	1
IRC−20420			−20420		9.9		7.22	C	1
TW Oph			−20364	158377	11.6–14		4.69	C5,5	1
SS Vir			00217	108105	6.0–9.6		4.30	C5,3e	1
SZ Sgr		160795	−20382	161208	8.6		6.08	C7,3	1
TX Psc (19 Psc)	9004	128374	00532	223075	5.04	2.60	2.63	C7,2	1
Y Tau	1977	077516	20121	38307	6.95	3.03	4.35	C6,4	1
X Cnc	3541	098230	20206	76221	6.2–6.7	3.36	3.90	C5,4	1
RT Cap			−20585	192737	8.9–12		4.39	C6,4	1
V Cnc		097753		70276	7.5–13.			S2,9e	10
R Gem	2671	079070	20171	53791	6.0–14.	2.21	6.71	S3,9e	1

Notes to TABLE I—Spectral-type references

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10. See reference given in Table II.

TABLE II. Catalog of stellar angular diameters.

No.	Star Name	Spectral Type	UT Date	Tel. Apt. (m)	Wave-length (μm)	Angular Diameter U.D. (arc ms)	L.D. (arc ms)	Error (arc ms)	Error %	Obs.	Reference Code	Norm. Diam.	Notes
1	α Leo	B7V	May 13 70	0.82	0.39	1.7		0.50	29.4	McC	Berg (1971)	3.2	*
2	α Leo	B7V	Mar 28 80	0.90	0.44	1.37		0.11	8.0	CT	Radick (1981b)	2.5	
3	α Leo	B7V	Mar 28 80	0.90	0.58	1.32		0.12	9.1	CT	Radick (1981b)	2.4	
4	α Leo	B7V	Jun 18 80	4.0	1.7	1.42	1.44	0.11	7.7	KP	Ridgway (1982a)	2.6	
5	α Leo	B7V	Jun 18 80	1.3	2.2	1.46	1.48	0.38	26.0	KP	Ridgway (1982a)	2.7	
6	ζ Gem	F7–G3 Ib	Apr 10 81	4.0	1.7	1.88	1.92	0.88	46.8	KP	Ridgway (1982a)	10.8	
7	ζ Gem	F7–G3 Ib	Apr 10 81	4.0	2.2	1.81	1.85	0.32	17.7	KP	Ridgway (1982a)	10.4	
8	χ^1 Ori	G0 V	Jan 15 76	0.75	0.42		1.70	0.50	33.8	McD	Africano (1976)	11.3	
9	χ^1 Ori	G0 V	Jan 15 76	2.7	0.69		1.30	0.50	38.5	McD	Evans (1977)	8.6	
10	ξ^1 Cet	G6 II–III	Dec 16 83	0.90	0.55	1.64		0.28	17.1	KP	Schmidtke (1984)	12.3	
11	BD+27°888	gG7	Sep 4 69	0.60	0.43	2.40		1.20	50.0	Ham	de Vegt (1976)	31.1	*
12	ϵ Gem	G8 Ib	Nov 6 71	0.60	0.42	5.60		0.60	10.7	Ham	de Vegt (1976)	22.1	
13	ϵ Gem	G8 Ib	Jan 28 72	0.60	0.57		4.00	0.20	5.7	Iowa	Beavers (1980)	13.7	
14	ϵ Gem	G8 Ib	Jan 28 72	0.60	0.75		3.00	0.30	11.5	Iowa	Beavers (1980)	10.3	
15	ϵ Gem	G8 Ib	Mar 12 84	0.75	0.40		4.0	2.0	57.1	McD	Evans (1985)	13.8	
16	ϵ Gem	G8 Ib	Mar 12 84	4.0	0.45	4.72		0.16	3.4	KP	Schmidtke (1986)	18.5	
17	ϵ Gem	G8 Ib	Mar 12 84	4.0	0.51	3.70		0.57	15.4	KP	Schmidtke (1986)	14.6	
18	ϵ Gem	G8 Ib	Mar 12 84	0.90	0.55	4.31		0.31	7.2	KP	Schmidtke (1984)	17.1	
19	ϵ Gem	G8 Ib	Mar 12 84	4.0	0.58	4.73		0.09	1.9	KP	Schmidtke (1986)	18.5	
20	ϵ Gem	G8 Ib	Mar 12 84	4.0	1.6	4.13		0.27	6.5	KP	Schmidtke (1986)	16.1	
21	ϵ Gem	G8 Ib	Mar 12 84	4.0	2.2	4.56		0.10	2.2	KP	Schmidtke (1986)	18.1	
22	43 Sgr	G8 II–III	Sep 30 79	1.2	0.55	1.27		0.26	20.5	Cld	Radick (1982b)	12.5	
23	43 Sgr	G8 II–III	Sep 30 79	0.75	0.68	2.0	2.3	0.40	20.0	McD	Evans (1981)	19.6	
24	κ Gem	G8 IIIa	Mar 13 84	0.90	0.55	2.38		0.31	13.0	KP	Schmidtke (1984)	12.3	
25	κ Gem	G8 IIIa	Mar 13 84	0.75	0.55		2.5	1.0	45.4	McD	Evans (1985)	11.4	
26	κ Gem	G8 IIIa	Mar 13 84	0.75	0.61		3.0	1.0	38.5	McD	Evans (1985)	13.5	
27	57 Gem	G8 III	Apr 9 84	0.75	0.52		1.8	0.4	25.0	McD	Evans (1985)	16.2	
28	κ Cap	G8 IIIa	Sep 19 83	0.75	0.41		1.8	0.3	18.7	McD	Evans (1985)	14.1	
29	υ Leo	G8+ IIIb	Apr 30 77	0.41	0.61	2.10		0.70	33.3	UCLA	Jacoby (1978)	15.2	
30	υ Leo	G8+ IIIb	Apr 30 77	0.75	0.68		2.90	0.40	15.8	McD	Africano (1978)	18.2	
31	γ Lib	G8.5 III	Jul 6 79	1.3	1.6	2.16		0.32	14.8	KP	Ridgway (1980b)	13.1	
32	γ Lib	G8.5 III	Jul 6 79	4.0	2.2	2.15		0.27	12.6	KP	Ridgway (1980b)	13.0	

TABLE II. (continued)

No.	Star Name	Spectral Type	UT Date	Tel. Apt. (m)	Wave-length (μm)	Angular Diameter U.D. (arc ms)	L.D. (arc ms)	Error (arc ms)	Error %	Obs.	Reference Code	Norm. Diam.	Notes
33	γ Lib	G8.5 III	Sep 26 79	1.2	0.55	2.07		0.12	5.8	Cld	Radick (1982b)	12.5	
34	γ Lib	G8.5 III	Sep 26 79	0.75	0.70		3.90	0.70	20.6	McD	Evans (1981)	20.5	
35	γ Lib	G8.5 III	Jun 25 80	0.75	0.70		4.40	0.90	25.9	McD	Evans (1981)	23.2	
36	γ Lib	G8.5 III	Jan 29 81	1.3	1.6	2.89		0.20	6.9	KP	Ridgway (1982b)	17.5	
37	45 Sgr	gG9	Oct 12 75	1.2		6.50		0.50	7.7	Dom	Morbey (1978)	97.0	*
38	γ Tau	K0− IIIab	Mar 4 79	4.0	2.2	2.84		0.16	5.6	KP	Ridgway (1980b)	15.2	
39	β Cap	K0 II–III	Sep 5 76	0.60	0.46		5.80	1.10	21.8	Iowa	Beavers (1982)	20.8	
40	β Cap	K0 II–III	Sep 5 76	0.60	0.74		5.00	1.30	29.9	Iowa	Beavers (1982)	18.0	
41	β Cap	K0 II–III	Apr 21 76	1.3	1.6	3.05	3.17	0.12	3.9	KP	Ridgway (1977)	12.6	
42	β Cap	K0 II–III	Oct 20 77	1.0	0.55	3.13		0.39	12.5	Ill	Radick (1980)	12.9	
43	β Cap	K0 II–III	Nov 26 78	0.90	0.55		3.20	0.50	17.9	McD	Africano (1978)	11.5	
44	BD+22°1756	K0 III	May 3 71	1.2	0.45	4.00		1.00	25.0	Dom	Morbey (1974)	69.8	*
45	BD+22°1756	K0 III	May 3 71	1.2	0.65	5.65		0.50	8.8	Dom	Morbey (1974)	98.6	*
46	δ Cnc	K0 III–IIIb	Apr 9 81	1.3	1.6	2.45		0.26	10.6	KP	Ridgway (1982b)	15.0	
47	θ^1 Tau	K0 IIIb	Sep 22 78	1.1	0.47	2.60	2.80	0.30	11.5	Low	White (1979)	15.2	
48	θ^1 Tau	K0 IIIb	Sep 22 78	1.1	0.55	2.20	2.40	0.30	13.6	Low	White (1979)	12.9	
49	θ^1 Tau	K0 IIIb	Sep 22 78	0.60	0.56		3.40	1.20	40.6	Iowa	Beavers (1982)	17.3	
50	θ^1 Tau	K0 IIIb	Sep 22 78	0.60	0.75		2.90	1.50	59.4	Iowa	Beavers (1982)	14.8	
51	θ^1 Tau	K0 IIIb	Sep 22 78	1.0	0.86	1.49		0.45	30.2	Ill	Radick (1980)	8.7	
52	θ^1 Tau	K0 IIIb	Sep 12 79	1.2	0.41	2.92		0.32	11.0	Cld	Radick (1982b)	17.1	
53	θ^1 Tau	K0 IIIb	Sep 12 79	0.60	0.56		3.80	1.20	36.3	Iowa	Beavers (1982)	19.4	
54	θ^1 Tau	K0 IIIb	Jan 27 80	1.2	0.47	2.52		0.13	5.2	Cld	Radick (1982b)	14.8	
55	θ^1 Tau	K0 IIIb	Jan 27 80	0.75	0.70		2.00	0.20	11.5	McD	Evans (1981)	10.2	
56	θ^1 Tau	K0 IIIb	Jan 27 80	1.54	mult	1.98		0.20	10.1	Aga	Peterson (1981a)	11.6	
57	θ^1 Tau	K0 IIIb	Jan 27 80	0.61	mult	1.71		0.30	17.5	Wal	Peterson (1981a)	10.0	
58	θ^1 Tau	K0 IIIb	Jan 27 80	1.3	1.6	2.67		0.12	4.5	KP	Ridgway (1982b)	15.6	
59	θ^1 Tau	K0 IIIb	Aug 5 80	1.54	mult	2.26		0.10	4.4	Aga	Peterson (1981b)	13.2	
60	ξ^2 Sgr	K1 III	Oct 31 73	0.90	0.70	3.70	4.20	0.50	13.5	CT	Vilas (1977)	18.6	
61	ξ^2 Sgr	K1 III	Jul 28 74	0.60	0.75		3.50	0.80	26.3	Iowa	Beavers (1981)	15.3	
62	ξ^2 Sgr	K1 III	Aug 28 74	0.75	0.71		3.00	1.00	38.3	McD	Africano (1975)	13.1	
63	λ Sgr	K1+ IIIb	Apr 6 72	0.46	0.55	4.40		0.20	4.5	Cape	Harwood (1975)	16.0	
64	κ Aqr	K1.5 IIIb	Oct 9 73	0.60	0.57		2.50	1.00	46.0	Iowa	Beavers (1981)	22.0	

TABLE II. (continued)

No.	Star Name	Spectral Type	UT Date	Tel. Apt. (m)	Wave-length (μm)	Angular Diameter U.D. (arc ms)	Angular Diameter L.D. (arc ms)	Error (arc ms)	Error %	Obs.	Reference Code	Norm. Diam.	Notes
65	κ Aqr	K1.5 IIIb	Sep 29 74	0.60	0.75		3.60	1.00	31.9	Iowa	Beavers (1981)	31.8	
66	75 Tau	K2 III	Sep 22 78	1.0	0.55	1.63		1.07	65.6	Ill	Radick (1980)	16.1	
67	75 Tau	K2 III	Jan 27 80	1.3	1.6	2.27		0.24	10.6	KP	Ridgway (1982b)	22.4	
68	42 Lib	K2.5 III	Sep 13 72	0.50	0.55	2.20		0.30	13.6	Suth	Harwood (1975)	21.6	
69	6 Leo	K2.5 IIIb	Jan 8 77	1.3	2.2	3.41		0.27	7.9	KP	Ridgway (1979)	35.2	*
70	3 Cnc	gK3	Mar 5 74	0.60	0.75		4.0	1.50	43.1	Iowa	Beavers (1981)	44.8	
71	3 Cnc	gK3	Dec 7 79	0.75	0.68		2.10	0.60	32.8	McD	Evans (1981)	23.5	
72	BD+15°430	K3 III	Dec 6 84	0.75	0.40		4.0	1.0	28.6	McD	Evans (1985)	69.8	*
73	κ Vir	K3 III		2.54		5.0				Mt.W	Whitford (1946)	34	*
74	μ Psc	K3 III	Jan 6 79	0.60	0.57		1.60	1.60	115	Iowa	Beavers (1982)	12.9	
75	μ Psc	K3 III	Jan 6 79	0.60	0.75		4.30	1.20	32.1	Iowa	Beavers (1982)	34.7	
76	ν Psc	K3 IIIb	Jan 23 80	4.0	1.6	2.77		0.10	3.6	KP	Ridgway (1982b)	21.4	
77	ν Psc	K3 IIIb	Jan 23 80	4.0	2.2	2.56		0.27	10.5	KP	Ridgway (1982b)	19.8	
78	1 Cnc	K3+ III	Mar 22 75	0.60	0.60	2.10		0.60	28.6	Ham	de Vegt (1976)	30.1	
79	87 Leo	K3.5 III	May 12 73	0.90	0.55	3.70	4.10	0.40	10.8	McD	Dunham (1974)	33.3	
80	87 Leo	K3.5 III	Mar 10 78	1.1	0.55	2.9	3.2	0.51	17.6	Low	White (1978a)	26.1	
81	31 Leo	K3.5 IIIb	May 3 71	0.70	0.45	3.10		0.20	6.5	RGO	Glass (1976)	23.2	
82	31 Leo	K3.5 IIIb	May 3 71	0.30	0.53	3.90		0.20	5.1	Lohr	Bohme (1978)	29.2	
83	31 Leo	K3.5 IIIb	May 3 71	0.60	0.55	2.80		0.60	21.4	Ham	de Vegt (1976)	20.9	
84	31 Leo	K3.5 IIIb	Jun 1 79	4.0	2.2	3.00		0.09	3.0	KP	Ridgway (1980b)	22.4	
85	33 Cet	K4 III	Jan 11 84	0.75	0.61		3.4	0.8	26.6	McD	Evans (1985)	46.5	
86	δ Psc	K4 IIIb	Jan 13 70	0.60	0.48	4.20		1.00	23.8	Ham	de Vegt (1976)	32.3	
87	BD+24°571	K4.5 Ve	Sep 10 71	0.60	0.75		3.40	0.90	30.4	Iowa	Beavers (1980)	57.7	*
88	60 Cnc	gK5	Mar 27 77	1.1	0.75	3.30		0.40	12.1	Low	White (1978b)	39.8	
89	ν Lib	K5− III	May 31 77	1.3	2.0	2.77		0.40	14.4	KP	Ridgway (1979)	30.4	
90	187 B. Gem	K5	Apr 30 71	0.30	0.52	2.90		0.10	3.4	Lohr	Bohme (1978)	43.7	
91	BD−18°4320	K5	Jun 29 77	4.0	2.2	3.24		0.24	7.4	KP	Ridgway(1979)	77.4	*
92	BD−18°4489	K5	Jun 20 78	1.3	1.6	1.65		0.61	37.0	KP	Ridgway (1979)	62.7	*
93	θ Cnc	K5 III	Mar 16 81	4.0	0.94	3.21		0.34	10.6	KP	Ridgway (1982b)	37.7	
94	θ Cnc	K5 III	Mar 16 81	4.0	1.6	3.35		0.36	10.7	KP	Ridgway (1982b)	39.4	
95	θ Cnc	K5 III	Mar 16 81	4.0	2.2	3.13		0.15	4.8	KP	Ridgway (1982b)	36.8	
96	BD+23°1518	K5 III	Oct 27 72	0.60	0.55		4.30	0.60	16.0	Iowa	Beavers (1980)	50.5	*

TABLE II. (continued)

No.	Star Name	Spectral Type	UT Date	Tel. Apt. (m)	Wave-length (μm)	Angular Diameter U.D. (arc ms)	Angular Diameter L.D. (arc ms)	Error (arc ms)	Error %	Obs.	Reference Code	Norm. Diam.	Notes
97	BD+23°1518	K5 III	Oct 27 72	0.60	0.75		3.30	0.60	20.9	Iowa	Beavers (1980)	38.7	
98	BD−11°6032	K5 III	Jul 11 82	1.2	0.55	2.54		1.00	39.4	Cld	Radick (1984)	42.5	
99	74 Gem	K5 III	Oct 9 74	0.60	0.57		2.70	0.80	34.1	Iowa	Beavers (1981)	24.0	
100	74 Gem	K5 III	Oct 9 74	0.60	0.76		2.70	2.00	85.1	Iowa	Beavers (1981)	24.0	
101	74 Gem	K5 III	Dec 30 74	0.60	0.76		3.80	0.70	21.2	Iowa	Beavers (1981)	33.8	
102	74 Gem	K5 III	Feb 23 75	1.1	0.75	2.78		0.27	9.7	Low	White (1978)	28.4	
103	α Tau	K5+ III	Aug 26 78	0.81	0.47	21.0	23.0	5.0	23.8	StAn	Brown (1979)	31.1	*
104	α Tau	K5+ III	Sep 22 78	0.90	0.47	18.6		0.68	3.7	KP	Ridgway (1982c)	27.5	
105	α Tau	K5+ III	Sep 22 78	1.1	0.47	18.2	21.2	0.40	2.2	Low	White (1979)	26.9	
106	α Tau	K5+ III	Sep 22 78	0.67	0.49		20.2	0.70	4.0	TMt	Evans (1980)	26.0	
107	α Tau	K5+ III	Sep 22 78	0.90	0.55	19.5		0.71	3.6	KP	Ridgway (1982c)	28.8	
108	α Tau	K5+ III	Sep 22 78	1.1	0.55	18.1	20.4	0.60	3.3	Low	White (1979)	26.8	
109	α Tau	K5+ III	Sep 22 78	0.60	0.57	16.0	18.4	2.10	13.1	Iowa	Beavers (1979)	23.7	
110	α Tau	K5+ III	Sep 22 78	0.90	Hα	20.8		0.64	3.1	KP	Ridgway (1982c)	30.8	*
111	α Tau	K5+ III	Sep 22 78	0.60	0.75	18.1	20.9	2.20	12.2	Iowa	Beavers (1979)	26.8	
112	α Tau	K5+ III	Sep 22 78	1.3	3.8	18.4		0.30	1.6	KP	Ridgway (1982c)	27.2	
113	α Tau	K5+ III	Nov 16 78	0.75	0.55		21.5	2.00	10.7	McD	Evans (1980)	27.7	
114	α Tau	K5+ III	Feb 5 79	1.5	0.44	17.4		1.60	9.2	PaSt	Panek (1980)	25.7	
115	α Tau	K5+ III	Feb 5 79	1.0	0.65	18.9		3.90	20.6	Ill	Radick (1982a)	28.0	
116	α Tau	K5+ III	Feb 5 79	1.5	0.73	17.6		1.60	9.1	PaSt	Panek (1980)	26.0	
117	α Tau	K5+ III	Apr 29 79	2.0	0.48		20.9	0.70	3.8	McD	Evans (1980)	26.9	
118	α Tau	K5+ III	Apr 29 79	1.0	0.66	15.0		5.40	36.0	Ill	Radick (1982a)	22.2	
119	α Tau	K5+ III	Sep 12 79	1.1	0.47	17.8		1.00	5.6	Low	White (1984)	26.3	
120	α Tau	K5+ III	Sep 12 79	0.75	0.47		20.4	0.30	1.7	McD	Evans (1980)	26.8	
121	α Tau	K5+ III	Sep 12 79	1.2	0.55	17.2		0.92	5.3	Cld	Radick (1982b)	25.4	
122	α Tau	K5+ III	Sep 12 79	0.75	0.61		20.7	0.30	1.7	McD	Evans (1980)	26.6	
123	α Tau	K5+ III	Sep 12 79	1.0	0.65	17.1		6.70	39.2	Ill	Radick (1982a)	25.3	
124	α Tau	K5+ III	Sep 12 79	0.90	0.85	23.1		2.30	10.0	KP	Radick (1981a)	34.2	*
125	α Tau	K5+ III	Sep 12 79	0.90	0.85	22.2		3.40	15.3	KP	Radick (1981a)	32.8	*
126	α Tau	K5+ III	Sep 12 79	1.1	0.87	18.4		2.10	11.4	Low	White (1984)	27.2	
127	α Tau	K5+ III	Sep 12 79	1.3	1.6	19.4		0.25	1.3	KP	Ridgway (1982c)	28.7	*
128	α Tau	K5+ III	Sep 12 79	1.3	1.6	20.0		0.16	0.8	KP	Ridgway (1982c)	29.6	*

TABLE II. (continued)

No.	Star Name	Spectral Type	UT Date	Tel. Apt. (m)	Wave-length (μm)	Angular Diameter U.D. (arc ms)	L.D. (arc ms)	Error (arc ms)	Error %	Obs.	Reference Code	Norm. Diam.	Notes
129	α Tau	K5+ III	Sep 12 79	4.0	1.6	20.4		0.30	1.5	KP	Ridgway (1982c)	30.2	
130	α Tau	K5+ III	Nov 6 79	0.75	0.44		19.3	1.20	7.1	McD	Evans (1980)	24.8	
131	α Tau	K5+ III	Nov 6 79	1.1	0.47	19.9		0.30	1.5	Low	White (1984)	29.4	
132	α Tau	K5+ III	Nov 6 79	0.75	0.61		20.2	1.50	8.5	McD	Evans (1980)	26.0	
133	α Tau	K5+ III	Nov 6 79	1.2	0.85	21.1		0.85	4.0	Cld	Radick (1982b)	31.2	
134	α Tau	K5+ III	Nov 6 79	1.1	0.87	18.0		1.10	6.1	Low	White (1984)	26.6	
135	α Tau	K5+ III	Nov 6 79	1.3	1.6	18.6		0.57	3.1	KP	Ridgway (1982c)	27.5	
136	α Tau	K5+ III	Jan 27 80	0.90	0.35	17.9		0.96	5.4	KP	Ridgway (1982c)	26.5	
137	α Tau	K5+ III	Jan 27 80	0.90	0.47	17.8		0.55	3.1	KP	Ridgway (1982c)	26.3	
138	α Tau	K5+ III	Jan 27 80	0.75	0.47		18.0	0.40	2.5	McD	Evans (1980)	23.1	
139	α Tau	K5+ III	Jan 27 80	0.90	0.55	17.8		0.59	3.3	KP	Ridgway (1982c)	26.3	
140	α Tau	K5+ III	Jan 27 80	0.75	0.61		18.3	0.60	3.8	McD	Evans (1980)	23.6	
141	α Tau	K5+ III	Jan 27 80	0.90	0.66		20.0	0.50	2.9	McD	Evans (1980)	25.7	
142	α Tau	K5+ III	Jan 27 80	2.7	0.69		20.7	0.80	4.4	McD	Evans (1980)	26.6	
143	α Tau	K5+ III	Jan 27 80	1.1	Hα	17.6		1.30	7.4	Low	White (1984)	26.0	*
144	α Tau	K5+ III	Jan 27 80	1.2	0.85	16.0		0.38	2.4	Cld	Radick (1982b)	23.7	
145	α Tau	K5+ III	Jan 27 80	2.0	1.6	21.6		0.89	4.1	KP	Ridgway (1982c)	31.9	
146	α Tau	K5+ III	Jan 27 80	1.3	3.8	20.6		0.19	0.9	KP	Ridgway (1982c)	30.5	
147	α Tau	K5+ III	Aug 5 80	1.1	Hα	20.1		0.30	1.5	Low	White (1984)	29.7	
148	α Tau	K5+ III	Aug 5 80	1.3	1.6	20.8		0.15	0.7	KP	Ridgway (1982c)	30.8	
149	BD−16°5440	M0	Oct 29 76	1.3	1.6	3.37		0.61	18.1	KP	Ridgway (1979)	47.8	*
150	BD−15°4221	M0 III	Jan 2 81	4.0	1.7	2.47		0.23	9.3	KP	Ridgway (1982b)	20.2	
151	BD−15°4221	M0 III	Jan 2 81	4.0	2.2	2.70		0.24	8.9	KP	Ridgway (1982b)	22.1	
152	56 Gem	M0 IIIab	Oct 18 73	0.60	0.57		4.40	0.90	23.5	Iowa	Beavers (1981)	21.2	
153	56 Gem	M0 IIIab	Oct 18 73	0.60	0.76		5.90	1.00	19.5	Iowa	Beavers (1981)	28.4	
154	τ^2 Aqr	M0+ III	Jun 3 83	4.0	0.96	6.15		0.35	5.7	KP	Schmidtke (1986)	19.0	
155	τ^2 Aqr	M0+ III	Jun 3 83	4.0	1.6	4.82		0.17	3.5	KP	Schmidtke (1986)	14.9	
156	τ^2 Aqr	M0+ III	Jun 3 83	4.0	2.2	5.18		0.22	4.2	KP	Schmidtke (1986)	16.0	
157	TV Gem	M0–M1 Iab	Aug 15 82	1.2	0.55	5.31		0.91	17.1	Cld	Radick (1984)	36.2	*
158	IRC−20445	M1	May 27 75	1.3	2.4	4.00		1.00	25.0	KP	Ridgway (1977)	70.2	*
159	ν Vir	M1 IIIab		2.54		8.0				Mt.W	Whitford (1946)	25.0	*
160	ν Vir	M1 IIIab					5.65			Low	Rakos (1971)	15.5	

TABLE II. (continued)

No.	Star Name	Spectral Type	UT Date	Tel. Apt. (m)	Wave-length (μm)	Angular Diameter U.D. (arc ms)	Angular Diameter L.D. (arc ms)	Error (arc ms)	Error %	Obs.	Reference Code	Norm. Diam.	Notes
161	ν Vir	M1 IIIab	Jan 14 82	0.75	0.40		5.60	0.60	12.3	McD	Blow (1982)	15.3	
162	ν Vir	M1 IIIab	Jan 14 82	4.0	0.58	4.88		0.14	2.9	KP	Schmidtke (1986)	15.4	
163	ν Vir	M1 IIIab	Jan 14 82	0.75	0.75		6.10	0.60	11.3	McD	Blow (1982)	16.7	
164	ν Vir	M1 IIIab	May 30 82	1.3	2.2	5.20		0.16	3.1	KP	Schmidtke (1986)	16.4	
165	ν Vir	M1 IIIab	Apr 24 83	0.90	0.47	4.00		0.28	7.0	KP	Schmidtke (1984)	12.6	
166	ν Vir	M1 IIIab	Apr 24 83	0.75	0.61		6.2	0.7	11.3	McD	Evans (1985)	17.3	
167	ν Vir	M1 IIIab	Apr 24 83	1.3	2.1	5.24		0.16	3.0	KP	Schmidtke (1986)	16.5	
168	BD+16°625	M1.0 II	Feb 16 78	4.0	2.2	2.92		0.15	5.1	KP	Ridgway (1979)	25.9	
169	BD+16°625	M1.0 II	Mar 12 80	1.3	1.6	2.65		0.29	10.9	KP	Ridgway (1982b)	23.5	
170	α Sco	M1.5 Iab	May 4 50	0.60		45		5	11.1	Cape	Cousins (1953)	31.1	*
171	α Sco	M1.5 Iab	Jul 15 51	0.60		35		5	14.3	Cape	Cousins (1953)	24.2	
172	α Sco	M1.5 Iab	Apr 13 52	0.60		45		5	11.1	Cape	Cousins (1953)	31.1	
173	α Sco	M1.5 Iab	Apr 13 52	1.8		42		5	11.9	Pret	Evans (1953)	29.1	
174	α Sco	M1.5 Iab	Mar 8 53	0.60		40		5	12.5	Cape	Cousins (1953)	27.7	
175	α Sco	M1.5 Iab	Mar 8 53	0.40		39		5	12.8	Johan	Evans (1955)	27.0	
176	ϕ Aqr	M1.5 III	Oct 21 69	0.70	0.55	4.90		0.80	16.3	F&C	Poss (1971)	15.5	
177	82 Vir	M1.5 III	May 20 78	1.3	2.2	4.21		0.24	5.7	KP	Ridgway (1979)	18.5	
178	82 Vir	M1.5 III	Aug 10 78	0.75	0.7		4.10	1.20	33.6	McD	Edwards (1980)	15.7	
179	46 Leo	M1.5 IIIb	May 26 66	0.90	0.50	5.60		1.1	19.6	KP	Poss (1971)	30.9	
180	46 Leo	M1.5 IIIb	May 19 83	4.0	0.96	3.04		0.76	25.0	KP	Schmidtke (1986)	16.8	
181	46 Leo	M1.5 IIIb	May 19 83	4.0	1.6	3.11		0.24	7.7	KP	Schmidtke (1986)	17.2	
182	46 Leo	M1.5 IIIb	May 19 83	4.0	2.2	3.70		0.32	8.6	KP	Schmidtke (1986)	20.4	
183	46 Leo	M1.5 IIIb	Apr 12 84	4.0	0.45	4.45		0.62	13.9	KP	Schmidtke (1986)	24.6	
184	46 Leo	M1.5 IIIb	Apr 12 84	4.0	0.58	3.75		0.20	5.3	KP	Schmidtke (1986)	20.7	
185	46 Leo	M1.5 IIIb	Apr 12 84	4.0	0.96	2.93		0.65	22.2	KP	Schmidtke (1986)	16.2	
186	46 Leo	M1.5 IIIb	Apr 12 84	4.0	1.6	3.28		0.28	8.5	KP	Schmidtke (1986)	18.1	
187	46 Leo	M1.5 IIIb	Apr 12 84	4.0	2.2	3.72		0.17	4.6	KP	Schmidtke (1986)	20.5	
188	π Leo	M2− III	Mar 7 74	0.90	0.70	5.20	5.90	0.50	9.6	CT	Vilas (1977)	20.9	
189	π Leo	M2− III	Nov 5 77	0.75	0.52		3.90	1.00	29.5	McD	Africano (1978)	13.6	
190	π Leo	M2− III	Nov 5 77	1.3	2.2	4.85		0.33	6.8	KP	Ridgway (1979)	19.5	
191	BD−19°4708	M2	Jun 30 77	4.0	2.2	2.24		0.38	17.0	KP	Ridgway (1979)	31.6	
192	119 Tau	M2 Iab–Ib	Jan 31 77	1.1	0.54	10.4	11.7	1.60	15.4	Low	White (1980)	34.4	

TABLE II. (continued)

No.	Star Name	Spectral Type	UT Date	Tel. Apt. (m)	Wave-length (μm)	Angular Diameter U.D. (arc ms)	Angular Diameter L.D. (arc ms)	Error (arc ms)	Error %	Obs.	Reference Code	Norm. Diam.	Notes
193	119 Tau	M2 Iab–Ib	Jan 31 77	0.60	0.57		9.20	1.40	17.5	Iowa	Beavers (1982)	26.5	
194	119 Tau	M2 Iab–Ib	Jan 31 77	0.60	0.76		9.10	1.00	12.6	Iowa	Beavers (1982)	26.2	
195	119 Tau	M2 Iab–Ib	Apr 23 77	0.80	0.54	10.3	11.5	3.00	29.1	Low	White (1980)	34.1	
196	119 Tau	M2 Iab–Ib	Apr 23 77	1.1	0.62	9.0	10.1	2.00	22.2	Low	White (1980)	29.8	
197	119 Tau	M2 Iab–Ib	Apr 23 77	1.1	0.72	8.9	10.0	0.30	3.4	Low	White (1980)	29.5	
198	119 Tau	M2 Iab–Ib	Aug 6 80	1.1	0.65	9.0		0.20	2.2	Low	White (1982)	29.8	
199	119 Tau	M2 Iab–Ib	Aug 6 80	1.80	Hα	14.0	17.0	1.00	7.1	Low	White (1982)		*
200	119 Tau	M2 Iab–Ib	Aug 6 80	1.3	1.6	9.48		0.07	0.7	KP	Ridgway (1982b)	31.4	
201	υ Cap	M2 III	Jun 29 72	0.60	0.55		4.10	0.70	19.6	Iowa	Beavers (1980)	16.4	
202	υ Cap	M2 III	Jun 29 72	2.7	0.69	4.10		0.50	12.2	McD	Dunham (1973)	18.9	
203	υ Cap	M2 III	Jun 29 72	0.60	0.76		4.50	0.50	12.8	Iowa	Beavers (1980)	18.1	
204	υ Cap	M2 III	Aug 22 72	0.60	0.73	8.6		2.00	23.3	Ham	de Vegt (1976)	39.7	*
205	υ Cap	M2 III	Oct 18 80	1.3	1.6	3.79		0.34	9.0	KP	Ridgway (1982b)	17.5	
206	BD+12°271	M2 III	Nov 17 75	0.60	0.57		3.00	1.50	57.5	Iowa	Beavers (1982)	16.8	
207	BD+12°271	M2 III	Nov 17 75	0.60	0.76		4.70	1.00	24.4	Iowa	Beavers (1982)	26.3	
208	BD+12°271	M2 III	Feb 7 76	0.75	0.40		2.60	0.50	22.1	McD	Africano (1976)	14.5	
209	BD+12°271	M2 III	Feb 7 76	0.60	0.57		4.00	1.00	28.7	Iowa	Beavers (1982)	22.4	
210	BD+12°271	M2 III	Feb 7 76	0.60	0.76		3.30	1.20	41.8	Iowa	Beavers (1982)	18.4	
211	WW Psc	M2 III	Aug 4 77	1.3	1.6	3.04		0.15	4.9	KP	Ridgway (1979)	22.2	
212	BD−15°3817	M2 IIIa	May 23 75	0.75	0.40		3.60	0.50	16.0	McD	Africano (1976)	13.3	
213	BD−15°3817	M2 IIIa	May 23 75	1.1	0.47	5.00		1.00	20.0	Low	White (1978b)	21.2	
214	BD−15°3817	M2 IIIa	May 23 75	1.3	1.6	4.65	4.79	0.34	7.3	KP	Ridgway (1977)	19.7	
215	ψ Vir	M2.5 III	May 21 75	1.0	0.63		6.10	0.30	5.6	Suth	Walker (1975)	18.8	
216	ψ Vir	M2.5 III	Dec 26 75	2.7	0.69		6.50	0.30	5.3	McD	Evans (1977)	20.0	
217	ψ Vir	M2.5 III	Mar 17 76	1.3	1.6	4.92	5.11	0.39	7.9	KP	Ridgway (1977)	17.4	
218	λ Aqr	M2.5 III	Dec 15 69	0.90	0.55	7.40	8.20	0.40	5.4	McD	Nather (1970)	13.9	
219	η Gem	M2.5 IIIa	Feb 22 64	0.30	0.53	9.50		1.50	15.8	Lohr	Bohme (1978)	16.4	
220	η Gem	M2.5 IIIa	Nov 5 82	0.90	0.47	8.45		1.02	12.1	KP	Schmidtke (1984)	14.5	
221	BD−11°5756	M3	Dec 5 78	1.3	1.6	2.98		0.23	7.7	KP	Ridgway (1980b)	29.2	
222	BD+13°1994	M3 II–III	Feb 24 75	1.3	0.75	4.00		0.49	12.2	Low	White (1978b)	33.4	
223	BD+13°1994	M3 II–III	Mar 13 76	1.3	1.6	3.84		0.55	14.3	KP	Ridgway (1977)	32.1	
224	BD+13°1994	M3 II–III	Mar 3 77	1.3	1.6	4.49		0.59	13.1	KP	Ridgway (1979)	37.5	*

TABLE II. (continued)

No.	Star Name	Spectral Type	UT Date	Tel. Apt. (m)	Wave-length (μm)	Angular Diameter U.D. (arc ms)	Angular Diameter L.D. (arc ms)	Error (arc ms)	Error %	Obs.	Reference Code	Norm. Diam.	Notes
225	χ Aqr	M3 III	Jul 3 80	1.3	1.6	6.70		0.15	2.2	KP	Ridgway (1982b)	21.4	
226	47 Cap	M3 III	Dec 11 72	1.0		2.80		0.60	21.4	Suth	Harwood (1979)	17.7	
227	μ Gem	M3 IIIab	Feb 21 56	0.60		23				Cape	Evans (1959)	32.9	*
228	μ Gem	M3 IIIab	Feb 22 64	0.30	0.53	13.5		2.50	18.5	Lohr	Bohme (1978)	19.3	
229	μ Gem	M3 IIIab	Oct 17 73	1.1	0.55	12.1		1.80	14.9	Low	White (1974)	17.3	
230	μ Gem	M3 IIIab	Feb 4 74	0.75	Hβ		13.2	2.40	20.9	McD	Dunham (1975)	16.5	
231	μ Gem	M3 IIIab	Feb 4 74	1.5	0.45	12.6	14.2	0.60	4.8	KP	Ridgway (1974)	18.0	
232	μ Gem	M3 IIIab	Feb 4 74	1.5	0.52	12.1	13.5	0.70	5.8	KP	Ridgway (1974)	17.3	
233	μ Gem	M3 IIIab	Feb 4 74	1.0	0.55	15.6	16.5	1.45	9.3	Ill	Nelson (1975)	22.3	
234	μ Gem	M3 IIIab	Feb 4 74	0.60	0.55	12.3		1.80	14.6	Low	White (1974)	17.6	
235	μ Gem	M3 IIIab	Feb 4 74	0.75	0.55	11.8		0.90	7.6	Low	White (1974)	16.9	
236	μ Gem	M3 IIIab	Feb 4 74	1.1	0.55	12.0		0.70	5.8	Low	White (1974)	17.2	
237	μ Gem	M3 IIIab	Feb 4 74	0.60	0.57		15.2	1.50	11.3	Iowa	Beavers (1981)	18.9	
238	μ Gem	M3 IIIab	Feb 4 74	1.5	0.58	12.3	14.0	0.80	6.5	KP	Ridgway (1974)	17.6	
239	μ Gem	M3 IIIab	Feb 4 74	0.60	0.76		16.0	1.00	7.2	Iowa	Beavers (1981)	19.9	
240	μ Gem	M3 IIIab	Feb 4 74	0.75	0.82		13.5	1.40	11.9	McD	Dunham (1975)	16.7	
241	BD+01°2519	M3	Apr 24 72	0.60	0.76		3.30	0.80	27.9	Iowa	Beavers (1980)	31.9	
242	BD−20°5118	M3	Nov 11 80	4.0	2.2	2.95		0.29	9.8	KP	Ridgway (1982b)	34.8	
243	$BD+15°635$	M3	Sep 22 78	1.3	1.6	2.00		0.47	23.5	KP	Ridgway (1980b)	24.5	
244	BD+15°635	M3	Jan 27 80	1.3	1.6	3.06		0.30	9.8	KP	Ridgway (1982b)	37.5	
245	IRC−20418	M3ep	Sep 25 82	4.0	2.2	4.73		0.47	9.9	KP	Schmidtke (1986)	262	*
246	BD−19°5250	M3	Oct 27 79	1.3	1.6	2.64		0.40	15.2	KP	Ridgway (1982b)	40.9	
247	BD+05°168	M4	Jun 28 78	4.0	2.2	2.84		0.36	12.7	KP	Ridgway (1979)	37.1	
248	GG Gem	M4	Mar 8 79	1.3	1.6	3.41		0.23	6.7	KP	Ridgway (1980b)	81.1	*
249	IRC−20529	M4	Nov 14 77	4.0	2.2	1.98		0.35	17.7	KP	Ridgway (1979)	39.5	
250	BD−19°5134	M4 III	Aug 7 76	0.60	0.76	10.3	11.6	1.00	9.7	Iowa	Beavers (1982)	40.2	
251	BD−19°5134	M4 III	Aug 7 76	0.75	0.82		8.50	1.50	20.3	McD	Africano (1977)	28.9	
252	BD−19°5134	M4 III	Aug 7 76	1.3	1.6	8.69		0.16	1.8	KP	Ridgway (1979)	34.0	
253	BD−19°5134	M4 III	Jul 9 79	1.3	1.6	7.53		0.17	2.3	KP	Ridgway (1980b)	29.4	
254	BD−19°5134	M4 III	Sep 2 79	0.75	0.68		11.7	1.40	13.8	McD	Evans (1981)	39.9	
255	BD−19°5134	M4 III	Sep 2 79	1.3	1.6	7.74		0.38	4.9	KP	Ridgway (1982b)	30.2	
256	110 Gem	M4.0 III	Dec 16 78	1.0	0.86	5.98		1.17	19.6	Ill	Radick (1980)	33.5	

TABLE II. (continued)

No.	Star Name	Spectral Type	UT Date	Tel. Apt. (m)	Wave-length (μm)	Angular Diameter U.D. (arc ms)	L.D. (arc ms)	Error (arc ms)	Error %	Obs.	Reference Code	Norm. Diam.	Notes
257	110 Gem	M4.0 III	Mar 8 79	1.2	0.55	4.27		0.21	4.9	Cld	Radick (1982b)	23.9	
258	110 Gem	M4.0 III	Mar 8 79	1.3	2.2	4.16		0.12	2.9	KP	Ridgway (1980b)	23.3	
259	BD−24°14219	M4.1 III	Sep 16 72	0.50	0.55	3.20		0.80	25.0	Suth	Harwood (1975)	14.5	
260	BD−19°5255	M4.2 III	Nov 8 75	0.75	0.40		2.80	0.90	36.9	McD	Africano (1976)	16.2	
261	BD−19°5255	M4.2 III	Oct 27 79	1.2	0.55	4.32		0.81	18.8	Cld	Radick (1982b)	28.7	
262	BD−19°5255	M4.2 III	Oct 27 79	1.3	1.6	3.66		0.18	4.9	KP	Ridgway (1982b)	24.3	
263	XZ Psc	M4.6 IIb	Jan 14 78	0.60	0.57		7.90	0.80	11.6	Iowa	Beavers (1982)	28.9	
264	XZ Psc	M4.6 IIb	Jan 14 78	0.75	0.70		6.30	0.50	9.1	McD	Africano (1978)	23.1	
265	XZ Psc	M4.6 IIb	Jan 14 78	0.60	0.77		6.00	0.90	17.2	Iowa	Beavers (1982)	22.0	
266	BD−19°5077	gM5	May 15 79	1.3	1.6	4.28		0.34	7.9	KP	Ridgway (1980b)	26.1	
267	BD−19°5077	gM5	Sep 2 79	1.3	1.6	3.53		0.51	14.4	KP	Ridgway (1982b)	21.6	
268	BD−11°3841	gM5	Aug 29 79	1.3	1.6	6.55		0.15	2.3	KP	Ridgway (1982b)	35.7	
269	BD−11°3841	gM5	Mar 24 81	0.75	0.75	9.2	10.8	1.40	15.2	McD	Blow (1982)	50.1	*
270	BD−11°3841	gM5	Mar 24 81	4.0	0.86	6.69		0.07	1.0	KP	Ridgway (1982b)	36.4	
271	BD−11°3841	gM5	Mar 24 81	4.0	1.6	5.14		0.39	7.6	KP	Ridgway (1982b)	28.0	
272	BD−11°3841	gM5	Mar 24 81	4.0	2.2	5.49		0.37	6.7	KP	Ridgway (1982b)	29.9	
273	BD−11°3841	gM5	Jun 14 81	4.0	1.6	5.79		0.11	1.9	KP	Schmidtke (1986)	31.5	
274	BD−11°3841	gM5	Jun 14 81	4.0	2.2	5.80		0.20	3.4	KP	Schmidtke (1986)	31.5	
275	V774 Sgr	M5	Jul 3 74	1.3	1.6	5.65		0.73	12.9	KP	Ridgway (1977)	74.8	*
276	BQ Ori	M5 III	Jan 26 83	4.0	0.96	6.14		1.37	22.3	KP	Schmidtke (1986)	48	
277	BQ Ori	M5 III	Jan 26 83	4.0	1.6	4.16		0.41	9.8	KP	Schmidtke (1986)	33	
278	BQ Ori	M5 III	Jan 26 83	4.0	2.2	4.04		0.48	12.0	KP	Schmidtke (1986)	32	
279	GI Ori	M5	Feb 24 80	1.3	1.6	3.59		0.18	5.0	KP	Ridgway (1982b)	59.3	
280	S Psc	M5–9.2	Dec 2 76	1.3	2.2	3.84		0.37	9.6	KP	Ridgway (1979)	126	*
281	W Tau	M6	Sep 22 78	1.3	2.2	3.90		0.65	16.7	KP	Ridgway (1980b)	53.6	
282	W Tau	M6	Jan 27 80	1.3	1.6	4.38		0.27	6.2	KP	Ridgway (1982b)	60.2	
283	W Tau	M6	Jan 27 80	4.0	1.6	3.81		0.10	2.6	KP	Ridgway (1982b)	52.4	
284	IRC 00233	M6	Jun 12 81	4.0	1.6	2.83		0.11	3.9	KP	Schmidtke (1986)	40.8	
285	IRC 00233	M6	Jun 12 81	4.0	2.2	2.95		0.20	6.8	KP	Schmidtke (1986)	42.5	
286	RZ Ari	M6− III:	Nov 28 74	0.90	0.75		9.50	2.00	24.2	McD	Africano (1975)	20.0	
287	RZ Ari	M6− III:	Nov 28 74	0.60	0.76		12.0	1.50	14.4	Iowa	Beavers (1981)	25.2	
288	RZ Ari	M6− III:	Nov 28 74	1.3	1.6	9.88	10.3	0.21	2.1	KP	Ridgway (1977)	23.9	

TABLE II. (continued)

No.	Star Name	Spectral Type	UT Date	Tel. Apt. (m)	Wave-length (μm)	Angular Diameter U.D. (arc ms)	Angular Diameter L.D. (arc ms)	Error (arc ms)	Error %	Obs.	Reference Code	Norm. Diam.	Notes
289	RZ Ari	M6– III:	Jan 21 75	1.3	3.4	11.2	11.4	1.00	8.9	KP	Ridgway (1977)	27.1	
290	R Leo	M6.0–9.2	Nov 9 71		3.5	50				Hale	Neugebauer (1973)		
291	R Leo	M6.0–9.2	Nov 9 71		4.8	50				Hale	Neugebauer (1973)		
292	R Leo	M6.0–9.2	Nov 9 71		11	300				Hale	Neugebauer (1973)		
293	R Leo	M6.0–9.2	May 19 72	0.45	0.65	67		5.00	7.5	Cape	Nather (1973)		*
294	Z Sgr	M6.0–9.0	Mar 29 81	4.0	0.86	5.92		1.28	21.6	KP	Ridgway (1982b)	134	*
295	Z Sgr	M6.0–9.0	Mar 29 81	4.0	1.6	3.40		0.44	12.9	KP	Ridgway (1982b)	76.8	
296	Z Sgr	M6.0–9.0	Mar 29 81	4.0	2.2	3.94		0.37	9.4	KP	Ridgway (1982b)	89.0	
297	S Vir	M6.5–9.0	Dec 24 78	1.3	1.6	8.11		0.32	3.9	KP	Ridgway (1980b)	112	
298	S Vir	M6.5–9.0	Mar 16 79	1.3	1.6	6.64		0.23	3.5	KP	Ridgway (1980b)	91.6	
299	DV Tau	M6	Aug 6 80	1.3	1.6	3.38		0.19	5.6	KP	Ridgway (1982b)	33.0	
300	BD+13°2045	M6	Apr 6 79	1.3	2.2	7.05		0.33	4.7	KP	Ridgway (1980b)	51.1	
301	IRC−20370	M7	May 28 83	4.0	1.6	3.66		0.29	7.9	KP	Schmidtke (1986)	79.3	
302	IRC−20370	M7	May 28 83	4.0	2.2	3.52		0.31	8.8	KP	Schmidtke (1986)	76.8	
303	IRC−20504	M7	Mar 31 78	1.3	1.6	2.16		1.04	48.1	KP	Ridgway (1979)	43.9	
304	IRC−20507	M7	Mar 31 78	1.3	1.6	10.4		1.28	12.3	KP	Ridgway (1979)	380	*
305	IRC−20578	M7	May 26 78	1.3	1.6	2.61		0.35	13.4	KP	Ridgway (1979)	58.4	
306	SW Vir	M7 III:	Jan 26 81	1.3	1.6	16.8		0.34	2.0	KP	Ridgway (1982b)	48.2	
307	SW Vir	M7 III:	Sep 1 81	4.0	2.2	16.11		0.13	0.8	KP	Schmidtke (1986)	46.2	
308	SW Vir	M7 III:	Nov 22 81	4.0	2.2	20.79		0.89	4.2	KP	Schmidtke (1986)	59.7	
309	SW Vir	M7 III:	Jun 29 82	4.0	2.3	16.77		0.23	1.4	KP	Schmidtke (1986)	48.2	
310	IRC−20321	M7.5	Apr 28 75	1.3	2.2	4.37		0.25	5.7	KP	Ridgway (1977)	101	
311	IRC−20324	M7.7	Aug 5 76	1.3	1.6	4.66		0.35	7.5	KP	Ridgway (1979)	86.4	
312	IRC−20379	M7.8	Aug 6 76	1.3	1.6	3.06		0.64	20.9	KP	Ridgway (1979)	87.0	
313	U Ari	M7.8–9.5	Sep 3 77	1.3	1.6	6.11		0.34	5.6	KP	Ridgway (1979)	100	
314	U Ori	M7.9–9.6	Aug 31 75	1.3	1.6	14.3		0.54	3.8	KP	Ridgway (1977)	137	
315	U Ori	M7.9–9.6	Jan 15 76	1.3	2.1	15.4		0.33	2.1	KP	Ridgway (1977)	147	
316	IRC−20424	M8.0–9.9	Jul 10 76	1.3	1.6	9.96		0.54	5.4	KP	Ridgway (1979)	276	*
317	IRC−20563	M8.3	Sep 4 76	1.3	2.3	7.07		0.31	4.4	KP	Ridgway (1979)	112	
318	IRC−20563	M8.3	Jun 4 77	1.3	2.2	7.75		0.94	12.1	KP	Ridgway (1979)	123	
319	IRC−20563	M8.3	Apr 28 78	1.3	2.2	5.47		0.24	4.4	KP	Ridgway (1979)	86.7	
320	VV Sgr	M8e, M3	Aug 24 77	1.3	1.6	5.21		0.40	7.7	KP	Ridgway (1979)	86.1	

TABLE II. (continued)

No.	Star Name	Spectral Type	UT Date	Tel. Apt. (m)	Wave-length (μm)	Angular Diameter U.D. (arc ms)	L.D. (arc ms)	Error (arc ms)	Error %	Obs.	Reference Code	Norm. Diam.	Notes
321	VV Sgr	M8e, M3	May 24 78	1.3	2.2	4.99		0.42	8.4	KP	Ridgway (1979)	82.4	
322	IRC+10011	M9:shell, M	Nov 18 72	2.5	2.2	65.0		5.0	15.4	Hale	Zappalà (1974)		
323	IRC+10011	M9:shell, M	Nov 18 72	5.0	10	135		5.0	3.7	Hale	Zappalà (1974)		
324	IRC+10011	M9:shell, M	Jan 12 73	5.0	20	270		40.0	14.8	Hale	Zappalà (1974)		
325	IRC+10216	C	Nov 20 70	0.61	3.5	440		20	4.5	Hale	Toombs (1972)		
326	IRC+10216	C	Nov 20 70	1.5	4.8	440		20	4.5	Hale	Toombs (1972)		
327	IRC+10216	C	Nov 20 70	5.0	10	2000				Hale	Toombs (1972)		
328	IRC+10216	C	Jan 14 71	1.5	2.2	360		20	5.5	Mt.H	Toombs (1972)		
329	IRC−20420	C	Aug 24 77	1.3	1.6	1.53		0.88	57.5	KP	Ridgway (1979)	42.5	
330	TW Oph	C5,5	Jun 27 80	1.3	1.6	9.87		0.21	2.1	KP	Ridgway (1982b)	85.6	
331	TW Oph	C5,5	Aug 20 80	1.3	1.6	10.1		0.48	4.8	KP	Ridgway (1982b)	87.6	
332	SS Vir	C5,3e	Jun 20 80	1.3	1.6	8.71		0.49	5.6	KP	Ridgway (1982b)	63.1	
333	SZ Sgr	C7,3	Oct 7 78	1.3	1.6	3.14		0.33	10.5	KP	Ridgway (1980b)	51.6	
334	SZ Sgr	C7,3	Oct 7 78	4.0	2.2	3.23		0.18	5.6	KP	Ridgway (1980b)	53.1	
335	TX Psc	C7,2	Oct 31 71	0.90	0.70	9.0		1.00	11.1	CT	Lasker (1973)	30.2	
336	TX Psc	C7,2	Aug 18 73	0.60	0.71	8.00	8.90	1.00	12.5	Ham	de Vegt (1974)	26.9	
337	TX Psc	C7,2	Jan 18 75	2.7	0.69		10.2	2.50	28.2	McD	Dunham (1975)	29.9	
338	Y Tau	C6,4	May 14 75	1.3	1.6	8.39	8.80	0.25	3.0	KP	Ridgway (1977)	62.2	
339	Y Tau	C6,4	Aug 31 75	1.3	1.6	7.98	8.38	0.24	3.0	KP	Ridgway (1977)	59.2	
340	Y Tau	C6,4	Nov 14 81	0.75	0.75		7.80	1.30	19.2	McD	Blow (1982)	50.3	
341	Y Tau	C6,4	Nov 14 81	4.0	1.6	8.91		0.37	4.1	KP	Schmidtke (1986)	66	
342	Y Tau	C6,4	Nov 14 81	4.0	2.2	8.68		0.35	4.0	KP	Schmidtke (1986)	64	
343	Y Tau	C6,4	Jan 8 82	4.0	2.2	6.94		0.20	2.9	KP	Schmidtke (1986)	51	
344	X Cnc	C5,4	Nov 9 71	2.7	0.69	7.90	9.00	0.80	10.1	McD	Bartholdi (1972)	47.6	
345	X Cnc	C5,4	May 10 81	1.3	1.6	7.62		0.56	7.3	KP	Ridgway (1982b)	45.9	
346	RT Cap	C6,4	Mar 20 82	4.0	2.2	7.72		0.16	2.1	KP	Schmidtke (1986)	58.3	
347	V Cnc	S2,9e	Apr 11 73	2.1	0.84	2.60	2.80	0.80	30.8	McD	McGraw (1974)		
348	R Gem	S3,9e	Sep 30 72	0.60	0.77		4.90	1.40	32.8	Iowa	Beavers (1980)	93.8	

Notes to TABLE II

The following observations are noted because their normalized diameters deviated by more than $3\sigma_{ND}$. Their corresponding formal error may or may not substantiate the possible lower accuracy: 10, 37, 44, 45, 69, 70, 72, 87, 91, 92, 96, **149**, 157, 158, 204.

The following observations are noted because their normalized diameters deviated by more than $3\sigma_{ND}$. However, these stars are of spectral type M3 and cooler. For these stars, large deviations in the normalized diameter are also likely to be due to poorly known magnitudes or spectral types as well as an inaccurate angular-diameter measurement: 245, 248, 269, 275, 280, 293, 294, 304, 316.

1. Regulus is presently the star of earliest spectral type resolved by the occultation technique and the first to have its diffraction fringes recorded at occultation (Arnulf 1936). Spica is of earlier spectral type and is resolvable by occultation observations.

73 and 159. These stars are among the first resolved by occultation; however, no errors or details of the observations were published.

103 through 148 present the largest number of multiple observations of a single star.

124 and 125. The observations were made with narrow-bandpass filters centered on the infrared calcium-triplet lines.

143 and 147. The observations were made with an Hα filter.

170 through 175. First well-documented, successful stellar angular-diameter resolutions.

199. This measurement is in Hα light and cannot be compared with continuum measurements.

224. Noted by authors as being affected by strong scintillation.

227. Data not reduced by the method of least squares.

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Site abbreviations in TABLE II.

Aga—Agassiz Observatory
Cape—Cape, Royal Observatory
Cld—Cloudcroft Observatory
CT—Cerro Tololo Inter-American Observatory
Dom—Dominion Astrophysical Observatory
F&C—Flower & Cook Observatory (University of Pennsylvania)
Hale—Hale Observatory
Ham—Hamburg Observatory
Ill—Prairie Obervatory (University of Illinois)
Iowa—Fick Observatory (Iowa State University)
Johan—Johannesburg, Union Observatory
KP—Kitt Peak National Observatory
Lohr—Lohrmann Observatory
Low—Lowell Observatory
McC—Leander McCormick Observatory
McD—McDonald Observatory
Mt. H—Mt. Hopkins Observatory
Mt. W—Mt. Wilson Observatory
PaSt—Pennsylvania State Observatory
Pret—Pretoria, Radcliffe Observatory
RGO—Royal Greenwich Observatory
StAn—St. Andrews, Scotland
Suth—Sutherland, South African Astronomical Observatory
TMt—Table Mountain Observatory
UCLA—University of California-Los Angeles
Wal—Wallace Observatory

ment among authors as to which assumption is most nearly correct or useful. In the photoelectric region of the spectrum, the ratio of the two extremes, LD to UD, is empirically about 1.13 (also see Ridgway *et al.* 1982; Schmidtke *et al.* 1986). Thus, one value can be approximately scaled to the other for comparison. In the infrared, the UD assumption is probably the best approximation and is generally used at wavelengths longward of 1 μm.

The published errors in milliseconds of arc and derived percentage errors are listed in columns 8 and 9. The percentage error is given because it more clearly singles out possibly less useful results from the compilation. Columns 10 and 11 give the observatory site of the observation and a first author-date reference code with full reference information following Table II. Column 12, normalized diameters (ND), is concerned with the relative estimate per spectral type of the observational accuracy as explained later. Additional information or discordant angular-diameter values are indicated by an asterisk (*) in the note column (14).

PRECISION AND ACCURACY

The transient nature of lunar occultations generally precludes the determination of precision or accuracy of an angular-diameter value by the method of repeated measurements. Multiple measurements can be obtained by simultaneous observations with several telescopes or in the unusual case of an extended series of occultations (i.e., α Tau). However, of the 124 stars listed in Table II, 72 stars have been observed once, 35 stars have two or three independent observations, and just 17 stars have four or more independent observations. An independent observation is conservatively defined as being observed with different telescopes or on different dates.

The generally quoted measure of precision of the five parameters (star intensity, background, time of occultation, velocity of occultation, and angular diameter) determined in the nonlinear, least-squares analysis of an occultation trace is the formal error, the square root of the diagonal of the error matrix (e.g., Bevington 1969). This value is an estimate of the standard error under the assumption that the observed scatter about the true pattern is random, and the five parameters are independent. These assumptions are often not valid in the observations of occultations, and therefore it is expected that the formal error may not always reflect the accuracy of the result.

There are, in fact, occultation observations where the formal error clearly will not give a true indication of the accuracy of the measurement. For example, a star's angular diameter can be sufficiently large that the diffraction effects are only barely discernible. In that case, the slope of the occultation curve is a function of both the velocity of occultation and the angular diameter. A range of assumed velocities will give a corresponding range of angular diameters with essentially the same formal error. A misleading formal error may also occur for traces showing scintillation excursions near the diffraction-pattern frequency. Bartholdi *et al.* (1972) and Ridgway *et al.* (1977) have shown empirically where for a particular data set a range of assumed diameter values in the model fitting will produce the same formal error (also see Evans *et al.* 1985).

There are at least ten sources of systematic effects that may not affect the formal error but will influence the accuracy. Eight of these can be measured and allowed for in the reduction procedures. These include pulse-counting dead time, unstable or unknown time constants of a dc amplifier or solid-state detector systems, sampling interval, entrance pupil of the telescope, the bandwidth of the filter/detector combination, the star's flux distribution, too coarse diffraction modeling, and careless numerical techniques. Ridgway (1977) has summarized the limiting effects of some of these on angular resolution. Correct allowance can be tested by null experiments on known point sources and comparative reductions of the same data sets with independently developed software.

The deviation of the lunar limb from a straight edge and scintillation are less controllable sources of error in the derived angular diameters. The former, although vehemently debated early on, is no longer considered a dominant effect both from theoretical and empirical grounds (Evans 1970; Evans *et al.* 1985). Scintillation, however, is probably the most important source of undetermined errors. Relative to the frequency of the diffraction pattern, low-frequency scintillation ($\sim$30–40 Hz at visual wavelengths) may increase the formal error but not correspondingly decrease the accuracy of the angular-diameter results (Ridgway *et al.* 1977). Under conditions of high-frequency scintillation, when the assumption of random scatter about the pattern becomes valid, the formal error is expected to be a good estimate of error. However, scintillation at frequencies near that of the diffraction pattern may result in small formal errors with clearly erroneous angular-diameter values. This occurs when, for example, the first or second fringe intensity is systematically modified.

Since the scale of the diffraction pattern is a function of effective wavelength but scintillation is not, simultaneous, broad-based, multicolor observations are important in helping to separate diffraction and scintillation effects (Evans 1970). Independent observations of an event are obviously most important. Knoechel and von der Heide (1978) have developed a reduction method that attempts to compensate for correlated scintillation with apparent improvements for observations made at large airmasses with telescopes of less than about 0.5 m aperture.

Ridgway *et al.* (1980b) have discussed the general equivalence of formal error and measurement accuracy for occultation observations. They compared the formal error estimates with the observed dispersion of the measurements for stars with two or more independent measurements. Their conclusion was that the formal error for the data subset (multiple measurements) is, in general, a good indication of measurement accuracy.

The comparison is limited since 22 of the 24 available stars with multiple measurements had only two or three independent measurements. These two or three independent measurements per star and their formal errors determined the weighted mean from which the measurement dispersions were calculated for the comparison. The small number of independent measurements per star plus the use of the formal error in both predicting and calculating the dispersion does result in some lack of sensitivity. As a test, we increased the formal errors of the data by 50% and repeated the comparison with no clear change in the results. An arbitrary increase of a factor of 2 in the formal errors did indicate a discrepancy between formal error and measurement dispersion.

In summary, the nonrepeatable character of an occultation observation hinders the determination of systematic errors. There are various error sources, most of which can be minimized with proper techniques. The often-quoted formal error as given in Table II is clearly related to the accuracy or external error of an angular-diameter measurement, but should be used with care. It should be noted that discrepancies between internal error estimates and external errors are not uncommon in other astronomical measurements, such as proper-motion, parallax, and radial-velocity measurements.

NORMALIZED DIAMETERS AS A TEST OF ACCURACY

The previously discussed study estimated external accuracy using the available multiple measurements of stars. Although the situation is improving, at present, the small percentage of such observations still limits the statistical significance of the conclusion, as noted by Ridgway *et al.* (1977). If a larger number of stars were to be compared, a stronger statement on external agreement could be made. By normalizing the angular diameters of a given spectral type to some arbitrary standard distance, the relative angular diameters of subgroups of stars may be compared, circumventing the need for independent measurements on any single star.

If we assume that the absolute magnitude and effective temperature are essentially the same for all stars of the same spectral type and luminosity class, a normalization factor can be determined from a star's apparent brightness and some arbitrary zero point. Thus, a star's apparent brightness m on the magnitude scale is related to its angular diameter ϕ and effective temperature $T_{\rm eff}$ by

$$m = -5 \log \phi - 10 \log T_{\rm eff} + \text{const.},$$

or for the same spectral class

$$m + 5 \log \phi = \text{const.}$$

The normalized angular diameter ND is defined as

$$m + 5 \log \phi = 0 + 5 \log ND,$$

or

$$ND = \phi 10^{(m/5)},$$

where ϕ is taken as the uniform disk value.

The percentage of scatter in the ND is given by

$$\frac{\Delta ND}{ND} = \frac{\Delta\phi}{\phi} + \frac{2\Delta T_{\rm eff}}{T_{\rm eff}} + 0.46\Delta m.$$

The value of $\Delta\phi/\phi$, the external agreement or accuracy of the occultation measurements, is the desired quantity. The value of $\Delta ND/ND$ is the observed quantity and contains both the measurement scatter and the scatter due to apparent-magnitude errors and differences in effective temperature within the spectral bins. The latter contributes the most error for nonvariable stars because of the balance reached between a choice of the number of stars per bin, approximately 10, and the spectral-type range defining a group.

The NDs are listed in Table II, column 13, as a useful indication of discrepant results. For a given spectral type, a deviant ND value is an indication that all or some combination of diameter value, spectral type, or magnitude may be in error. Mean ND values and standard errors are given in Table III for each spectral bin. The I magnitudes of Table I were used for normalizing stars cooler than spectral type M0, and the V magnitudes for the G and K type stars.

The percentage value of $\sigma_{ND}/\overline{ND}$ for each spectral-type bin is listed in Table III. There is a mean scatter of 31% within each bin. We estimate, using any of the more recent effective-temperature calibrations, that $\Delta T_{\rm eff}/T_{\rm eff}$, the slope within a spectral bin, will at worst contribute no more than 5% to the scatter. The ND scatter due to Δm, the error in apparent magnitude, is only a few percent for the G and K stars, and increases for the cool variable stars as the effect due to $\Delta T_{\rm eff}/T_{\rm eff}$ decreases. Allowing about 7% for the scatter due to effective temperature and magnitude errors, the mean external scatter $\Delta\phi/\phi$ is still about 25%.

TABLE III. Normalized angular diameters.

Spectral Bin	No. of Stars	No. of Observations	Mean ND (arc ms)	$\pm\sigma_{ND}$ (arc ms)	$\pm\sigma/\overline{ND}$ (%)
B7	1	5			
F7–G0	2	4			
G6–G9	10	28	16.3	4.5	28
K0–K2.5	11	32	16.6	5.8	35
K3–K4.5	11	18	28.8	9.4	33
K5	10	61	30.5	9.3	30
M0–M1.5	12	39	20.7	5.8	28
M2–M2.5	10	33	21.7	6.4	30
M3	10	26	24.4	8.2	34
M4	8	19	28.8	7.7	27
M5–M6.5	14	35	37.2	12.1	32
M7–M9	14	24	88.9	30.4	34
Carbon	8	22	56.2	18.6	33
S	2	2			

In comparison, the mean percent formal error from Table II, column 14, is about 15%, or roughly two-thirds the external error inferred from ND scatter. There has been no attempt to remove data of dubious quality; therefore, these values describe the worst case. We conclude, however, that the formal errors tend to underestimate the external errors of occultation angular-diameter measurements when single as well as multiple measurements are included.

Nevertheless, the occultation technique has been shown to be capable of producing high accuracy. Repetitive observations at many sites, such as the series of α Tau as summarized by White and Kreidl (1984), demonstrate the technique is capable of at least 2% accuracy. One should also note that the large number of infrared observations made at Kitt Peak with large-aperture telescopes show an average formal error of about half that observed with 1-meter-class telescopes in the photoelectric spectral region.

CATALOG SUMMARY

The catalog contains 348 published angular-diameter measurements of 124 stars. More than 95% of these have been measured since 1970. The number of stars per spectral type is fairly evenly distributed among the giants from G8 to M8. α Leo, B7 V, is presently the hottest star with an angular diameter measured by the occultation technique. The distribution of diameter values is Poissonian in shape with a mean of about 3 mas and a minimum of about 1.2 mas. The published error values also show an approximate Poisson distribution with a mean of about 0.55 ms.

Observations at wavelengths less than 0.8 μm show an average formal error of 0.86 mas. For wavelengths greater than 1.0 μm, the observations show an average formal error of 0.36 mas. This difference is expected for several reasons. Because of the wavelength dependence of the diffraction pattern, observations at 2 μm last a factor of 2 times longer than at 0.5 μm. Most of the infrared observations are of stars cooler than spectral type M3, where maximum photon fluxes occur between about 1 and 2 μm. All of the infrared observations have been made with 1.3 or 4 m telescopes whose larger apertures further reduce the intrinsically smaller effect of scintillation in the infrared compared to photoelectric observations in the visual region, which are usually made with 1 m or smaller telescopes.

Measurement of stellar angular diameters by lunar occultation is a productive technique available to most modern professional, college, and amateur observatories. The data system described by White and Wasserman (1984) can be inexpensively duplicated with personal-computer technology. Telescopes from 0.5 to 4.0 m are producing useful measurements. Because occultations are transient events, extreme care must be taken in making the observation and in not overinterpreting the data. Observations of the same event at several sites and observations of occultation series are the best way to increase accuracy with a proven potential approaching 1%. We encourage small, as well as large, observatories to support this kind of inexpensive program, which does not require the best of weather conditions.

We are pleased to gratefully acknowledge the support of the Lowell Observatory and National Science Foundation grant AST-8414370.

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