Reprinted from:

THE ASTRONOMICAL JOURNAL VOLUME 81, NUMBER 11 NOVEMBER 1976

Variability of extragalactic sources at 2.7 GHz. I. Results of a 2-yr monitoring program

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(Received 8 June 1976; revised 20 August 1976)

Three hundred sixty-five extragalactic sources selected without strong spectral bias have been monitored for variability at 2.7 GHz between September 1972 and August 1974 using the NRAO 300-ft transit telescope. This paper (the first of a series of three) describes the observing and calibration procedures which permit flux-density measurements with an internal consistency of order 1%. Table II presents the results of this monitoring program and Table III gives flux densities for 41 sources for which observations indicating variability have not previously been published. The astronomical implications of the results are discussed in Paper III of this series.

INTRODUCTION

IT IS well known that many extragalactic radio sources with optically thick components at centimeter wavelengths are variable in intensity (e.g., Kellermann and Pauliny-Toth 1968; Brandie 1972; Andrew *et al.* 1972; Nicolson 1973). Most intensity-monitoring programs have concentrated on sources with radio spectra suggestive of such components, so that we have little data on the incidence of variability among other spectral types. The higher radio frequencies, at which greater amplitudes of variation are expected theoretically (e.g., van der Laan 1966) have also been emphasized in most programs.

The work reported in this series of papers was carried out for two reasons: to assess the incidence of variability in a large sample of sources selected without strong spectral bias, and to compare variability amplitudes at a decimetric wavelength with those for the same sources at centimetric wavelengths.

This paper (Paper I) describes a series of repeated, precise observations of the 2.7-GHz flux densities of 365 sources during the period September 1972–August 1974. As the usefulness of these observations in examining the incidence of variability at low levels depends critically on their accuracy, Secs. II and III of this paper give a detailed description of our observing and calibration procedures. Section IV assesses the accuracy of our measurements and examines the variability of sources within the 2-yr monitoring period.

Paper II (Bridle, Kesteven, and Brandie 1977) presents further new observations which we use to normalize 2.7-GHz flux densities measured with a variety of telescopes between 1964 and 1971 to the flux-density scale adopted in this paper. The resulting set of self-consistent 2.7-GHz flux densities is used to determine the variability of sources over longer time scales at this frequency.

Paper III (Brandie, Kesteven, and Bridle 1977) analyzes the incidence of variability at 2.7 GHz in various classes of extragalactic source on time scales of 2–8 yr using the results of Papers I and II, and compares the variations observed at 2.7 GHz with those found in the same sources at higher frequencies.

I. SELECTION OF SOURCES FOR MONITORING AT 2.7 GHz

The frequency of 2.7 GHz was chosen for this work because stable, sensitive receivers were available at this frequency for the 300-ft (91.4 m) telescope of the National Radio Astronomy Observatory (operated by Associated Universities, Inc., under contract with the National Science Foundation), and because extensive measurements of flux densities had been made at this frequency by other observers since the mid-1960s. A large transit instrument such as the 300-ft telescope is ideally suited to monitoring large numbers of sources for low-level variability because orientation-dependent telescope parameters vary only with elevation and are therefore more easily calibrated than those of a fully steerable antenna.

The observing program included samples selected from the 178-MHz Revised 3C Catalogue (Bennett 1962), the 1400-MHz BDFL Catalogue (Bridle *et al.* 1972; Bridle and Fomalont 1974) and the 8-GHz Michigan Catalogue (Brandie and Bridle 1974). To avoid difficulties in the calibration and reduction of observations of extended or confused sources, we excluded those known to have angular diameters greater than 1 arcmin and sources noticeably confused on the first scans made with the telescope. The angular resolution of the 300-ft telescope at 2.7 GHz is about 4.7 arcmin.

Use of a transit instrument meant that at some sidereal times no program source was available for observation without making an excessively long drive in elevation; at such times we observed either previously known variables not in any of the three source catalogues, or other sources known to be brighter than 1.0 Jy at 2.7 GHz. Results for all sources observed on four or more occasions are presented in this paper.

Because of difficulties in establishing a sufficiently reliable calibration of telescope performance at high declinations and large zenith angles we restrict the observations reported here to the declination range between −10° and +60°.

II. THE OBSERVATIONS

The resurfaced 300-ft telescope was used with a 3-

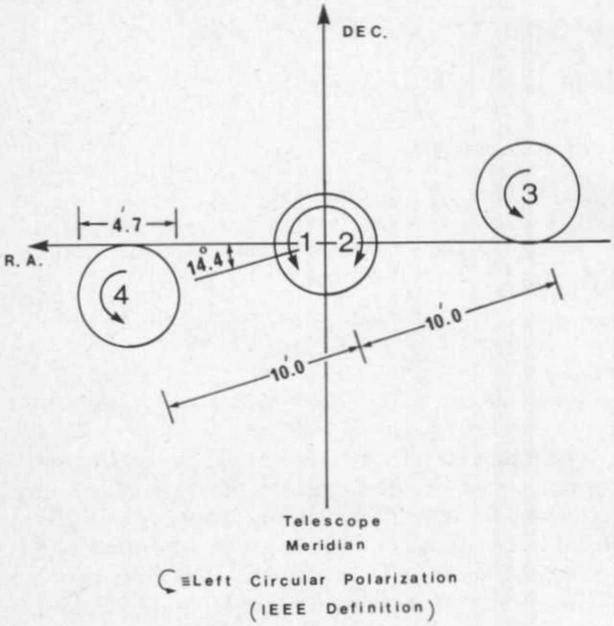

FIG. 1. Beam pattern on the sky produced by the 11-cm, 3-feed system at the 14°.4 rotation angle used for this program. The four receivers respond to circular polarization in the senses indicated.

feed, 4-receiver system and all observations were made as drift scans on the meridian. In the declination range from −10° to +60° the variations of the telescope efficiency with elevation and solar illumination are sufficiently repeatable to permit flux-density measurements with an internal consistency of order 1%, providing care is taken to determine the declination pointing. We emphasize that this program was designed specifically to monitor sources for variability. (This is a little easier than measuring flux densities against an absolute scale.) The calibration procedures adopted were therefore designed to monitor the stability *in time* of the telescope's performance; questions such as the declination dependence of the gain (i.e., questions relating to absolute values) were assigned a lower priority.

The 3-feed system has three circular horns arranged in line. When the central horn is on the electrical axis of the telescope the outer horns provide beams 10 arcmin off axis. This configuration was utilized in the orientation shown in Fig. 1 in order to check the declination pointing of the telescope at every source transit. At this orientation a source transiting exactly on the axis of the telescope is observed at half-intensity in both of the outer beams (after allowing for differences in the system sensitivities between feeds). If the telescope is mispointed in declination, the ratio of the intensities observed in the outer beams is a very sensitive indicator of the pointing error; measurement of this ratio can therefore be used to correct the intensities measured using the on-axis beam for any reduction caused by mispointing. This correction cannot easily be made for sources extended by much more than a minute of arc in declination; this was the main reason for excluding extended sources from the monitoring program.

Four load-switched radiometers with 120-K system temperatures and 100-MHz RF bandwidths were used, one on each of the outer feeds and two on the central feed. All responded to circular polarization, as indicated in Fig. 1. The gains of the four receivers were monitored during every scan by injecting a known noise signal into all four radiometers for 1 sec in every 15. The sensitivity of the system was such that flux densities could normally be measured with internal standard errors (not including errors in absolute calibration) of 0.035 Jy from a single transit.

The observations were made during eight periods between September 1972 and August 1974; the exact dates are listed in Table I. The September 1972 and June 1974 observing periods were longer than normal because observing time was combined with that from other flux-density measurement programs using the same equipment (see Paper II).

Our use of the off-axis receivers to determine declination pointing corrections required accurate knowledge of the relative efficiencies of the telescope and receivers in the two outer beams over the whole declination range. It was also essential to monitor the overall efficiency of the system (telescope and receivers) in all three beams as a function of time. To these ends we made special observations of about 40 steep-spectrum sources every day throughout each observing period. These 40 "internal" calibrators were chosen to be sources which we felt were unlikely to vary significantly within an observing period. As several sources were used to calibrate the performance of each beam and receiver, we were required to assume only that the mean of their intensities did not vary significantly on this time scale. The calibrators were divided into two groups. One group was observed so that a given source transited at the maximum response of a given beam every day; these observations monitored system performance of that beam *as a function of time* through the observing period. The other group was observed so that a given source transited successive beams on successive days; these observations established system sensitivity *ratios* between the different beams. Both groups were chosen to span the full range of declinations at which source observations were made. As the radiometer gains were also calibrated directly every 15 sec these observations monitored varia-

TABLE I. Observing periods.

Period	Dates
1	3–11 September 1972
2	17–22 January 1973
3	9–14 April 1973
4	22–27 August 1973
5	1–6 November 1973
6	1–6 February 1974
7	10–26 June 1974
8	1–8 August 1974

tions of the aperture efficiency and the stability of the local noise signal as functions of declination and time on a scale of several hours. The variations in overall efficiency at any declination were only of order ±2% throughout a typical observing run.

These calibrations allowed the measured radiometer responses at every source transit to be reduced to an intensity scale self-consistent within a given declination zone and within a given observing period. Source intensities determined from the responses of the on-axis receivers were averaged and corrected for the declination pointing errors derived from the off-axis observations; the intensity corrections arising from pointing errors were usually less than 2%. The accuracy of the declination pointing corrections was verified by comparing the apparent declinations of compact sources observed in this way with accurate declinations determined interferometrically for the same sources at 2.7 GHz by Adgie *et al.* (1972), Wade (1970), Brosche *et al.* (1973), and Browne *et al.* (1973). The rms error for 77 such sources was 0.2 arcmin; this implies that flux-density errors in our data due to residual declination pointing errors should normally be less than 1%.

When sources were observed several times during an observing period, the intensities derived from the various transits were averaged; we will not consider day-to-day variations in this paper. Each intensity estimate was assigned the larger of the errors obtained from (1) the observed noise on the transit records and (2) the scatter in the interbeam averaging procedures at each stage in the data reduction. Uncertainties in the pointing, receiver, and telescope calibrations were also included.

III. NORMALIZATION BETWEEN OBSERVING PERIODS

The search for variability in the radio sources observed requires the intensities determined during each observing period to be further normalized to a scale common to all eight observing periods, eliminating any long-term (quarterly, yearly) variations in the efficiency of the 300-ft telescope as a function of declination. Rather than assume long-term intensity stability of any set of calibration sources in order to achieve this, we adopted the following iterative procedure to select a flux-stable group of sources from our own observations.

First, we excluded from the data set all sources shown to be variable by previous work at any radio frequency. Then, denoting the average intensity of the jth source observed in the ith observing period by A_{ij}, we computed the ratio, $R_{ij} = A_{ij}/\overline{A}_j$, of that observation to the average intensity, $\overline{A}_j = (1/n)\ \Sigma_i A_{ij}$, for that source over the n observing periods. If a set of m nonvariable sources had been observed in n observing periods with a perfectly stable telescope, the R_{ij} would make up an $m \times n$ matrix whose elements would not differ significantly from unity. In fact, the R_{ij} may differ from unity either owing to source variability or to changes in the efficiency of the telescope between observing periods. Our reduction procedure relies on the fact that, within a given declination range, changes in the telescope efficiency should affect all sources equally. Variations in telescope performance between periods should thus appear as significant deviations of the averages, $\overline{R}_i = (1/m)\ \Sigma_j R_{ij}$, from unity, while variations in individual sources would introduce significant differences between individual values of R_{ij} and the corresponding $\overline{R}_i$. The two sources of scatter in the R_{ij} values were separated as follows.

First, we assumed that the average intensity of all the m sources observed in one observing session, $\overline{A}_i = (1/m)\ \Sigma_j A_{ij}$, was essentially constant, i.e., that as many "undetected" variable sources still in the sample increased in intensity as decreased from period to period. With this assumption the initial $\overline{R}_i$ values derived from the data set provide a first approximation to the variations in telescope performance and were used to derive "corrected" source intensities $A'_{ij} = A_{ij}/\overline{R}_i$. The A'_{ij} were then subjected to the test for source variability described in Sec. IV. The sources suspected of variability after this test were discarded, and the entire procedure was repeated with the reduced set of starting A_{ij} values. As possibly variable sources were discarded by this procedure, successive iterations increasingly contained a source set for which the assumption of constant average flux density was valid, and so the successive sets of $\overline{R}_i$ values more closely represented the variations in telescope performance. When the procedure finally converged, a set of 190 flux-stable sources remained and the uncertainities in the $\overline{R}_i$ values determining interperiod normalization were of order 1% or less, depending on the observing period and the 10° declination strip within which the analysis was carried out.

We emphasize that this process was conservative: No sources were *assumed* to be stable calibrators *a priori,* and all sources which *might* be variable were excluded from the calibration as the procedure converged.

After this analysis, the source intensities derived from all observing periods could be placed on a scale which was self-consistent within each declination strip. Tests for variability need only use these self-consistent values, without referring them to an absolute scale of flux density. For convenience of presentation of the results we have however normalized our intensity scale to that of Kellermann *et al.* (1968) using 82 of the flux-stable sources recognized by our internal calibration procedure. The uncertainty in this normalization does not contribute to uncertainties in detecting source variability, and so is not included in the error estimates given in the main table of this paper (Table II). We call the units of Table II "flux-density units" rather than "janskys" to emphasize this.

IV. ANALYSIS FOR VARIABILITY

The significance of the scatter of flux densities for a given source was appraised as follows. Given a set of flux densities S_i each with an estimated standard error σ_i we computed the quantity

TABLE II. Results of the 2-yr monitoring program.

Source	Other name	No. of obs.	Variable at 2.7 GHz?	Flux-density range*	x^2	$p(x^2)$	Other variability
0003–003	3C 2	7	No	2.33±0.02	3.20	78.5%	14
0010+005‡	3C 5	6	No	0.88 0.01	1.75	88.3	
0012+319	3C 6	8	No	1.20 0.01	5.28	62.7	
0019–000	PK 0019–00	8	No	1.84 0.02	2.20	94.7	8
0026+346	OB 343	4	No	1.52 0.01	1.40	71.0	
0026–014	PK 0026–014	4	No	0.28 0.03	6.99	7.1	
0028–012	PK 0029–01	4	No	0.54 0.03	4.46	21.4	
0029+013	PK 0029+01	6	No	0.30 0.03	9.17	10.1	
0030+196	3C 12	6	No†	1.25 0.05	3.55†	47.1	
0033+183‡	3C 14	6	No	0.98 0.02	3.58	61.4	
0034–014	3C 15	8	Yes	2.34/2.63	43.48	<0.1	
0035–024‡	3C 17	8	No	3.94 0.04	8.53	28.7	
0038+328‡	3C 19	8	No	1.86 0.02	3.43	84.4	
0038+097	3C 18	6	No†	2.68 0.05	11.15†	2.5	
0048+509‡	3C 22	8	No	1.23 0.03	9.94	19.1	
0048–097	PK 0048–09	8	Yes	1.39/2.00	104.6	<0.1	8,9,14
0051–038‡	3C 26	7	No	1.17 0.01	1.57	95.3	
0055+300	DW 0055+30	7	No†	1.25 0.03	6.88†	22.9	8
0056–001	PK 0056–00	7	No	1.93 0.03	8.97	17.4	10,14,15,18,21
0059+144‡	3C 30	5	No	0.89 0.02	5.92	20.4	
0100+146	PK 0100+14	6	No†	0.58 0.03	7.94†	9.3	22
0106+013	PK 0106+01	8	Yes	2.54/3.86	1831	<0.1	6,7,10,14–16,18,21
0111+021	PK 0111+021	7	Possibly	0.57/0.66	17.78	0.7	
0112–017	PK 0112–017	7	No	1.11 0.04	15.11	1.9	15,18
0114+074	PK 0114+07	4	No	0.94 0.01	1.40	70.9	
0116+082	PK 0116+08	7	No	1.66 0.03	16.41	1.2	3
0116+319	4C 31.04	7	No	1.98 0.03	7.39	28.5	
0119+115	PK 0119+11	6	No	0.82 0.02	7.73	17.0	3,14
0119+041	MA 0119+04	6	Yes	1.58/1.91	129.9	<0.1	
0122–003	PK 0122–00	8	Possibly†	1.04/1.21†	20.81†	0.2	8,14,15,21,22
0123+329‡	3C 41	7	No	2.24 0.03	4.35	63.1	
0125+287‡	3C 42	7	No	1.59 0.02	9.53	14.5	
0127+233‡	3C 43	8	No	1.76 0.02	5.17	64.2	
0128+250	4C 25.07	7	No	0.87 0.05	15.74	1.5	
0132+079‡	3C 45	5	No	1.29 0.02	3.15	53.5	
0133+476	OC 457	8	Yes	1.27/2.64	1723	<0.1	7
0134+329	3C 48	8	Possibly†	8.87/9.30†	21.23†	0.2	
0138+136	3C 49	7	Yes	1.47/1.70	51.45	<0.1	
0145+532	3C 52	8	No	2.31 0.03	6.66	46.5	
0146+056	OC 079	4	No	0.72 0.03	4.36	22.4	
0154+286	3C 55	8	No	1.21 0.01	7.60	36.9	
0202+319	DW 0202+31	7	Yes	0.84/1.06	88.19	<0.1	8
0202+149	PK 0202+14	6	Possibly†	3.48/3.61†	17.27†	0.2	13,14,22
0204+067	PK 0204+06	4	Yes	0.96/1.09	17.25	<0.1	
0206+355	4C 35.03	7	No	1.38 0.02	3.74	71.4	
0208+210	3C 60	6	No	0.74 0.02	13.97	1.6	
0216+011	PK 0216+011	4	No	0.49 0.02	3.92	26.9	
0218–021	3C 63	8	Possibly	1.56/1.75	24.31	0.1	
0220+397‡	3C 65	8	No	1.59 0.03	8.45	29.4	
0221+276‡	3C 67	8	No	1.70 0.03	11.50	11.7	
0223+341	4C 34.07	7	No†	1.71 0.03	10.03†	7.4	
0229+341	3C 68.1	8	No†	1.42 0.01	2.99†	81.1	
0229+131	PK 0229+13	8	Possibly	1.06/1.12	20.65	0.4	3,14,21,22
0234+285	4C 28.07	8	Yes	1.17/1.31	44.74	<0.1	7,8
0235+164	AO 0235+16	8	Yes	0.60/1.96	4816	<0.1	20
0237–027	PK 0237–027	8	Possibly†	0.31/0.45	19.18†	0.4	18,22
0240–002	3C 71	8	Yes	2.80/3.23	117.1	<0.1	4,14
0256+075	OD 094.7	6	Yes	0.75/0.93	76.86	<0.1	
0258+350	4C 34.09	6	No	1.29 0.02	5.76	33.0	
0307+169	3C 79	7	No	2.41 0.04	13.60	3.4	
0312+100	PK 0312+10	8	Yes	0.87/1.12	59.10	<0.1	
0316+413	3C 84	8	Yes	15.86/21.47	1008	<0.1	1,4,6,7,11,12,16
0316+162‡	CTA 21	8	No	4.96 0.04	9.34	22.8	
0317+188	H 0317+18	7	No	0.71 0.01	2.61	85.7	8
0319+176	PK 0319+17	5	No	0.62 0.02	3.18	53.0	
0319+121	PK 0319+12	5	No	1.27 0.02	2.75	60.3	8
0320+053	PK 0320+05	7	No	1.51 0.03	7.55	27.3	
0326+277	DW 0326+27	8	No	0.83 0.02	7.81	34.9	8
0331–013	3C 89	8	No	1.30 0.02	5.96	54.6	
0333+321	NRAO 140	8	Yes	2.79/3.08	92.28	<0.1	1,7,12,16

TABLE II (*continued*)

Source	Other name	No. of obs.	Variable at 2.7 GHz?	Flux-density range*	x^2	$p(x^2)$	Other variability
0336–019	CTA 26	8	Yes	1.98/3.25	719.7	<0.1	1,6,7,10–16,18,21
0340+048	3C 93	8	No	1.56 0.03	12.84	4.5	
0345+337‡	3C 93.1	7	No	1.27 0.02	6.88	33.1	
0347+057	PK 0347+05	8	No	1.94 0.01	6.64	46.8	
0355+508	NRAO 150	8	Yes	5.12/5.90	92.45	<0.1	1,6,7,11,12,16
0408+070	3C 106	5	No	0.90 0.03	8.19	8.4	
0411+141	PK 0411+14	8	No	1.37 0.03	15.53	3.0	
0411+054	PK 0411+05	8	No	1.08 0.02	3.73	81.2	
0420+417	4C 41.11	6	Yes	1.34/1.59	98.77	<0.1	
0420–014	PK 0420–01	8	No†	1.23 0.04	13.40†	3.7	1,6,7,10,14–16,18,22
0422+004	PK 0422+00	8	Yes	0.49/0.92	155.6	<0.1	10,14,15,18
0428+205	PK 0428+20	8	No	3.04 0.04	11.88	10.4	
0430+052	3C 120	7	Yes	7.39/9.70	1112	<0.1	1,4–7,11–14,16,21
0433+295	3C 123	8	Yes	23.35/27.39	525.3	<0.1	
0438+252	4C 25.15	6	No†	0.38 0.03	0.41†	97.8	
0440–003	NRAO 190	8	Yes	2.47/2.92	138.6	<0.1	1,6,7,10,13–16,18,21
0446+112	PK 0446+11	8	Yes	0.76/0.99	182.3	<0.1	
0450+314	3C 131	8	No†	1.49 0.03	15.86†	1.5	
0453+227‡	3C 132	8	No	1.91 0.03	15.40	3.1	
0454+066	PK 0454+06	8	Yes	0.44/0.64	109.3	<0.1	3
0458–020	PK 0458–02	8	Yes	1.86/2.16	53.85	<0.1	7,10,14,18,21
0459+252‡	3C 133	8	No	3.34 0.04	10.64	15.4	
0550+019	OG 003	8	No†	2.31 0.04	16.79†	1.0	18
0507+179	PK 0507+17	8	Yes	0.49/0.69	114.5	<0.1	14
0515+508	3C 137	7	No	1.05 0.02	5.34	50.3	
0518+165	3C 138	8	No†	5.74 0.10	5.64†	46.5	14,21,22
0528+064	3C 142.1	8	No	1.65 0.01	3.40	84.7	
0529+075	OG 050	8	Yes	1.24/1.45	46.74	<0.1	7
0531+194	PK 0531+19	7	No	3.98 0.03	8.43	20.8	
0538+498	3C 147	8	Yes	12.38/13.21	38.99	<0.1	
0540+187	4C 18.16	8	No†	1.27 0.05	8.07†	23.2	
0548+165	4C 16.14	8	No	1.42 0.01	4.40	73.5	
0552+398	DA 193	8	Yes	3.50/3.90	133.9	<0.1	7,8
0554–026	PK 0554–026	6	No	0.54 0.02	9.62	8.6	
0559+024	PK 0558+02	4	No	0.30 0.01	1.43	70.2	
0605+480‡	3C 153	8	No	2.30 0.04	8.55	28.6	
0605–085	PK 0605–08	8	Yes	3.15/3.92	272.9	<0.1	7,13,14,16
0624–058	3C 161	8	No	11.19 0.07	3.15	79.5	14,21
0640+233	3C 165	8	No	1.28 0.03	17.01	1.7	
0642+449	OH 471	4	Yes	0.99/1.17	42.56	<0.1	17
0642+214	3C 166	8	Yes	1.40/1.55	47.79	<0.1	
0651+542‡	3C 171	8	No	2.00 0.03	8.15	31.9	
0659+445	4C 44.15	8	No	1.15 0.01	4.56	71.5	
0711+146‡	3C 175.1	8	No	1.07 0.02	6.84	44.6	
0723–008	DW 0723–00	8	Yes	1.94/2.40	198.9	<0.1	7,9,14,15,18
0725+147‡	3C 181	7	No	1.24 0.02	4.17	65.6	
0732+332	B2 0732+33	8	No†	1.40 0.05	10.91†	9.0	
0735+178	PK 0735+17	8	Yes	1.79/2.09	105.1	<0.1	6,7,11,14,16,21
0736+017	PK 0736+01	7	No†	1.97 0.12	10.53†	6.1	1,7,10,13–16,18,21,22
0738+313	OI 363	6	Yes	2.06/2.24	67.71	<0.1	7,12
0741–063	PK 0741–06	7	No†	5.01 0.12	11.95†	3.5	8
0742+103	DW 0742+10	8	Possibly†	3.68/3.88†	20.65†	0.2	8,12
0743–006	PK 0743–006	7	No†	1.37 0.04	10.62†	5.9	7,15,18
0748+333	B2 0748+33	8	Yes	0.70/0.86	39.46	<0.1	
0758+143‡	3C 190	8	No	1.37 0.02	7.24	40.5	
0801+303	B2 0801+30	4	No	0.72 0.02	6.94	7.3	
0802+212	PK 0802+21	4	No	0.96 0.03	8.24	4.1	
0802+103‡	3C 191	4	No	0.91 0.02	2.95	40.1	
0805–077	PK 0805–07	8	Yes	1.01/1.50	266.3	<0.1	3,14
0806+426‡	3C 194	8	No	1.12 0.02	10.40	16.6	
0808+019	PK 0808+019	8	Yes	0.45/0.96	476.1	<0.1	8,10,18
0809+483	3C 196	8	No	7.64 0.08	8.73	27.2	
0811+131	PK 0812+13	6	No†	1.02 0.05	8.38†	7.8	
0814+425	OJ 425	8	Yes	1.68/2.16	248.7	<0.1	
0820+225	PK 0820+22	8	No	1.89 0.02	16.07	2.4	
0824+294	3C 200	7	No†	1.02 0.04	7.40†	19.1	
0827+378	4C 37.24	7	No†	1.40 0.04	8.47†	13.1	
0828+493	BP 77	7	Yes	0.79/1.16	131.4	<0.1	8
0829+046	MA 0829+04	7	No†	0.61 0.05	3.19†	67.3	15
0831+557	4C 55.16	8	No	7.49 0.08	9.15	24.1	

TABLE II (*continued*)

Source	Other name	No. of obs.	Variable at 2.7 GHz?	Flux-density range*	x^2	$p(x^2)$	Other variability
0831+171	3C 202	6	No	0.97 0.02	6.65	24.7	
0835+580‡	3C 205	5	No	1.11 0.03	3.88	42.3	
0838+133	3C 207	8	No	1.63 0.02	8.21	31.4	
0839+187	DW 0839+18	8	No	1.22 0.02	16.36	2.2	8
0850+140‡	3C 208	5	No	1.12 0.02	3.06	55.0	
0851+202	OJ 287	7	Yes	2.45/3.58	1275	<0.1	7,9,11,19
0855+143‡	3C 212	7	No	1.42 0.03	8.39	21.0	
0905+380‡	3C 217	7	No	1.00 0.01	2.57	86.1	
0906+430	3C 216	7	No	2.38 0.03	7.26	29.7	
0906+015	PK 0906+01	8	No	0.86 0.03	12.92	7.4	9,14,15,18,22
0911+174	PK 0911+17	5	No†	0.81 0.04	2.73†	43.7	
0912+029	PK 0912+029	4	Yes	0.32/0.74	31.99	<0.1	18
0922+005	PK 0922+005	8	Yes	0.70/0.82	27.35	<0.1	15,18
0923+392	4C 39.25	8	Possibly	4.73/4.89	22.01	0.3	6,7,11,12,16
0932+022	PK 0932+02	6	No	0.46 0.02	13.50	1.9	
0936+022	PK 0936+02	4	No	0.26 0.02	3.85	27.8	
0937+033	PK 0937+033	5	No	0.27 0.03	6.34	17.4	
0941+100	3C 226	8	No	1.07 0.03	17.53	1.4	
0947+145	3C 228	8	No	1.97 0.03	9.10	24.4	
0953+254	OK 290	8	Yes	1.00/1.16	76.48	<0.1	7,9
0954+556	4C 55.17	8	No†	2.60 0.05	10.51†	10.4	8
1003+351	3C 236	8	No†	2.09 0.03	7.62†	26.6	
1005+077	3C 237	8	Possibly†	3.48/3.64†	19.17†	0.4	
1008+066	3C 238	8	Yes	1.30/1.46	41.39	<0.1	
1012+022	PK 1012+022	5	No	0.40 0.01	1.27	86.7	
1014+018	PK 1014+018	5	No	0.34 0.03	7.58	10.7	
1021+028	PK 1021+028	4	No	0.23 0.01	2.47	48.3	
1021−006	PK 1021−00	6	No	0.96 0.04	10.52	6.1	
1027+008	PK 1027+00	6	No	0.60 0.03	8.62	12.4	
1039+029	PK 1039+02	7	No	1.59 0.02	5.38	49.7	
1040+123	3C 245	8	No	2.11 0.02	5.06	65.4	14
1049+215	PK 1049+21	8	Possibly†	0.98/1.08†	18.67†	0.5	
1055+201	PK 1055+20	6	Possibly†	1.42/1.55†	16.06†	0.3	
1055+018	PK 1055+01	8	Yes	2.75/3.07	101.0	<0.1	1,6,7,10,11,13−16,18,21
1056+432	3C 247	6	No	1.59 0.03	14.39	1.3	
1059−010	3C 249	8	Possibly†	1.32/1.52†	17.59†	0.8	
1111+408	3C 254	8	No†	1.46 0.05	16.85†	1.0	
1116+128‡	PK 1116+12	8	No	1.70 0.03	14.42	4.4	
1117+146	PK 1117+14	8	Possibly†	1.52/1.63†	19.11†	0.4	8
1119+183	OM 133	8	No	0.71 0.02	14.03	5.0	8
1123+264	PK 1123+26	7	No	0.83 0.02	12.26	5.6	8
1128+455	OM 448	7	No	1.13 0.01	2.55	86.4	
1138+015	PK 1138+01	8	No†	1.54 0.05	9.68†	13.8	
1140+223‡	3C 263.1	8	No	1.50 0.02	7.25	40.4	
1147+130	3C 267	8	No	1.23 0.02	6.36	50.0	
1148−001	PK 1148−00	8	Possibly†	2.36/2.56†	19.14†	0.4	14
1150+498	4C 49.22	7	Yes	1.43/1.66	56.27	<0.1	
1153+317‡	NRAO 389	7	No	1.73 0.01	3.53	74.2	
1156+295	B2 1156+29	7	Yes	1.09/1.28	83.62	<0.1	
1201−041	PK 1201−04	7	No	1.44 0.02	1.83	93.4	
1206+439‡	3C 268.4	7	No	1.05 0.01	2.42	87.8	
1213+350	B2 1213+35	7	No	1.23 0.02	11.21	8.1	
1218+339	3C 270.1	8	No†	1.53 0.04	5.14†	52.7	
1219+045	PK 1219+04	7	Yes	0.59/0.79	102.6	<0.1	15
1225+368	ON 343	8	No	1.46 0.01	2.05	95.6	
1226+023	3C 273	7	Yes	39.16/44.78	608.8	<0.1	1,2,4−7,10−16,21
1229−021	PK 1229−02	6	No†	1.29 0.06	9.14†	5.7	14
1237−101	PK 1237−10	7	No	1.51 0.06	12.24	5.6	3,8,14,21
1239−044	3C 275	8	Yes	1.71/2.01	51.34	<0.1	
1241+166	3C 275.1	8	No†	1.72 0.03	13.16†	4.0	22
1242+410	DA 329	8	No	1.06 0.03	13.45	6.1	8
1250+568	3C 277.1	6	No†	1.32 0.07	6.14†	18.7	
1251+278	3C 277.3	7	No	1.88 0.03	11.19	8.2	
1253+185	H 1253+18	8	No	0.48 0.03	12.75	7.8	8
1253−055	3C 279	8	Yes	11.88/13.77	314.7	<0.1	1,2,4,6,7,11−14,16,21
1254+476‡	3C 280	4	No	2.86 0.02	0.86	83.7	
1306−095	PK 1306−09	8	No	2.95 0.05	5.65	58.2	14
1318+113	PK 1318+11	8	No	1.33 0.02	11.29	12.5	
1323+321	B2 1323+32	7	No	3.29 0.04	6.75	34.5	
1328+307	3C 286	8	No	10.22 0.11	14.80	3.8	2

TABLE II (*continued*)

Source	Other name	No. of obs.	Variable at 2.7 GHz?	Flux-density range*	x^2	$p(x^2)$	Other variability
1328+254	3C 287	8	No	4.61 0.02	2.17	94.9	
1335−061‡	PK 1335−06	8	No	1.86 0.04	7.63	36.6	
1336+391‡	3C 288	8	No	1.77 0.03	12.30	9.0	
1340+053	PK 1340+05	5	No†	1.09 0.07	1.70†	64.0	
1343+500‡	3C 289	7	No	1.21 0.02	3.01	80.9	
1345+125	PK 1345+12	8	No	3.79 0.02	7.84	34.7	1,7,8,14
1354+013	PK 1354+01	7	No	1.29 0.01	2.65	85.3	
1354+195	PK 1354+19	8	Yes	1.60/1.92	213.8	<0.1	7,14
1403−085	DW 1403−08	7	No	0.68 0.05	12.29	5.5	8
1404+286	OQ 208	7	No	1.88 0.02	2.45	87.5	7
1409+524‡	3C 295	8	No	12.08 0.14	12.30	9.0	
1413+349	B2 1413+34	7	No†	1.67 0.04	8.94†	11.0	
1416+067‡	3C 298	8	No	2.78 0.03	7.44	38.4	
1419+419	3C 299	6	No†	1.67 0.06	5.86†	20.8	
1420+198	3C 300	8	No	1.94 0.02	5.39	61.4	
1420−005	PK 1420−005	4	No	0.26 0.01	1.30	73.4	
1425−011‡	3C 300.1	8	No	1.61 0.02	3.62	82.4	
1434+036	PK 1434+03	8	No	1.83 0.01	2.28	94.2	
1441+522‡	3C 303	6	No	1.53 0.03	8.78	11.7	
1442+101	OQ 172	8	Yes	1.65/1.83	66.88	<0.1	8
1453−109‡	PK 1453−10	8	No	2.48 0.03	7.85	34.5	
1456+044	4C 4.49	7	No	0.74 0.03	14.59	2.4	
1502+106	OR 103	8	Yes	1.59/1.87	140.5	<0.1	7,13
1502+036	PK 1502+036	8	Yes	0.36/0.69	296.3	<0.1	9,18
1509+015	PK 1509+01	8	No	1.21 0.03	11.56	11.5	
1510−089	PK 1510−08	8	Yes	1.71/3.25	1471	<0.1	1,2,7,9,11,13,14,16,21
1511+238	PK 1511+23	8	No	1.10 0.02	9.94	19.1	8
1514+072‡	3C 317	7	No	2.08 0.03	6.74	34.6	
1517+204‡	3C 318	7	No	1.35 0.01	3.42	75.6	
1518+046	PK 1518+047	8	No	2.32 0.03	9.29	23.2	8
1522+546	3C 319	7	No	1.26 0.01	7.32	29.2	
1523+033‡	PK 1523+03	8	No	1.12 0.02	13.27	6.5	
1532+016	PK 1532+01	8	Yes	1.07/1.18	37.73	<0.1	14,15,18
1535+139	PK 1535+13	4	No	1.00 0.03	4.79	18.6	
1535+004	MA 1535+00	8	Yes	0.84/1.06	97.56	<0.1	
1538+149	4C 14.60	7	Yes	1.40/1.84	342.6	<0.1	
1543+005	DW 1543+00	7	No†	1.15 0.10	6.50†	26.0	
1545+210	3C 323.1	7	No	1.33 0.03	12.95	4.3	
1546+027	PK 1546+027	8	Yes	1.05/1.26	61.11	<0.1	9,10,14,15,18
1547+215‡	3C 324	7	No	1.27 0.03	8.41	20.9	
1548+056	DW 1548+05	7	Yes	1.86/2.16	141.2	<0.1	13,16
1553+202‡	3C 326.1	7	No	1.25 0.01	2.53	86.5	
1555+001	DW 1555+00	8	No†	1.36 0.03	5.57†	47.4	7,13,15,16,18,22
1600+335	B2 1600+33	8	Yes	1.93/2.56	488.7	<0.1	8
1602+014	3C 327.1	8	Yes	2.01/2.17	45.48	<0.1	
1603+001	PK 1603+00	8	No†	1.48 0.04	10.23†	11.4	
1607+268‡	PK 1607+26	7	No	2.93 0.02	3.10	79.9	22
1611+343	DA 406	7	No	2.44 0.03	6.28	39.3	7,8
1614+269	PK 1614+26	8	No	0.90 0.02	15.57	2.9	8
1618+177	3C 334	8	No†	1.07 0.03	7.76†	25.6	
1622+238‡	3C 336	7	No	1.38 0.02	7.03	31.8	
1624+416	4C 41.32	8	No	1.65 0.02	4.47	72.6	
1626+396	3C 338	7	No	1.26 0.02	4.74	58.0	
1626+278	3C 341	7	No	0.96 0.03	10.23	11.4	
1627+444	3C 337	4	No	1.66 0.03	2.39	49.8	
1627+234	3C 340	6	No	1.37 0.02	7.12	21.1	
1635−035	PK 1635−035	7	No	0.48 0.02	14.18	2.8	18
1638+398	NRAO 512	6	Yes	0.92/1.22	126.3	<0.1	1,7,9
1638+124	4C 12.60	7	No	1.51 0.03	14.99	2.0	
1641+399	3C 345	8	Yes	8.61/10.41	489.6	<0.1	1,2,5−7,11,12,16
1641+173‡	3C 346	5	No	2.27 0.04	9.06	5.9	
1643+022	PK 1643+022	4	No	1.10 0.01	1.10	78.0	
1645+174	PK 1645+17	8	No	1.36 0.01	2.81	90.2	3,8,14
1648+015	MA 1648+01	8	Yes	0.82/0.96	63.96	<0.1	15,18
1649−062	PK 1648−06	8	No†	1.16 0.05	8.11†	22.9	8
1656+053	DW 1656+05	8	No†	1.62 0.06	16.73†	1.0	7
1702+298	B2 1702+29	7	No	0.82 0.02	5.48	48.5	
1708+006	PK 1708+00	4	No	0.85 0.01	0.88	83.1	
1711+006	PK 1711+006	5	No	0.64 0.02	0.88	92.6	
1712−032	PK 1712−03	4	No	0.61 0.02	1.42	70.6	

TABLE II (*continued*)

Source	Other name	No. of obs.	Variable at 2.7 GHz?	Flux-density range*	x^2	$p(x^2)$	Other variability
1716+006	PK 1717+006	8	No	1.26 0.01	9.44	22.1	
1735+240	PK 1735+24	6	No	0.94 0.01	4.08	53.9	
1741−038	PK 1741−03	8	Yes	1.75/2.65	780.5	<0.1	9,10,13−15,18
1749+096	OT 081	8	Yes	0.75/1.07	325.3	<0.1	7
1756+134‡	3C 365	8	No	1.34 0.03	10.11	18.2	
1759+138	PK 1759+13	4	No	0.75 0.03	11.22	1.1	
1801+010	PK 1801+01	7	No	0.85 0.02	7.96	24.0	14
1807+279	NRAO 547	8	No	0.76 0.01	6.92	43.8	
1810+046	4C 4.63	8	No	1.18 0.02	7.95	33.7	
1819+396	B2 1819+39	8	No	1.77 0.03	11.39	12.2	
1821+017	4C 1.55	7	No	1.46 0.02	4.29	64.0	
1828+487	3C 380	8	No	9.44 0.07	14.73	3.9	1,6,7,12,16
1829+290	4C 29.56	8	No	1.87 0.02	4.71	69.7	
1832+474‡	3C 381	7	No	2.26 0.03	7.24	29.8	
1832+315	B2 1832+31	8	No	1.42 0.03	15.33	3.2	
1835+134	4C 13.67	6	No	1.18 0.02	3.90	56.6	
1842+455	3C 388	8	No	3.18 0.02	3.28	85.9	
1843+098	3C 390	7	Yes	2.70/2.90	48.31	<0.1	12
1901+319	3C 395	8	Yes	2.85/3.18	114.2	<0.1	
1914+302	3C 399.1	8	Yes	1.58/1.70	38.21	<0.1	
1939+605‡	3C 401	7	No	2.72 0.03	2.67	85.0	
1953+035	PK 1953+035	4	No	0.25 0.03	4.25	23.5	
1957−013	PK 1957−013	6	No	0.42 0.02	5.93	31.3	
2003−025	PK 2003−025	8	No	1.51 0.04	15.21	3.3	
2012+234‡	3C 409	8	No	6.46 0.08	6.94	43.5	
2019+098‡	3C 411	8	No	1.70 0.01	7.50	37.9	
2030+257	3C 414	6	No†	1.01 0.04	7.70†	10.2	
2037+511	3C 418	8	Yes	3.69/4.30	89.64	<0.1	6,7,11,12
2037−029	PK 2037−03	4	No†	0.40 0.07	2.23†	32.9	
2044−027‡	3C 422	8	No	1.43 0.04	15.88	2.6	
2045+068‡	3C 424	8	No	1.22 0.02	9.32	22.9	
2050+363	DA 529	8	Yes	4.19/4.43	39.59	<0.1	
2052+005	PK 2052+005	6	No	0.48 0.01	0.98	96.2	
2059+283	3C 426	6	No†	0.97 0.04	0.92†	92.0	
2059+034	PK 2059+034	8	Yes	0.61/0.72	35.13	<0.1	15,18
2113+293	B2 2113+29B	8	Yes	0.90/1.10	164.2	<0.1	8
2121+248‡	3C 433	8	No	6.51 0.04	6.80	45.1	
2126+073	3C 435	8	No	1.07 0.02	3.54	83.2	
2128+048	PK 2127+04	8	No	2.94 0.02	7.53	37.6	8
2131−021	PK 2131−021	8	Yes	1.58/2.51	1283	<0.1	15,18
2134+004	PK 2134+004	8	Yes	7.03/7.47	89.44	<0.1	6,7,16,18
2141+279	3C 436	5	No	1.80 0.09	2.03	73.4	
2142+042	PK 2142+04	5	No	0.83 0.01	0.80	93.6	
2144+092	OX 074	8	Yes	0.69/0.99	233.0	<0.1	9
2145+151	3C 437	7	No	1.54 0.01	4.44	62.0	
2145+067	PK 2145+06	8	Yes	3.16/3.40	46.07	<0.1	6,7,11,12,14,16,21
2147+145‡	PK 2147+14	7	No	1.37 0.02	11.31	7.9	
2148+143	PK 2148+14	7	No†	1.30 0.06	13.59†	1.8	
2153+376‡	3C 438	8	No	3.25 0.03	7.18	41.1	
2200+420	BL Lac	8	Yes	3.59/6.32	2229	<0.1	4−7,11,12,16
2201+315	B2 2201+31A	7	Yes	1.75/2.23	430.3	<0.1	7,8
2203+292‡	3C 441	5	No	1.38 0.02	11.79	1.9	
2210+016	PK 2210+01	8	No	1.67 0.01	2.30	94.1	8
2216−038	PK 2216−03	8	Yes	1.19/1.36	106.7	<0.1	7,12,14−16,18,21
2223+210	PK 2223+21	8	Yes	1.72/1.87	47.67	<0.1	8
2223−052	3C 446	8	Yes	4.73/5.19	53.24	<0.1	1,6,7,11,13,14,16,21
2230+114	CTA 102	8	Yes	4.44/4.75	65.32	<0.1	7,13,14,21
2234+282	CTD 135	8	Yes	0.82/1.20	302.1	<0.1	8
2236+124	PK 2236+124	8	Yes	0.29/0.43	66.19	<0.1	19
2244+366	B2 2244+36	8	No	1.19 0.02	9.61	21.1	
2247+140	PK 2247+14	8	No	1.46 0.03	14.20	4.7	
2247+132	PK 2247+13	8	No	0.93 0.03	15.87	2.6	8
2249+185‡	3C 454	6	No	1.21 0.01	1.42	92.2	
2251+244	PK 2251+24	4	No	1.22 0.02	5.83	11.9	
2251+158	3C 454.3	8	Yes	10.10/11.11	149.8	<0.1	1,4−7,11−14,16,21
2252+129‡	3C 455	7	No	1.41 0.01	3.04	80.5	
2254+024	PK 2254+024	7	No	0.35 0.01	4.46	61.6	15,18
2300−013	PK 2300−013	4	No	0.20 0.01	0.57	90.1	
2302−025	PK 2302−025	5	No	0.27 0.03	6.94	13.8	
2303−008	PK 2303−008	6	No	0.34 0.01	7.48	18.6	

TABLE II (*continued*)

Source	Other name	No. of obs.	Variable at 2.7 GHz?	Flux-density range*	x^2	$p(x^2)$	Other variability
2304+006	PK 2304+00	5	No	0.29 0.03	10.38	3.4	
2309+090‡	3C 456	8	No	1.36 0.02	8.59	28.3	
2314+038	3C 459	8	Possibly	2.21/2.40	22.15	0.3	
2318+049	OZ 031	7	Yes	1.07/1.32	95.31	<0.1	
2320+079	PK 2319+07	7	No	0.81 0.01	2.97	81.5	8,14
2324+405	3C 462	6	No	1.54 0.03	5.49	35.9	
2332–017	PK 2332–017	8	No	0.54 0.03	13.08	7.0	15,18
2335–027	PK 2335–027	8	No	0.63 0.04	16.94	1.8	18
2338+042	PK 2338+04	6	No	0.83 0.02	4.38	49.8	
2344+092	PK 2344+09	8	Yes	1.41/1.50	34.22	<0.1	8,14
2347–026	PK 2347–02	4	No†	1.02 0.08	0.20†	89.8	
2349–014	PK 2349–01	4	No	1.00 0.02	1.61	66.1	
2351+456	4C 45.51	6	No†	1.51 0.05	7.67†	10.3	
2351–006	PK 2351–006	6	No	0.50 0.02	2.09	83.7	
2352+495	DA 611	7	Yes	2.00/2.19	24.85	<0.1	

* Flux density units (See Sec. III).

† Single discrepant transit not included in variability assessment.

‡ Source used to convert amplitudes to scale of Kellermann *et al.* (1968).

References for other reports of variability:

1. Kellermann *et al.* (1968)
2. Grahl and Grewing (1969)
3. Bell *et al.* (1971)
4. Fogarty *et al.* (1971)
5. Witzel and Veron (1971)
6. Dent and Kojoian (1972)
7. Medd *et al.* (1972)
8. Ross (1972)
9. Stull (1972)
10. Wall (1972)
11. Dent and Hobbs (1973)
12. Kellermann and Pauliny–Toth (1973)
13. Nicolson (1973)
14. Shimmins and Wall (1973)
15. Brandie and Bridle (1974)
16. Dent *et al.* (1974)
17. Gearhart *et al.* (1974)
18. McEwan *et al.* (1975)
19. Shimmins *et al.* (1975)
20. Spinrad and Smith (1975)
21. Wills (1975)
22. Bridle *et al.* (1976) (Paper II)

$$x^2 = \sum_{i=1}^{n} (S_i - \overline{S})^2/\sigma_i^2,$$

where

$$\overline{S} = \sum_{i=1}^{n} (S_i/\sigma_i^2)/\sum_{i=1}^{n} (1/\sigma_i^2)$$

is the weighted mean flux density observed over the n observing periods. In the presence of purely random errors x^2 should be distributed as χ^2 with $n - 1$ degrees of freedom. We consider a source to be variable if the probability $p(x^2)$ of exceeding the observed x^2 by chance is <0.1%, and "possibly" variable if $0.1\% \leq p \leq 1\%$. This procedure cannot detect a weak but continuous trend in the data because the x^2 statistic ignores the order of the S_i values in time. In some cases this can be overcome by extending the time baseline of the analysis after normalizing other observers' flux densities to our scale (Paper II).

For some sources data from a single observing period introduced a large contribution to x^2 which would have determined the variability classification of the source. Some of these single discrepant flux densities were attributable to the presence of the Sun in a sidelobe of the 300-ft telescope, to severe wind gusts or to unusual instrumental effects. *We have therefore discarded the flux density making the largest contribution to x^2 when assessing the variability of a source,* unless that flux density was derived from two or more transits during the same observing period. This approach guards against the possibility of interpreting occasional "bad" data as variability, although it may prevent us from recognizing some examples of isolated short-period variations.

Table II gives our results for 365 sources. Column 1 gives the IAU designation of the source and column 2 its common name from one of the major radio source catalogues. A ‡ in column 1 indicates that the source is one of the 82 used in normalizing the flux-density scale to that of Kellermann *et al.* (1968). Column 3 gives the number of observing periods during which we observed the source and column 4 indicates whether we consider the source variable *from the evidence of our 2.7-GHz observations.* The variability of these sources on longer time scales at 2.7 GHz is assessed in Papers II and III. Column 5 gives the flux-density range in our data for sources classified as variable or possibly variable; the mean flux density is given with its standard error for sources that did not vary significantly during our observations. Columns 6 and 7 give the calculated values of x^2 and $p(x^2)$, and column 8 gives references to variability detected by other monitoring programs (including results of Paper II).

The validity of the variability assessments made in

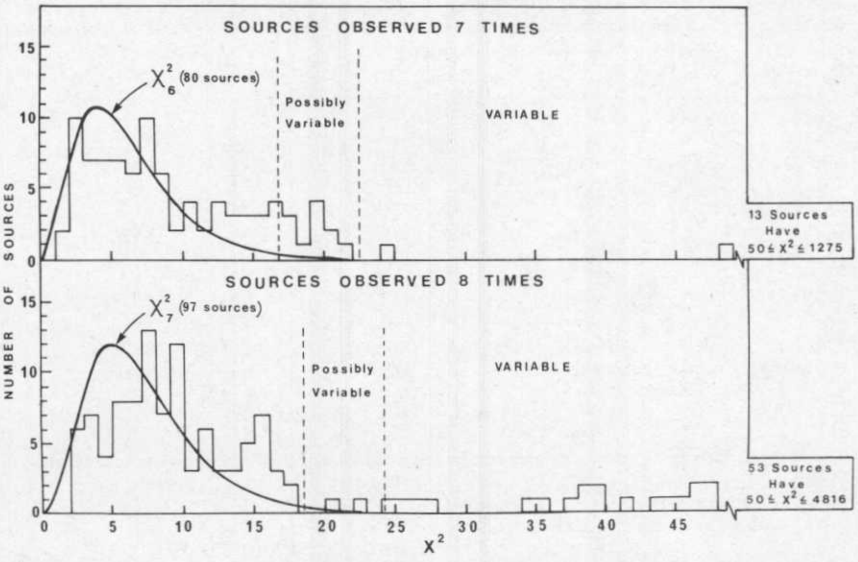

FIG. 2. Distributions of x^2 for sources with seven and eight observations. The curves are theoretical χ^2 distributions with 6 and 7 degrees of freedom, normalized to the number of nonvariable sources in each histogram.

column 4 depends strongly on the validity of our estimate of the error σ_i assigned to each flux density S_i. This estimate is in each case based on the system noise, the interreceiver consistency of the measurements, and the calibration quality for the individual observation; if the instrument were susceptible to variation in performance on a time scale to which our calibration procedures are insensitive, the σ_i values might be underestimated. An example of such an effect could be an hourly variation of aperture efficiency. Although we cannot appraise the errors assigned to individual observations in any *post hoc* way, the credibility of the ensemble of errors has been subjected to the following numerical tests.

The distribution of the derived values of x^2 for sources observed seven or eight times is shown in Fig. 2. If our error estimates were systematically too low this distribution would be biased towards higher values of x^2 than the corresponding theoretical χ^2 distribution, even for

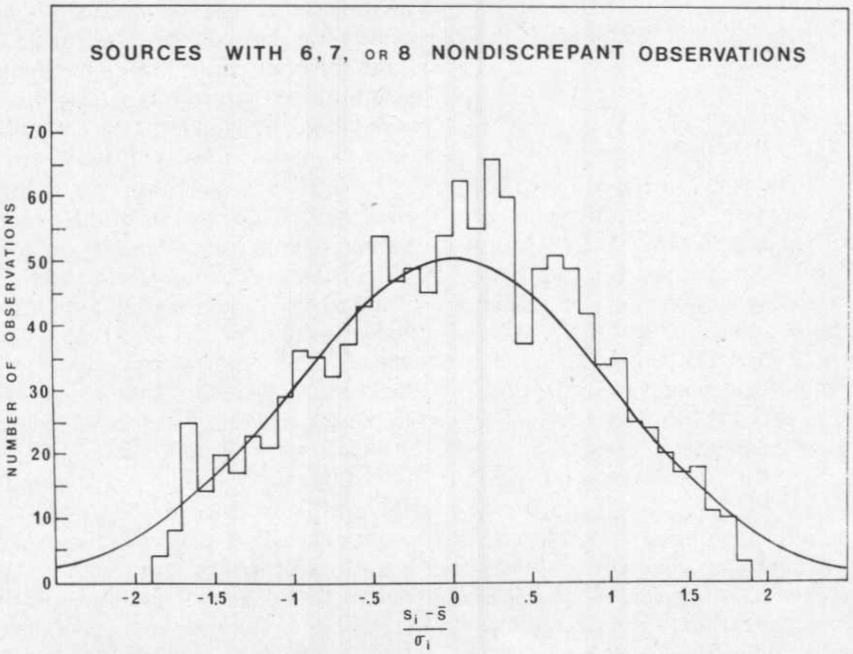

FIG. 3. Distribution of $(S_i - \overline{S})/\sigma_i$ for nonvariable sources observed six or more times. Single observations sufficiently discrepant to be rejected by Chauvenet's criterion and *all* observations of sources having two or more such discrepant observations were deleted from the sample. The distribution has mean: 0.023, standard deviation: 0.83. The curve is the normal curve with zero mean and unit variance normalized to the same number of observations as comprise the histogram.

TABLE III. Flux densities of sources not previously documented as variable.

Source	Observing period	No. of transits	Flux density
(a) Variable sources			
0034–014	1	1	2.50±0.04
	2	2	2.51 0.10
	3	1	2.47 0.04
	4	2	2.50 0.02
	5	1	2.34±0.03
	6	1	2.63 0.04
	7	1	2.42 0.02
	8	2	2.50 0.02
0119+041	1	1	1.79 0.05
	4	1	1.91 0.03
	5	1	1.79 0.03
	6	1	1.79 0.02
	7	1	1.65 0.02
	8	1	1.58 0.02
0138+136	1	1	1.53 0.02
	2	2	1.47 0.02
	3	2	1.70 0.03
	4	1	1.51 0.02
	5	1	1.52 0.02
	6	1	1.54 0.02
	8	2	1.49 0.01
0202+319	1	1	0.84 0.03
	3	1	0.89 0.02
	4	1	0.91 0.02
	5	1	0.96 0.03
	6	3	1.01 0.02
	7	1	1.05 0.02
	8	1	1.06 0.02
0204+067	1	2	1.09 0.03
	2	2	0.97 0.02
	3	2	0.96 0.02
	8	1	0.96 0.02
0256+075	1	1	0.78 0.03
	2	2	0.75 0.02
	4	2	0.79 0.02
	6	1	0.85 0.03
	7	1	0.93 0.02
	8	2	0.92 0.02
0312+100	1	1	1.12 0.04
	2	2	0.98 0.02
	3	1	0.87 0.02
	4	2	0.98 0.04
	5	2	0.94 0.02
	6	2	0.96 0.02
	7	1	1.06 0.02
	8	3	0.99 0.01
0420+417	3	1	1.49 0.02
	4	2	1.46 0.02
	5	3	1.50 0.05
	6	1	1.34 0.02
	7	2	1.55 0.02
	8	2	1.59 0.02
0433+295	1	3	26.45 0.19
	2	2	27.39 0.17
	3	1	26.28 0.19
	4	3	27.01 0.13
	5	4	26.96 0.17
	6	4	27.15 0.13
	7	2	27.24 0.17
	8	1	23.35 0.15
0446+112	1	5	0.96 0.01
	2	4	0.88 0.02
	3	3	0.99 0.03
	4	3	0.88 0.01
	5	4	0.78 0.01
	6	3	0.88 0.01
	7	9	0.76 0.02
	8	3	0.78 0.02
0538+498	1	4	12.38 0.11
	2	3	13.21 0.10
	3	1	13.06 0.09
	4	2	12.89 0.08
	5	2	12.81 0.21
	6	1	13.04 0.11
	7	4	12.92 0.14
	8	2	12.91 0.06
0642+214	1	3	1.49 0.02
	2	1	1.42 0.02
	3	1	1.55 0.03
	4	1	1.44 0.02
	5	1	1.46 0.03
	6	1	1.40 0.02
	7	2	1.42 0.02
	8	1	1.55 0.03
0748+333	1	1	0.86 0.03
	2	3	0.79 0.01
	3	4	0.75 0.03
	4	2	0.74 0.02
	5	1	0.70 0.02
	6	2	0.75 0.01
	7	1	0.75 0.02
	8	3	0.70 0.02
0814+425	1	1	2.16 0.03
	2	2	2.09 0.08
	3	2	2.03 0.04
	4	3	1.90 0.02
	5	1	1.92 0.04
	6	2	2.10 0.02
	7	1	1.90 0.02
	8	1	1.68 0.02
0828+493	1	1	1.16 0.03
	3	1	0.96 0.02
	4	1	0.88 0.02
	5	1	0.89 0.02
	6	1	0.83 0.02
	7	2	0.79 0.02
	8	1	0.94 0.02
1008+066	1	1	1.32 0.03
	2	1	1.44 0.03
	3	1	1.39 0.03
	4	1	1.46 0.03
	5	1	1.30 0.02
	6	2	1.34 0.01
	7	1	1.39 0.03
	8	2	1.41 0.04
1150+498	1	1	1.66 0.03
	2	1	1.57 0.03
	3	1	1.51 0.02
	4	1	1.52 0.03
	6	2	1.47 0.03
	7	1	1.44 0.02
	8	1	1.43 0.02
1156+295	1	1	1.17 0.03
	2	1	1.28 0.02
	3	1	1.24 0.02
	4	1	1.09 0.02
	5	1	1.10 0.02
	6	1	1.10 0.02
	7	1	1.10 0.02
1239–044	1	1	1.71 0.04
	2	1	1.86 0.04
	3	2	1.75 0.05
	4	1	1.92 0.03
	5	1	2.01 0.04
	6	1	1.97 0.04
	7	1	1.83 0.03
	8	2	1.89 0.04
1442+101	1	4	1.81 0.02
	2	4	1.83 0.02
	3	4	1.72 0.03
	4	3	1.81 0.02

TABLE III (*continued*)

Source	Observing period	No. of transits	Flux density
	5	2	1.82 0.02
	6	4	1.65 0.03
	7	3	1.78 0.02
	8	5	1.70 0.02
1535+004	1	4	1.06 0.02
	2	3	0.87 0.01
	3	5	0.93 0.02
	4	4	0.84 0.01
	5	1	0.97 0.02
	6	1	0.92 0.02
	7	5	0.91 0.01
	8	2	0.90 0.02
1538+149	1	2	1.84 0.02
	2	1	1.56 0.02
	4	1	1.49 0.02
	5	2	1.48 0.05
	6	3	1.40 0.02
	7	2	1.44 0.03
	8	3	1.52 0.02
1600+335	1	2	2.56 0.04
	2	1	2.41 0.03
	3	2	2.41 0.02
	4	1	2.20 0.03
	5	2	2.09 0.05
	6	1	2.06 0.02
	7	1	1.98 0.03
	8	1	1.93 0.02
1602+014	1	1	2.01 0.03
	2	1	2.15 0.03
	3	1	2.08 0.03
	4	1	2.01 0.02
	5	1	2.07 0.03
	6	1	2.15 0.03
	7	1	2.17 0.02
	8	1	2.10 0.02
1901+319	1	8	3.18 0.03
	2	3	2.98 0.03
	3	5	3.12 0.04
	4	1	3.09 0.03
	5	4	3.15 0.05
	6	1	2.85 0.02
	7	4	2.95 0.05
	8	7	2.99 0.02
1914+302	1	8	1.59 0.01
	2	3	1.67 0.03
	3	4	1.58 0.08
	4	1	1.66 0.02
	5	1	1.69 0.02
	6	4	1.70 0.02
	7	4	1.67 0.04
	8	7	1.65 0.01
2050+363	1	6	4.35 0.03
	2	2	4.30 0.03
	3	1	4.19 0.04
	4	1	4.20 0.04
	5	1	4.43 0.03
	6	1	4.38 0.03
	7	1	4.28 0.03
	8	1	4.27 0.03
2113+293	1	1	0.93 0.02
	2	1	1.08 0.02
	3	1	1.10 0.02
	4	1	1.09 0.02
	5	1	1.09 0.02
	6	1	1.05 0.02
	7	2	0.90 0.02
	8	2	0.91 0.01
2223+210	1	4	1.87 0.02
	2	2	1.76 0.02
	3	1	1.79 0.02
	4	2	1.75 0.02
	5	1	1.74 0.02
	6	1	1.74 0.02
	7	1	1.72 0.02
	8	2	1.73 0.02
2234+282	1	5	1.11 0.05
	2	1	1.16 0.02
	3	1	1.02 0.02
	4	1	1.20 0.02
	5	1	0.99 0.02
	6	1	0.88 0.02
	7	3	0.82 0.02
	8	1	0.87 0.02
2318+049	1	1	1.28 0.03
	2	1	1.28 0.03
	4	3	1.32 0.03
	5	3	1.20 0.05
	6	3	1.11 0.03
	7	2	1.07 0.02
	8	2	1.14 0.01
2352+495	1	2	2.00 0.03
	2	1	2.12 0.03
	4	1	2.13 0.03
	5	2	2.17 0.04
	6	2	2.19 0.04
	7	1	2.12 0.02
	8	2	2.15 0.02
(b) Possibly variable sources			
0111+021	1	2	0.60 0.02
	2	3	0.57 0.03
	4	3	0.64 0.01
	5	3	0.60 0.04
	6	3	0.63 0.02
	7	2	0.65 0.01
	8	3	0.66 0.01
0134+329	1	1	8.87 0.07
	2	2	9.17 0.05
	3	1	8.34 0.08
	4	1	9.17 0.06
	5	1	9.30 0.08
	6	2	9.29 0.13
	7	2	9.09 0.08
	8	1	9.21 0.06
0218−021	1	2	1.65 0.02
	2	1	1.56 0.04
	3	1	1.75 0.04
	4	1	1.69 0.03
	5	1	1.60 0.03
	6	1	1.72 0.03
	7	3	1.64 0.02
	8	2	1.65 0.02
1005+077	1	2	3.64 0.04
	2	1	3.57 0.03
	3	2	3.55 0.03
	4	1	3.97 0.04
	5	1	3.54 0.03
	6	1	3.62 0.03
	7	1	3.48 0.03
	8	1	3.57 0.03
1049+215	1	1	1.03 0.03
	2	3	1.08 0.02
	3	5	1.06 0.04
	4	4	1.02 0.03
	5	3	1.00 0.01
	6	5	1.00 0.02
	7	3	0.98 0.02
	8	1	0.96 0.02
1055+201	2	2	1.42 0.06
	3	3	1.49 0.02
	4	2	1.45 0.01

TABLE III (*continued*)

Source	Observing period	No. of transits	Flux density
	6	2	1.49 0.02
	7	1	1.55 0.02
	8	1	1.55 0.02
1059–010	1	1	1.52 0.05
	2	1	1.33 0.03
	3	2	1.37 0.04
	4	1	1.36 0.03
	5	1	1.22 0.03
	6	2	1.32 0.02
	7	2	1.32 0.02
	8	1	1.33 0.03
1117+146	1	2	1.53 0.11
	2	1	1.63 0.02
	3	1	1.53 0.03
	4	1	1.59 0.02
	5	1	1.64 0.02
	6	1	1.52 0.02
	7	1	1.57 0.02
	8	1	1.55 0.02
2314+038	1	3	2.30 0.03
	2	3	2.21 0.04
	3	3	2.21 0.10
	4	4	2.26 0.04
	5	3	2.40 0.03
	6	5	2.32 0.09
	7	3	2.30 0.01
	8	3	2.27 0.03

the nonvariable sources. The distributions in Fig. 2 indicate that our errors may be underestimated by ~20%, *if there are no real low-level variable sources with x^2 values below the cutoffs shown.* Figure 3 shows the distribution of the statistic $(S_i - \overline{S})/\sigma_i$ for a sample of apparently nonvariable sources. This distribution should be essentially normal with zero mean and unit variance, if our error estimates are generally correct. Sources were included in this sample if no more than one observation was sufficiently discrepant from the mean to be rejected by Chauvenet's criterion. The resulting distribution indicates that our errors may be *over*estimated by ~20%, but the distribution has probably been overtruncated.

We conclude from these tests that our error estimates are statistically correct to within 20% *in the error*. An increase of 20% in the assigned errors would not greatly alter the results presented in Table II; of the sources included in Fig. 2, 13 would be changed from possibly variable to nonvariable, five from variable to nonvariable, and two would be changed from variable to possibly variable.

The tests discussed above are not, of course, independent and exclusion of "possibly variable sources" from both of them also prevents them from detecting *occasional* large unaccounted-for errors. Our conservatism in discarding isolated large contributions to x^2 derived from single transits should however give us some protection against drawing false conclusions from occasional large errors.

The 41 sources designated "variable" or "possibly variable" in column 4 of Table II but which have no accompanying reference in column 8 have not previously been considered variable. Table III gives our flux densities from the individual observing periods for these sources and for sources for which other observations indicating variability have not been published. The corresponding data for other sources are available from the authors on request.

Repeated observations with a large transit telescope have shown 92 of the 365 sources monitored to be variable and 16 sources to be possibly variable within the 2-yr time scale of this program. In Paper III we show that a significant number of sources without strong centimeter-wavelength components has been found to vary. The small amplitudes of their variations at 2.7 GHz can be matched by the precision with which flux densities are measurable at this frequency, even with a relatively short observing time devoted to each source.

The implications of the results presented in Table II are discussed fully in Paper III.

ACKNOWLEDGMENTS

We thank the NRAO for allocating observing time to this project, and the operators of the 300-ft telescope for their excellent work. This research was supported by grants to M.J.L.K. and to A.H.B. from the National Research Council of Canada.

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