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CAMC
CAMC1-11
CCDM
CD
CNS3

FK5

FIFTH FUNDAMENTAL CATALOGUE

Fricke W., Schwan H., Lederle T. in collaboration with Bastian U., Bien R., Burkhardt G., du Mont B., Hering R., Jährling R., Jahreiß H., Röser S., Schwerdtfeger H.M., Walter H.G., 1988, Fifth Fundamental Catalogue (FK5). Part I. The Basic Fundamental Stars, *Veröff. Astron. Rechen-Inst. Heidelberg,* **32**, 106 pgs

Warren W.H. Jr, 1990, *Fifth Fundamental Catalogue (FK5). Part I. Basic Fundamental Stars (Fricke, Schwan & Lederle 1988).* **Documentation for the Machine-readable Version,** *NSSDC/WDC-A-R&S* 90-01, 20 pgs

Name	Equinox	d zone	N_rec	N_var	RecL	Objects	Type	CDS id.	Band
FK5	2000	all sky	1,535	20	149	Stars	Astrometric	1149A	Optical

The Fifth Fundamental Catalogue consists of two parts, which are given in separate publications. **The present catalogue, which may be referred to by the abbreviation** *Basic FK5,* **is the successor of the** FK4 **(Fricke et al. 1963) and provides mean positions and proper motions for the classical 1535 fundamental stars used to define the FK4 system, and already included in the FK4 and FK3 (Kopff 1937-38).** It represents a revision of the FK4 and results from the determination of systematic and individual corrections to the mean positions and proper motions of the FK4, the elimination of the error in the FK4 equinox, and the introduction of the IAU(1976) system of astronomical constants. About 300 catalogues providing star positions obtained from throughout the world are included in the Basic FK5.

The second part of the FK5, named *FK5 Extension* (FK5E, Fricke et al. 1991), gives the mean positions and proper motions for 3117 new fundamental stars, in the magnitude range 5.5 to about 9.7, selected from the FK4 Supplement (FK4S, Fricke 1963) and from the list of International Reference Stars (IRS, Corbin 1991), essentially on the basis of their history of observation. These stars are given in a separate publication, mainly because the accuracy of their positions and proper motions is significantly inferior to those of the basic fundamental stars. The new fundamental stars should represent the FK5 system as well as possible, although they have not contributed to the construction of the system.

The system of the FK5 is based on absolute and quasi-absolute catalogues with mean epochs later than 1900; these consist of about 85 catalogues giving observations from 1900 to about 1980. The observations presented in these catalogues were made with meridian circles, vertical circles, transit instruments, and astrolabes. The mean errors of the systems of positions (0.019") and proper motions (0.0007"/year) of the Basic FK5 have been estimated from the dispersion of the

systems of the individual absolute and quasi-absolute catalogues about the mean system. The major changes involved in the transition from the FK4 to FK5 are as follows:

a. The determination of systematic and individual corrections to the mean positions and proper motions of the FK4, computed on the mean equinox and equator B1950.0, and still using Newcomb's constant of precession. The new values for the precessional quantities were introduced within the transformation of the mean positions and proper motions from B1950.0 to J2000.0 (Lieske et al. 1977).

b. The elimination of the error in the FK4 equinox, as shown by Fricke (1982).

c. The introduction of the IAU(1976) System of Astronomical Constants (see *Trans. IAU*, 1977, **XVIB**, 52-67).

DIRA2 catalogue format			
Code	Column	Format	Description

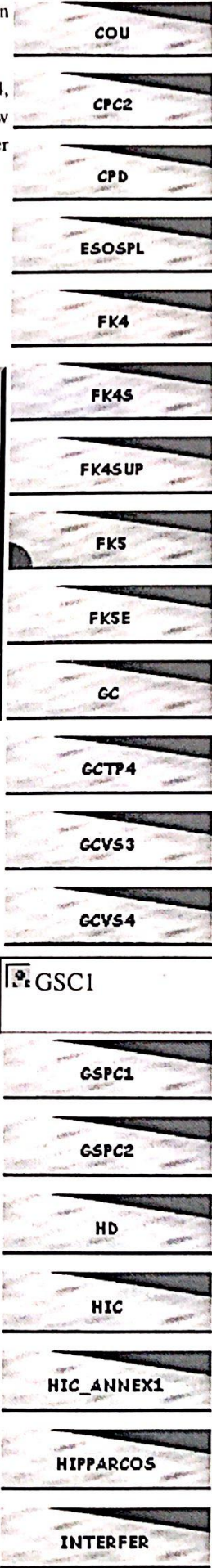U N D E R   C O N S T R U C T I O N

APPENDICES

A.

Motivation for the Construction of the FK5.

Shortly after the publication of the FK4, one became aware of considerable deficiencies in this catalogue, and initiated the plan for constructing a new fundamental catalogue. In particular, the following shortcomings in the FK4 should be mentioned:

↓ Large systematic errors in the FK4 right ascensions were detected first by observations made in Chile from 1962 onwards.

↓ The accidental errors in the mean positions and proper motions of the southern FK4 stars are considerable in comparison with the accuracy of modern meridian observations: the average mean error of the FK4 positions south of -30°, for instance, is about ±0.18" at the epoch 1975.

↓ The star density in the FK4 is rather low (about one star per 25 square degree) and the apparent magnitudes are rather bright; only about 200 of the 1535 FK4 stars are fainter than magnitude six.

↓ A time-dependent error in the position of the equinox as defined by the right ascensions of the FK4 stars was detected.

↓ Improved values for the expressions of general precession have become available and should be introduced in the new fundamental catalogue.

The elimination of these shortcomings in the FK4 comprised the essential sub-tasks in the construction of the FK5. It is to be mentioned that the changes involved in the transition from the FK4 to the FK5 are large compared with the transition from the FK3 to the FK4.

COU
CPC2
CPD
ESOSPL
FK4
FK4S
FK4SUP
FK5
FKSE
GC
GCTP4
GCVS3
GCVS4
GSC1
GSPC1
GSPC2
HD
HIC
HIC_ANNEX1
HIPPARCOS
INTERFER

B. The Equinox and Equator of the FK5.

The positions and proper motions of the stars in a fundamental catalogue define implicitly the zero points of the right ascensions and declinations in the catalogue, which should coincide as well as possible with the mean equinox and equator as defined by the dynamics of the planetary system. It has been shown by Fricke (1982) that the FK4 zero point in right ascension deviates significantly from the dynamical equinox, and he has derived the following correction E(T) to the FK4 zero point:

$$E(T) = +0.035^s +0.0085^s(T - 19.50)$$

At the epoch 1950, the FK4 right ascensions have therefore to be increased by $+0.035^s$, and the FK4 proper motions in right ascension by $+0.085^s$/cy.

C. Determination of Individual Corrections to the Positions and Proper Motions of the Fundamental Stars.

Individual corrections to the positions and proper motions of the FK4 stars have been determined from all observations which have become available since the completion of the FK4. This method is essentially the same as that applied earlier in the formation of the FK4. About 90 catalogues have become available for the individual improvement of the FK4 and were reduced to the FK4 system by determining and eliminating the systematic differences Cat-FK4. The residuals, which were obtained within this reduction, form the basic material for the derivation of the individual corrections to the FK4 positions and proper motions.

D. Systematic Differences FK5-FK4.

The systematic differences FK5-FK4 in positions and proper motions (presented in the printed version on pages 86 to 90) have been derived by making use of the analytical method developed by Schwan (1983) which yields these differences primarily in the form of series developments. The coefficients and the tabular values hold for the mean epoch and equinox B1950.0, which has been chosen since most of the reductions have recently been made on this equinox. In addition, the mean epoch of the FK5 system is - for large parts of the sky - near enough to 1950, so that the systematic corrections to the positions for that epoch contain only a small part of the proper motion corrections.

The systematic differences represent regional errors in the FK4 and, therefore, the corrections to the FK4 equinox and its fictitious motion (**see appendix B**), as well as the changes which have become necessary with the introduction of the IAU(1976) System of Astronomical Constants, are not included in these values.

E. Transformation of Observational Catalogues to the FK5 System and Transition to J2000.0.

The problem of transforming positions and proper motions from the FK4 to the FK5 system, and the transition to J2000.0, has been discussed in the recent years in various papers by different authors. At present, there exists, however, no commonly adopted procedure which can be applied to the various types of observations given in existing catalogues. In general, a detailed study of the data given in a catalogue is necessary in order to find the most appropriate procedure of transformation for each particular catalogue. The following procedure may be applied for

IRAS2

IRS

LANDOLT92

LHS

NED

NGP9

NGPFG

NLTT

NPM1

NPM1G

ORBITE

PERTH70

PERTH75

PERTH83

PLEIADES

POSS1

PPM

PPMBS

PPMSUP

RC3

RVBSS

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