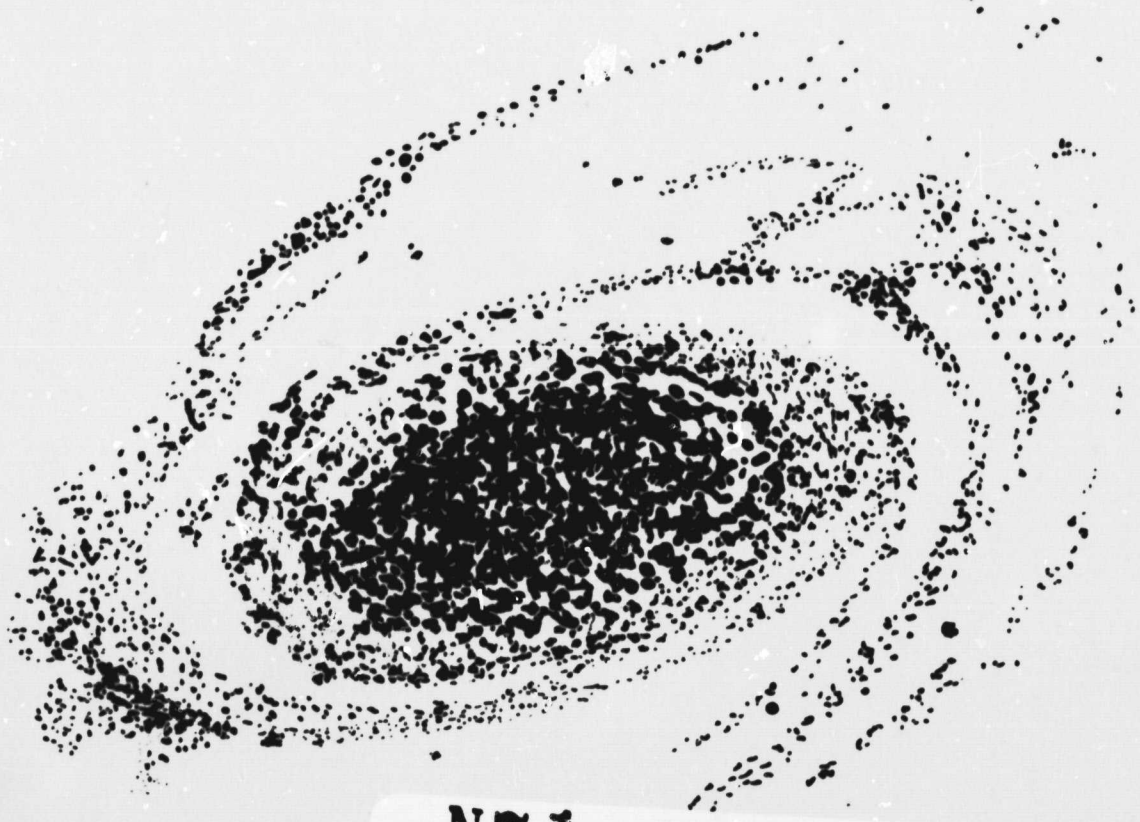
COMPARISON OF THE SAO STAR CATALOG WITH CAPE CATALOGUES FROM -64° to -90°

K. HARAMUNDANIS



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ABSTRACT

A comparison of the positions and proper motions of the SAO Star Catalog with new observations in the region of the south celestial pole indicates that the SAO data appear to contain systematic deviations that are source dependent. Data are tabulated for the epoch 1950.0.

RÉSUMÉ

Une comparaison entre les positions et propres mouvements du Catalogue d'Étoiles du SAO et les observations nouvelles dans la région du pôle céleste sud montre que les données du SAO semblent comporter des déviations systématiques qui dépendent de la source. Les données sont disposées en forme de table pour l'époque 1950.0.

КОНСПЕКТ

Сравнение положений и надлежащих скоростей звездного каталога САО с новыми наблюдениями в области южного небесного полюса указывает на то что данные САО кажется содержут систематические отклонения, являющиеся зависящими от источника. Расположены в виде таблиц данные за период 1950.0.

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To improve the coverage and increase the accuracy of its Star Catalog (Staff, Smithsonian Astrophysical Observatory, 1966) in the sky south of -64°, the Smithsonian Astrophysical Observatory acquired the latest catalogs prepared by the Cape Observatory (1966, 1968). The Cape Catalogue for the region -64° to -80° was obtained on magnetic tape from the U. S. Naval Observatory, and that for the region -80° to -90°, on microfilm from the Cape Observatory.

Both the Cape Catalogues were "approximately in the system of the FK 3" (Cape Observatory, 1966) when acquired. We reduced them to the system of the FK 4 by using the tables given in the latter (Fricke and Kopff, 1963) at epoch 1950.0. We then prepared comparison data lists using the Smithsonian Astrophysical Observatory Catalog (SAOC); each contained stars from one of the following catalogs: Melbourne 4 (Me 4), the Albany General Catalogue (GC), Cape Annals volume 20 (Cape 20), and the FK 4. Altogether, 4672 stars from the various catalogs could be compared with their counterparts in the newer Cape catalogs (see Table 1).

In the FK 4 system at epoch 1950.0, the difference between each pair of stars was computed; and from these differences, averages and variances were calculated for every 6 hours of right ascension and 10 degrees of declination. From these computations, the data in Tables 2 to 5 were prepared. To illustrate the existing systematic deviations, Figures 1 to 6 show polygons for each area. These results seem to confirm the suggestion of Scott and Smith (1967) that positional errors in the SAOC are source dependent.

This work was supported in part by grant NGR 09-015-002 from the National Aeronautics and Space Administration.

We selected zones that seemed most appropriate for the computation of the tabular material. Data in the tables are given to 0.″01, and in the figures, to 1″. The variance in right ascension (α) for the solution for each area is computed from the formula

$$\text{var} = \sum_{i=1}^{n} \frac{(\Delta\alpha_i - \overline{\Delta\alpha})^2}{n(n-1)} \quad ,$$

where $\overline{\Delta\alpha}$ is the mean of all the differences (SAOC − Cape) in the area, $\Delta\alpha_i$ is the difference for each i (star), and n is the number of stars in the zone. A similar formula applies for the other parameters: declination (δ), proper motion in right ascension (μ), and proper motion in declination (μ′). The data for proper motion are all centennial.

Errors bars based on the standard deviations in the source catalogs are indicated in the figures. These bars represent the combined errors of both position and proper motion at epoch 1950.0.

The correlation of the positional systematic deviation with the deviation in proper motion for the Me 4 catalog seems clear evidence that the effect in this case is directly caused by the uncorrected motions.

I am indebted to Miss Jean Hsiung for her assistance in writing some of the programs associated with this task, and to Dr. F. P. Scott for helpful suggestions.

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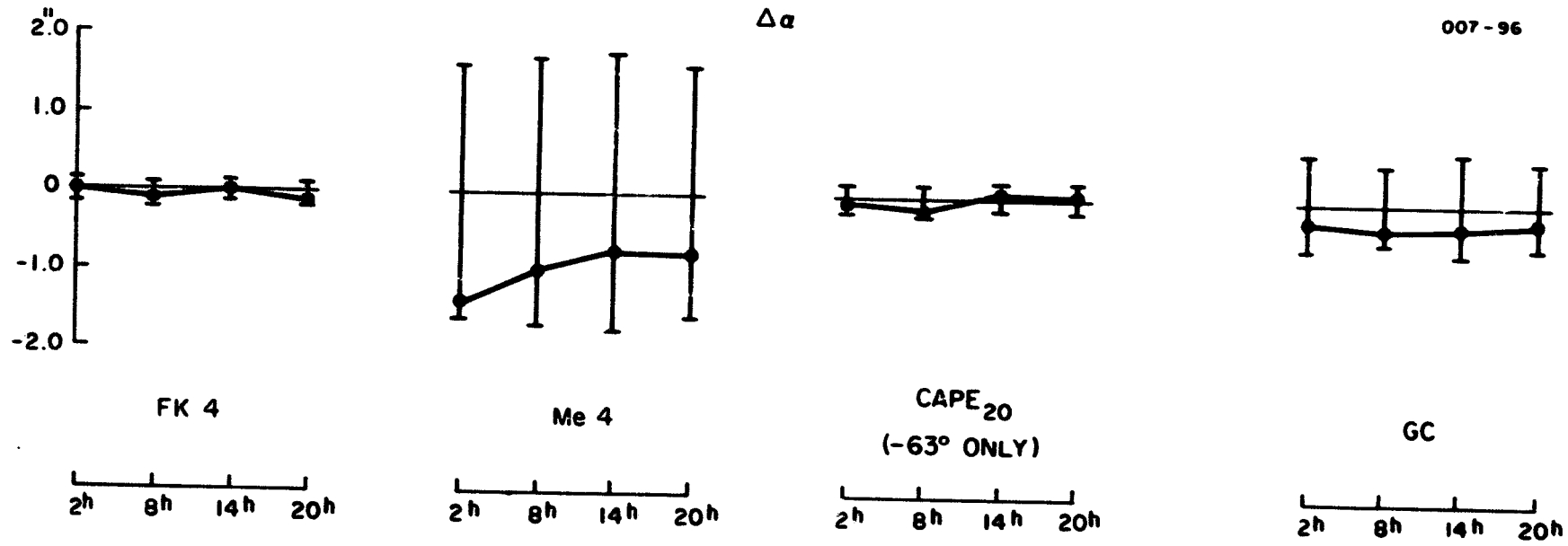

Figure 1. Systematic deviations in right ascension and centennial proper motion in right ascension for the zone -63° to -73°. Data from Cape 20 are from -63° only.

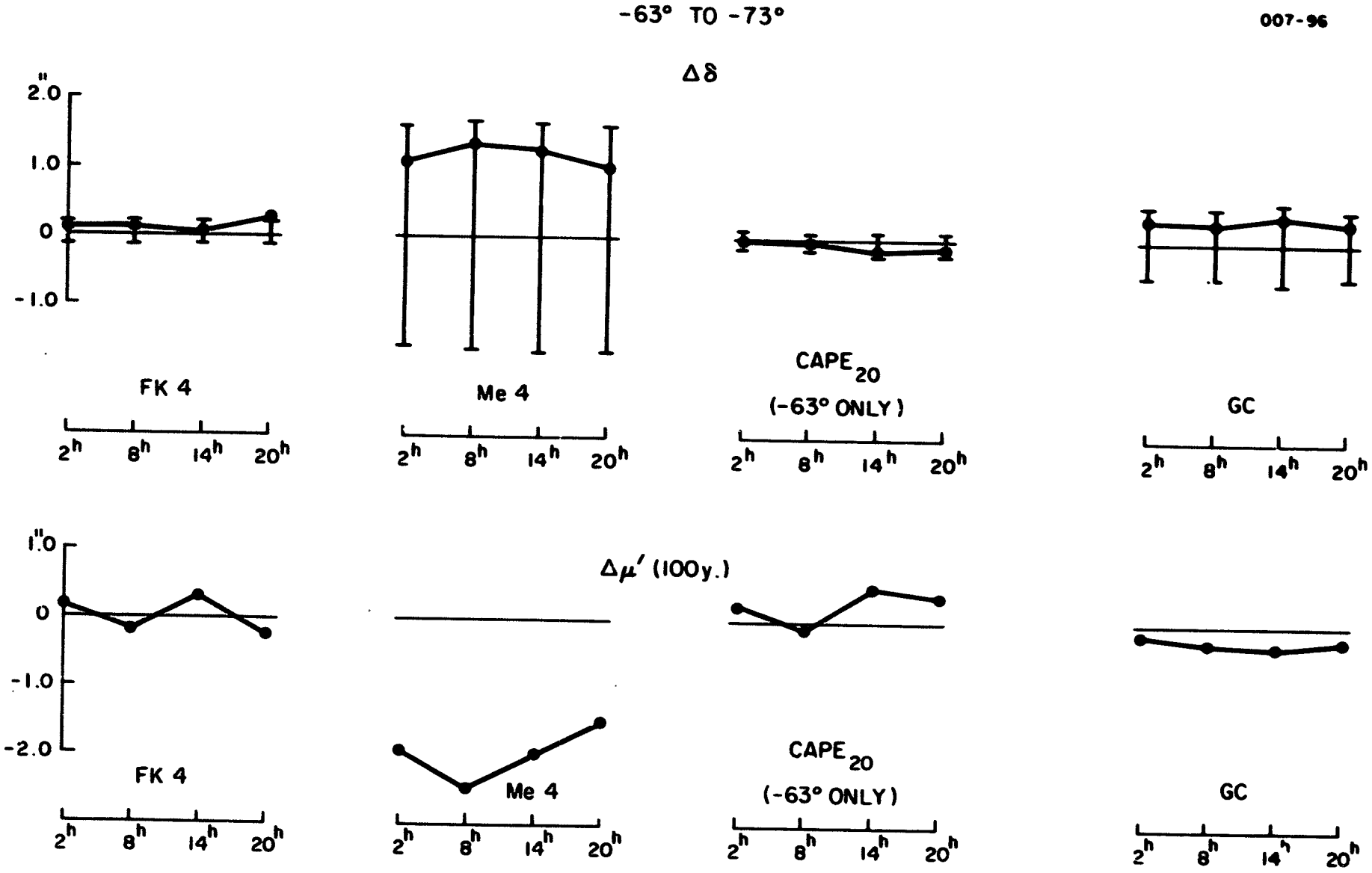

Figure 2. Systematic deviations in declination and centennial proper motion in declination for the zone -63° to -73°. Data from Cape 20 are from -63° only.

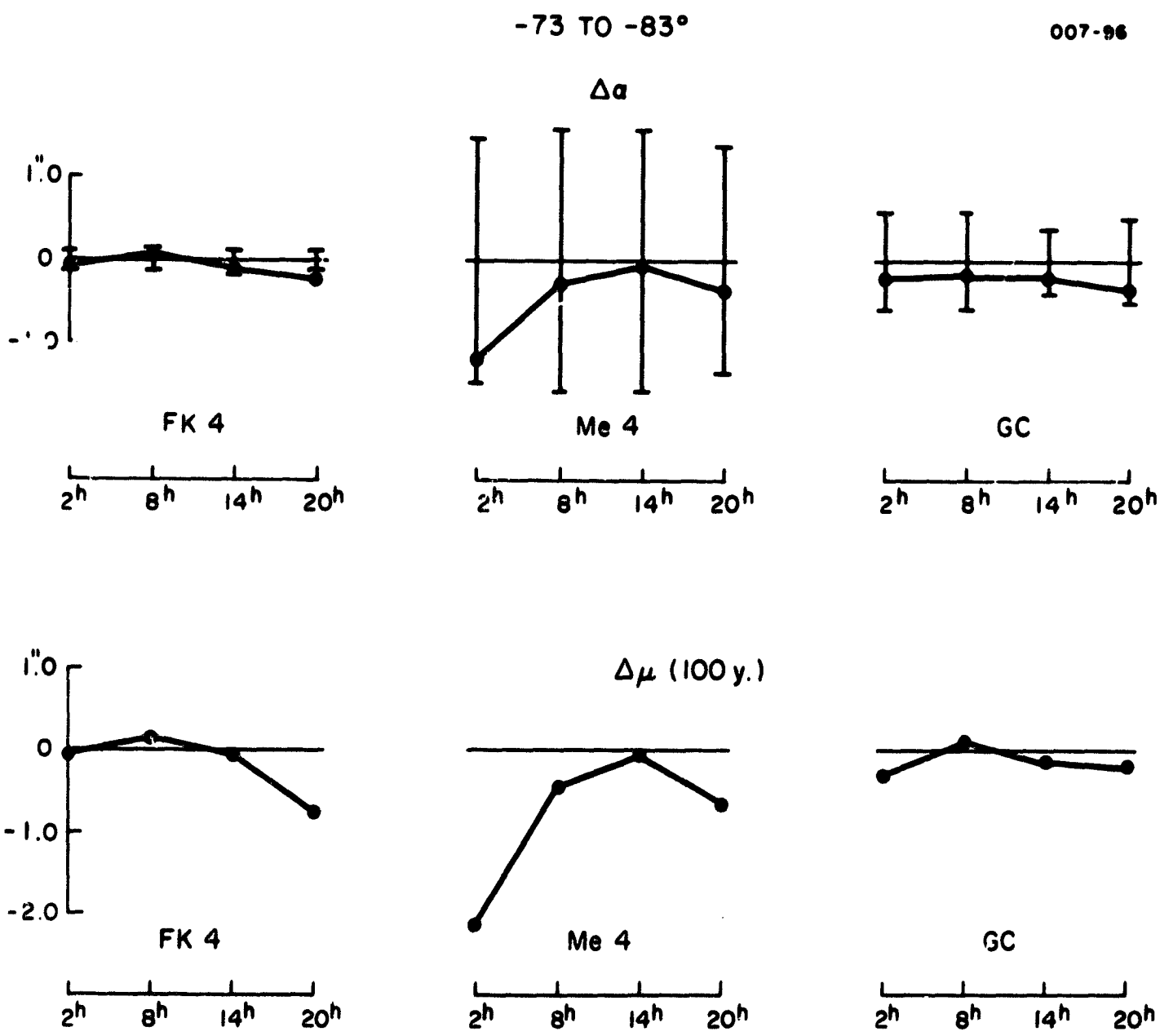

Figure 3. Systematic deviations in right ascension and centennial proper motion in right ascension for the zone -73° to -83°.

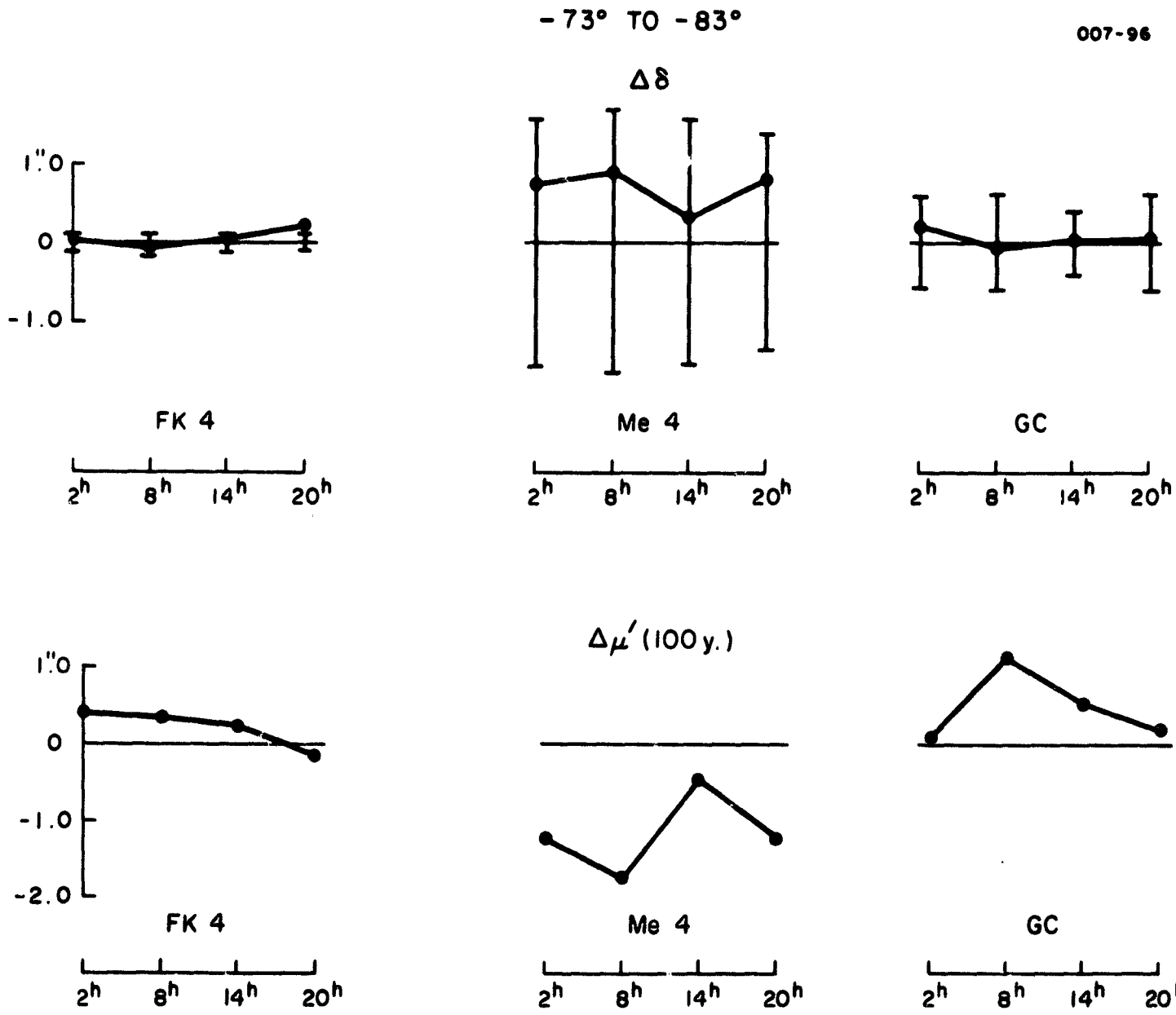

Figure 4. Systematic deviations in declination and centennial proper motion in declination for the zone -73° to -83°.

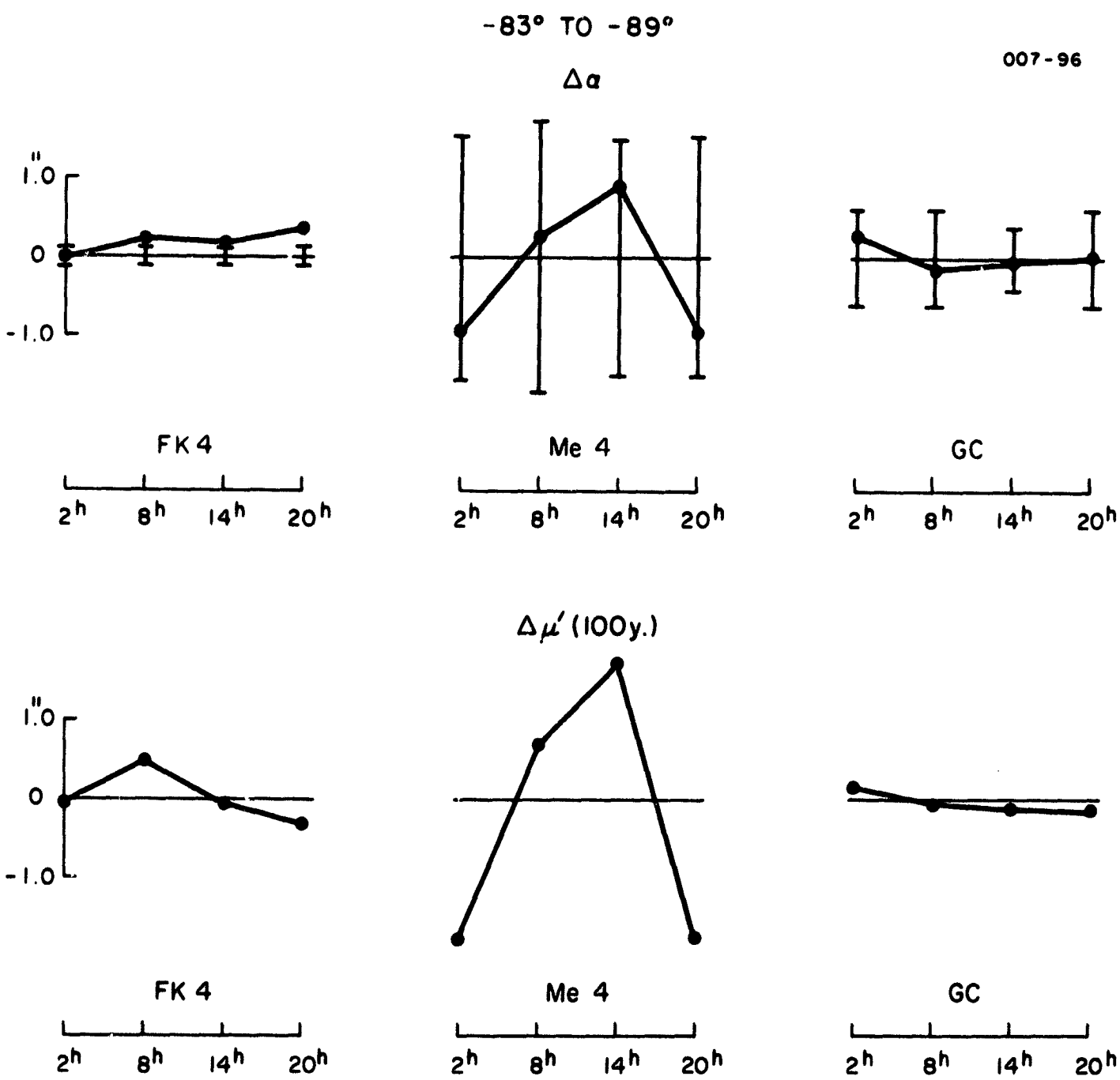

Figure 5. Systematic deviations in right ascension and centennial proper motion in right ascension for the zone -83° to -89°.

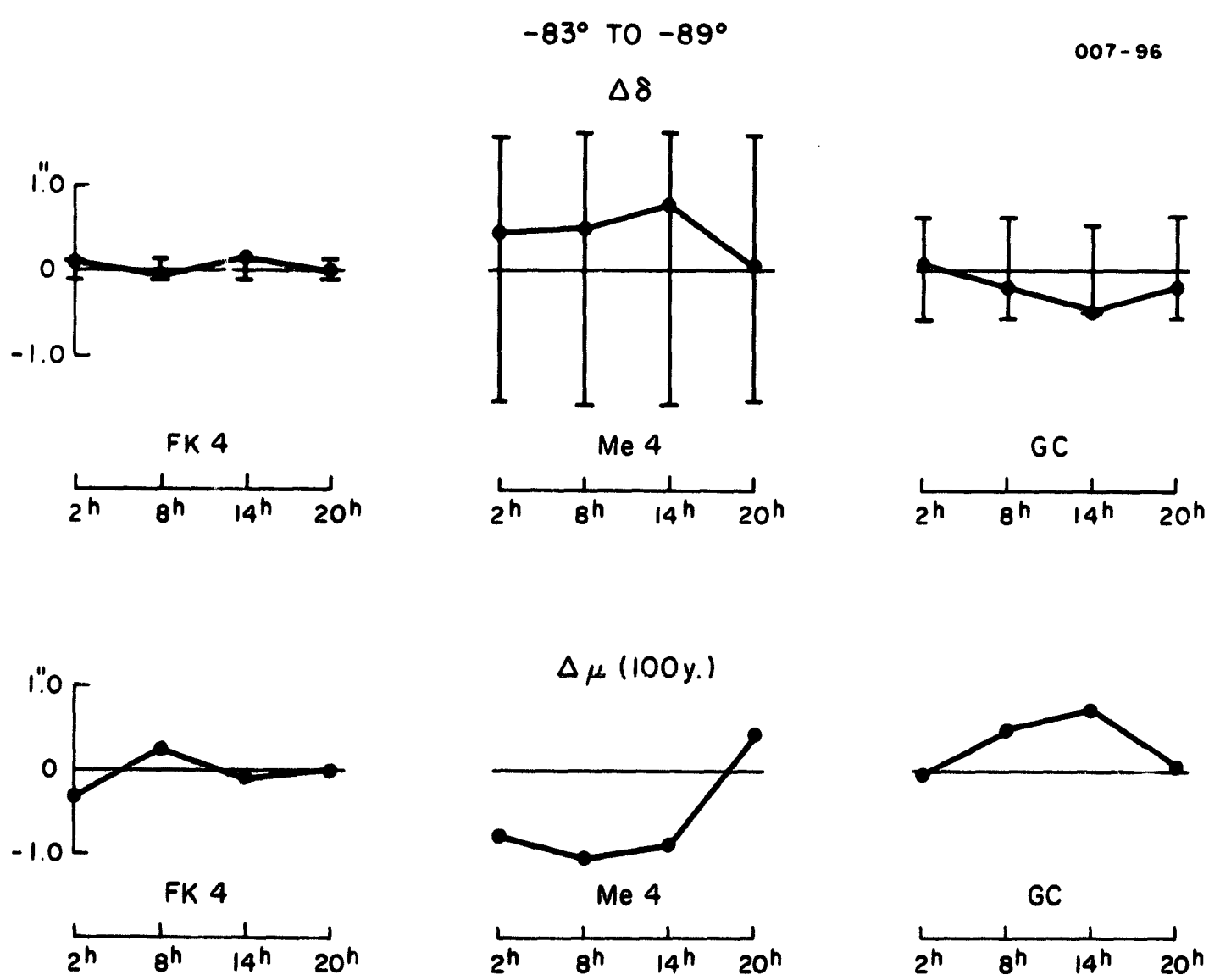

Figure 6. Systematic deviations in declination and centennial proper motion in declination for the zone -83° to -89°.

Table 1. Number of stars from each source catalog compared with newest Cape catalog, center of zone of α given.

Catalog α	2^h	8^h	14^h	20^h	Σ
FK 4	26	27	24	23	100
Me 4	625	568	584	598	2375
Cape 20	41	53	83	57	234
GC	459	550	503	451	1963
					Σ′ = 4672

Table 2. $SAOC_{FK\,4}$ − Cape. *

α center	2^h	8^h	14^h	20^h	var	
		Zone: -63° to -73°				
$\Delta\alpha$	- 0	-12	1	-11	16	
$\Delta\delta$	13	13	7	25	21	
$\Delta\mu$	11	- 5	26	2	21	
$\Delta\mu'$	18	-18	31	-24	121	
n_α	10	11	11	11		Σ = 43
		Zone: -73° to -83°				
$\Delta\alpha$	- 8	8	-10	-22	21	
$\Delta\delta$	5	- 8	6	21	21	
$\Delta\mu$	- 2	18	- 5	-77	484	
$\Delta\mu'$	40	38	23	-15	256	
n_α	11	9	8	8		Σ = 36
		Zone: -83° to -89°				
$\Delta\alpha$	- 0	22	17	-36	484	
$\Delta\delta$	11	- 9	15	- 2	100	
$\Delta\mu$	- 3	50	- 6	-30	841	
$\Delta\mu'$	-30	29	-10	0	441	
n_α	5	7	5	4		Σ = 21
Σn_α	26	27	24	23		Σ' = 100

*Unit = 0!"01; $\Delta\mu$, $\Delta\mu'$ = centennial.

Table 3. $SAOC_{Me\ 4}$ − Cape.*

α center	2^h	8^h	14^h	20^h	var	
		Zone: -63° to -73°				
$\Delta\alpha$	-144	- 98	- 74	- 75	40	
$\Delta\delta$	110	137	127	101	40	
$\Delta\mu$	-225	-147	-103	-132	40	
$\Delta\mu'$	-191	-247	-199	-147	90	
n_α	368	329	334			Σ = 1390
		Zone: -73° to -83°				
$\Delta\alpha$	-119	- 27	- 3	- 36	40	
$\Delta\delta$	76	95	35	84	40	
$\Delta\mu$	-211	- 42	- 3	- 67	40	
$\Delta\mu'$	-123	-172	- 42	-121	90	
n_α	218	204	221	203		Σ = 846
		Zone: -83° to -89°				
$\Delta\alpha$	- 93	29	91	- 93	140	
$\Delta\delta$	45	47	79	1	50	
$\Delta\mu$	-176	70	175	-172	480	
$\Delta\mu'$	- 77	-102	- 87	43	120	
n_α	39	35	29	36		Σ = 139
Σn_α	625	568	584	598		Σ' = 2375

*Unit = 0".01; $\Delta\mu$, $\Delta\mu'$ = centennial.

Table 4. $SAOC_{Cape\ 20} - Cape.$ *

α center	2^h	8^h	14^h	20^h	var	
		Zone: -63°				
$\Delta\alpha$	- 9	-16	7	4	10	
$\Delta\delta$	- 1	- 2	-17	-12	10	
$\Delta\mu$	-52	-34	13	4	90	
$\Delta\mu'$	23	-10	50	39	90	
n_α	41	53	83	57		$\Sigma = 234$

*Unit = 0!!01 ; $\Delta\mu$, $\Delta\mu'$ = centennial.

Table 5. $SAOC_{GC}$ − Cape.*

α center	2^h	8^h	14^h	20^h	var	
		Zone: -63° to -73°				
$\Delta\alpha$	- 22	- 32	- 28	- 22	02	
$\Delta\delta$	34	30	41	31	02	
$\Delta\mu$	- 48	- 61	- 14	- 20	03	
$\Delta\mu'$	- 14	- 26	- 30	- 21	00	
n_α	251	347	349	260		Σ = 1207
		Zone: -73° to -83°				
$\Delta\alpha$	- 20	- 14	- 19	- 32	03	
$\Delta\delta$	23	- 6	2	6	02	
$\Delta\mu$	- 27	14	- 10	- 16	04	
$\Delta\mu'$	6	114	54	20	19	
n_α	173	184	131	161		Σ = 649
		Zone: -83° to -89°				
$\Delta\alpha$	30	- 13	- 2	2	100	
$\Delta\delta$	3	- 24	- 50	- 22	150	
$\Delta\mu$	19	- 5	- 10	- 12	130	
$\Delta\mu'$	- 4	48	72	2	360	
n_α	35	19	23	30		Σ = 107
Σn_α	459	550	503	451		Σ' = 1963

*Unit = 0".01; $\Delta\mu$, $\Delta\mu'$ = centennial.

BIOGRAPHICAL NOTE

Mrs. Haramundanis received her B.A. from Swarthmore College in 1958 and was a research assistant in the Radio Astronomy Laboratory at the Berkeley campus of the University of California before joining SAO in 1958.

While at SAO she has been an astrometric technician and supervisor. She has supervised the SAO Star Catalog and SAO Star Charts and is currently Section Head of Data Reduction for SAO's Project Celescope.

Coauthor of an undergraduate textbook in astronomy, she is working toward a degree in astronomy at Boston University.