4.3. THE POLAR MOTION DERIVED FROM BOTH TIME AND LATITUDE OBSERVATIONS

SIGETUGU TAKAGI
(International Latitude Observatory, Mizusawa, Japan)

ABSTRACT

The coordinates of the pole were derived from both time and latitude observations made at eight observatories from 1962 to 1964. The differences between these results and the ILS results show an annual variation. After removal of this term the standard deviation is about $\pm 0\overset{''}{.}03$ for the x- and y-components. Corrections to the adopted longitudes and latitudes are obtained and these agree closely with those obtained by the BIH.

RÉSUMÉ

On a déduit les coordonnées du pôle simultanément des observations de temps et de latitude faites par huit observatoires de 1962 à 1964. La différence entre les résultats obtenus et ceux du SIL montre une variation annuelle. Après correction pour ce terme, la moyenne quadratique des différences est environ $0\overset{''}{.}03$ pour les coordonnées x et y. On obtient des corrections aux longitudes et latitudes adoptées qui concordent bien avec celles obtenues par le BIH.

1. We have attempted to derive the polar motion by making use of time and latitude observations simultaneously. We used the observations made with modern instruments, PZT and astrolabe, from 1962·0 to 1964·5 at eight observatories: Mizusawa, Tokyo, Paris, Greenwich, Alger, Neuchâtel, Washington, and Richmond.

2. The times observed are reduced to the atomic time system of A.1. The times observed at Greenwich and Paris are reduced to the A.1 system by the comparison between the standard clocks and the A.1 system, published in the Bulletins of the observatories. Those of other observatories are reduced to the A.1 system by using the results of the reception of the time signals.

3. The results of the observations made each year were divided into twelve groups by taking the monthly mean. The first nominal epoch of the monthly-mean date is 1962·0. The results were treated by methods of the modern theory of statistics. The weight of the results of every clear night is taken as unity. The weight is usually taken as the number of stars observed, but in the case where there are few observations the weight thus defined often makes skew the apparent distribution of data over the interval considered. The mean date of the monthly mean is made as near as possible to the nominal date within a range of ± 3 days, in order to avoid a

Markowitz and Guinot (eds.), Continental Drift, 77–79. © *I.A.U.*

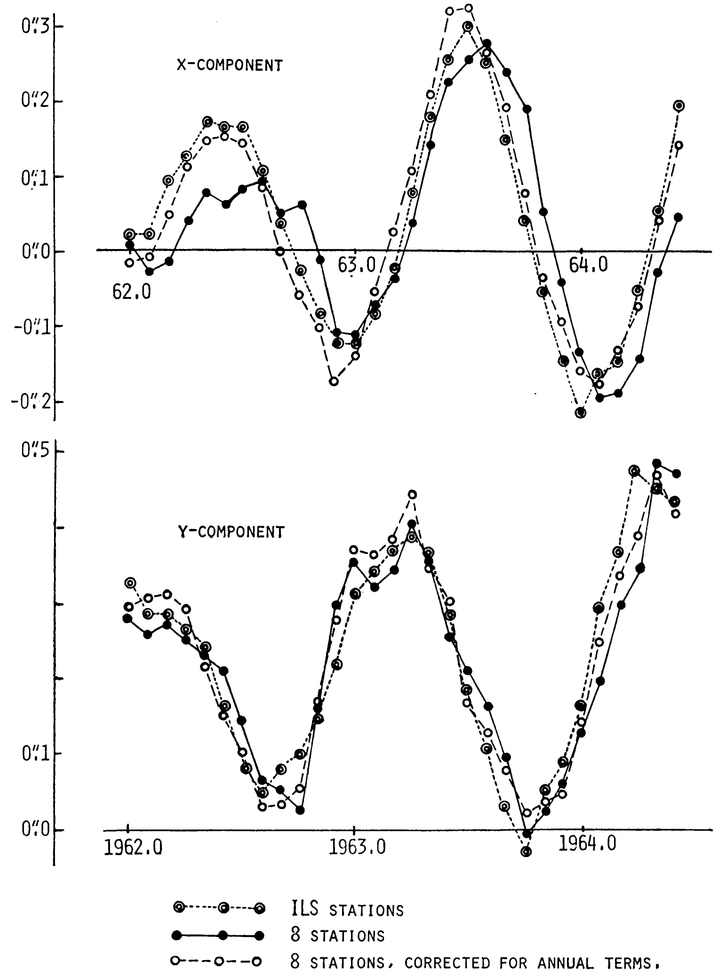

FIG. 1. *Coordinates of the pole derived from time and latitude observations and derived from ILS observations.*

timing error in the analysis. However, in some cases we had to obtain the data by means of interpolation.

4. The data obtained as above are combined to derive the coordinates of the pole by the following equations

$$\Delta\varphi = x \cos\lambda + y \sin\lambda + z$$
$$\Delta T = (x \sin\lambda - y \cos\lambda) \tan\varphi + s\,.$$

The coordinates are shown in Figure 1 together with those of the ILS. The difference

https://doi.org/10.1017/S0074180900019331 Published online by Cambridge University Press

between the coordinates in this paper and those of the ILS seems to be large and show an annual variation. After removal of the annual term from the differences, the standard deviations between the two coordinates are given as follows:

$$x\text{-component} \quad \pm 0''\!.031$$
$$y\text{-component} \quad \pm .''032.$$

The annual term may be chiefly due to a difference in the star catalogs used.

5. The coordinates of the mean pole in the period from 1962·0 to 1964·5 are determined with respect to both BIH and ILS system and are as follows.

BIH system	ILS system
$x = +\,''\!.0684$	$x = +\,''\!.0209$
$y = +\,''\!.0622$	$y = -\,''\!.1593.$

The BIH mean pole with respect to the ILS system in the same period is

$$x = -\,''\!.0475$$
$$y = -\,''\!.2215.$$

The coordinates given in this paper are reduced to the BIH system. The mean pole given above is rather different from that of the BIH. This suggests that the time system and the latitude system adopted do not have the same reference system.

The corrections to the longitude and latitude of the observatories have been obtained above with respect to the BIH system. These are shown in Table 1, together with the corrections which are given annually in the Bulletins of the BIH. They are reduced to the conventional longitude system of 1962 and to the mean of the ten observatories which are not influenced by the polar motion.

It is interesting that in general the longitude values of this paper and those of the BIH (1962–63) agree well for the American and Asian stations. We cannot be sure of the variations in these values for a long interval. It is supposed that the difference in the y-component of the mean pole causes a discrepancy.

Table 1

Station	Latitude	Longitude		
		This paper	BIH (1958–61)	BIH (1962–63)
Washington	$+\,''\!.0220$	$+\,^{s}\!.0040$	$+\,^{s}\!.0141$	$+\,^{s}\!.0039$
Richmond	$+\,''\!.0857$	$+\,^{s}\!.0068$	—	$+\,^{s}\!.0083$
Tokyo	$+\,''\!.0193$	$-\,^{s}\!.0086$	$-\,^{s}\!.0010$	$-\,^{s}\!.0028$
Paris	$-\,''\!.0216$	$+\,^{s}\!.0038$	$+\,^{s}\!.0043$	$-\,^{s}\!.0023$
Greenwich	$-\,''\!.0091$	$+\,^{s}\!.0107$	$+\,^{s}\!.0044$	$+\,^{s}\!.0009$
Mizusawa	$-\,''\!.0173$	$-\,^{s}\!.0134$	$-\,^{s}\!.0041$	$-\,^{s}\!.0135$
Neuchâtel	$-\,''\!.0224$	$-\,^{s}\!.0005$	$+\,^{s}\!.0040$	$-\,^{s}\!.0065$
Alger	$-\,''\!.1423$	$-\,^{s}\!.0021$	$-\,^{s}\!.0090$	$-\,^{s}\!.0147$

https://doi.org/10.1017/S0074180900019331 Published online by Cambridge University Press