19. COMMISSION DE LA VARIATION DES LATITUDES

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GENERAL REMARKS

The period of this report is notable for a considerable expansion in and change of the latitude work.

First, the total number of latitude observatories has been considerably increased and now exceeds thirty. Though the immediate purpose of some of the new latitude stations is to participate in the International Geophysical Year, it is believed that most of them will continue their work as permanent stations after the I.G.Y. is over. Up to the present the geographical location of latitude stations has been far from satisfactory: there were two groups of efficient stations—the European and the American ones—and only the one station of Mizusawa in the East Asiatic region. Now the PZT at Tokyo has been put into service and three new stations are being built in this region, namely: Irkutsk, Blagoveschensk and Tientsin. Also a fairly uniform set of Danjon astrolabes is to be placed round the Earth.

Secondly, in addition to ordinary zenith telescopes new instruments have been put in practice on an extensive scale. Though it is difficult to predict the exact number of instruments of each type which will be in operation by the time of the Moscow General Assembly, an approximate estimation is possible giving:

Zenith telescopes of aperture up to 135 mm	15
Zenith telescopes of 180 mm aperture	7
Photographic zenith tubes	10
Danjon Astrolabes	16
Instruments of other types	2

Thirdly, several observatories have organized concurrent latitude observations with two, or even three, instruments. Such observations are of special importance for they are likely to provide one of the most promising means of investigating the still obscure problem of the origin of non-polar latitude variation.

Lastly, in accordance with the recommendations of the last I.A.U. General Assembly a supplementary latitude service, the so-called Rapid Service, has been established. The most important feature of this Service is that, in computing the polar co-ordinates, it takes into account observations from stations of different latitudes observing different stars.

OBSERVATIONS

International Latitude Stations

Five International Latitude Stations on the 39° 08′ north parallel continued observations according to the new programme of January 1955.

Carloforte, Sardinia. During the period from 6 January 1955 to 6 July 1957 a total of 4307 observations were obtained.

Gaithersburg, Maryland, U.S.A. During the three years ending on 30 June 1957, 6518 star pairs were observed. A summary of new determinations of progressive and

periodic errors of the Gaithersburg micrometer was furnished by the Director of the Central Bureau of the International Latitude Service in August 1955. An excessive delay in the delivery of Gaithersburg observational records has been eliminated, and the information delivered to the Central Bureau is now essentially up to date.

Kitab, U.S.S.R. During the period from 6 January 1955 to 6 July 1957 a total of 4160 observations were made with the old zenith telescope. In 1957 several new zenith telescopes of an original design (ZTL–180) were manufactured in Leningrad. One of these instruments has been installed at the Kitab Latitude Station. The aperture of the new zenith telescope is 180 mm, its focal length is 2360 mm. Regular observations with this instrument were commenced on 17 August 1957, according to the same international programme as for the old zenith telescope.

Mizusawa, Japan. Latitude observations with both the visual and the floating zenith telescopes were continued. During the period from 6 January 1955 to October 1957, 5883 star pairs on 683 nights and 6731 star pairs on 650 nights were observed by the visual and the floating zenith telescopes respectively.

The visual zenith telescope was removed from the mounting for cleaning and oiling of each part on 6 August 1956. The telescope was set again on 10 August. Afterwards, the micrometer threads were re-spanned on 5–9 April 1957.

In March 1955, a photographic zenith tube of 200 mm aperture and 3564 mm focal length was installed at a site 13 m east of the visual zenith telescope in the same parallel of latitude. The observing programme consists of ninety stars, forty of which are common with those of the Washington PZT. Regular observation was commenced in February 1956.

The principal research pertaining to latitude variations has been as follows:

Tetsuro Ikeda investigated the effect of upper wind on the latitude during 1922–25;

Shigeru Yumi investigated the micrometer value and its temperature coefficient of the visual zenith telescope with 522 greatest elongation observations and 1777 scale pair observations, and found systematic differences between the two kinds of observation;

Chikara Sugawa investigated (i) the change of the character of the wind effect in regard to the epoch of observation, (ii) the effect of the upper wind on the latitude during the period 1951–54, (iii) the mean parallax of the latitude stars.

Ukiah, California, U.S.A. During the three years ending on 30 June 1957, 10 295 star pairs were observed. There was an interruption of observations for about eighteen days in December 1956 while the clamping mechanism of the telescope was being replaced.

No report was received from the *La Plata* Observatory, but it is understood that regular observations there have been continued. [Dr C. O. R. Jaschek, Acting Director of the La Plata Observatory confirmed this in his letter to the General Secretary dated 30 March 1959. This makes Resolution No. 31(a) unnecessary which, as it became clear, emerged from some misunderstanding of the true situation at the La Plata Observatory.]

Other Latitude Stations

Belgrade, Yugoslavia. The same programme as in previous years was followed during the reporting period. From 1 October 1955 to 1 September 1957, 1542 star pairs were observed with the visual Bamberg zenith telescope of 110 mm aperture. Regular publication of the results has been continued in the *Bulletin de l'Observatoire de Beograd.* The discussion of the material accumulated from 1949 to 1956 was undertaken with special attention to systematic errors of the telescope as well as non-polar latitude variation.

Blagoveschensk, U.S.S.R. The new Latitude Station near Blagoveschensk has been built as a branch of the Pulkovo Observatory. The co-ordinates of this station are: N. 50° 21′; E. 127° 36′. It is equipped with a zenith telescope ZTL–180 of the same type as at the Kitab Station.

Borowiec, Poland. The Latitude Station of the Polish Academy of Sciences is situated 20 km to the south-east of Poznan. The geographical co-ordinates are: N. 52° 17′; E. 17° 05′.

The Station has at its disposal two visual zenith telescopes: the first of 130 mm aperture and focal length 1760 mm manufactured by Karl Zeiss Ltd., and the other of 110 mm aperture and focal length 2020 mm manufactured by the Poznan Observatory workshop. The programme for the first telescope is of the type proposed by the Soviet astronomers [1] and is a common programme set up for Borowiec and Irkutsk as both these stations have the same latitude. The programme for the second telescope is of an international type.

Observations with both telescopes were commenced in autumn, 1957.

As a whole, the working plan of the Borowiec Observatory concerns the general problem of the Earth's rotation and includes, in addition to latitude observations, time determinations and observations with horizontal pendulums.

Engelhardt Observatory near Kazan, U.S.S.R. During the period from 1 January 1955 to 23 October 1957 a total of 2512 observations were made with a Bamberg zenith telescope of 90 mm aperture. The results obtained in 1952–54 have been published by Mme Chudovicheva in the *Bulletin* of the Engelhardt Observatory, no. 32.

The new zenith telescope ZTL-180 was mounted in July–August 1957 and observations were commenced on 16 August 1957. The programme, common to both telescopes, has been published by S. Kulagin [2].

Gorky, U.S.S.R. The Dubrovsky Observatory at Gorky continued observations with the Bamberg zenith telescope of 90 mm aperture. The programme comprises four groups of star pairs, two bright zenith stars and two pairs composed of bright stars which can also be observed in the day-time.

Herstmonceux, England. The new photographic zenith tube of the Royal Greenwich Observatory, Herstmonceux, was installed by the makers during 1955. Regular observations commenced on 23 November 1955. There have been two major interruptions for mechanical adjustment and modification during 1956 (September and October) and 1957 (August and September). The total number of star observations secured up to 31 July 1957 was 4814.

The preliminary observing programme has consisted of 256 stars in twenty groups. Observations have been made throughout the hours of darkness.

Provisional star places in each co-ordinate were deduced from observations made at Greenwich with the Airy Transit Circle during 1949–51. Proper motions have been determined from all available meridian observations. The PZT observations up to May 1957 are being analysed for corrections to the provisional star places. Definitive values of the variation of latitude at Herstmonceux from November 1955 should be available before the end of 1957.

A preliminary estimate of the probable error of a single PZT observation of one star, based on internal accordance, is $\pm 0''{\cdot}08$ in each co-ordinate.

The future time and latitude programme will be confined to about 120 stars fainter than magnitude 7·5.

Irkutsk, U.S.S.R. The University Observatory at Irkutsk in March 1958 began observations with a new zenith telescope ZTL-180. It co-operates with the Borowiec Observatory in a common programme of observations. The co-ordinates of Irkutsk Observatory are:

N. 52° 17′; E. 104° 21′;

Milan, Italy. Observations with the Bamberg transit instrument of 55 mm aperture are being conducted using the Horrebow-Talcott method. The observing list consists of stars taken from FK 3 and FK 3 supp. As the observer, J. O. Fleckenstein spends one fortnight at Milan and Basle alternately, the observations are not numerous.

Mount Stromlo Observatory, Canberra, Australia. The photographic zenith tube has been erected and adjusted and the observers have been trained in its use. The relative declinations of the stars that had been selected for the observing list are now being verified with the instrument itself so that they can be adopted correctly for determinations of latitude variation. The chronograph for determination of time is about to be installed.

Neuchâtel, Switzerland. Observations with the photographic zenith tube, manufactured by Sir Howard Grubb, Parsons and Co. Ltd., commenced in March 1956. The observing list consisted of 118 stars in twelve groups, taken from AGK 2. Results obtained during the first year of observations have enabled corrections for declinations to be found. In order to secure the connexions between successive groups of the greatest possible weight, observations were conducted mainly at the beginning and at the end of the night. For half of the observed stars proper motions were taken from the *Eigenbewegungs-Lexikon.* In future, observations with the PZT will be capable of giving accurate proper motions.

With a view to the determination of $\Delta\delta_a$ errors it is intended to compare PZT declinations with FK 3 by the use of: (*a*) direct comparison of PZT latitudes with those obtained with a Danjon astrolabe, (*b*) meridian observations of some PZT stars made at the U.S. Naval Observatory, Washington.

Testing of the PZT has given the following results: (i) the mean error in the measurement of a single star image is $\pm 3\mu$; it corresponds to the error of $\pm 0''.09$ in latitude; (ii) the mean error of a single reduction of one star to the group mean is $\pm 0''.13$. Then according to theoretical computation the error of a single observation of one group containing ten stars should be $\pm 0''.04$; (iii) the actual error of a single difference between two groups, observed during the same night, is $\pm 0''.07$.

Regular observations with the Danjon astrolabe were conducted first at Neuchâtel in June, July and August 1957 and then at the *Vue-des-Alpes* Station from the end of August 1957. The purpose of these observations was to determine the difference in longitude and latitude of the two observatories.

The observing programme of the astrolabe consists of twelve groups each containing 25–28 star pairs. The positions of the stars were taken from FK 3. Special care was taken to have the maximum number of stars for which it is possible to observe two transits. The observing list contains 122 double-transitting stars and 62 single-transitting ones. The distribution of stars with respect to azimuth was made in such a way as to secure, for latitude-determinations, a weight nearly equal to that of time-determination.

The series, though short, has provided material for the subsequent estimation of the accuracy of the observations: the mean error of a single measurement of zenith distance of one star being about $\pm 0''.20$, the mean error of the latitude determined by a single group should be theoretically $\pm 0''.06$; actually, it is not likely to exceed $\pm 0''.10$.

Ottawa, Canada. Regular observations for time and latitude with the photographic zenith tube have been carried out on an average of 180 nights a year. Two groups of twelve stars are usually taken on one plate. The latitude observations are reported in the monthly time signal sheets.

A second revised observing catalogue has been in use since January 1956. It consists of about 150 stars (including replacements for future use) in twelve two-hour groups. The positions are based on PZT observations during 1954, the connexion with FK 3 being assured by the meridian circle observations of 1950–3. Proper motions are newly derived on the FK 3 system by the use of all suitable catalogues from AGK 1 to the present. A definitive catalogue should be possible by 1965, when the results of recent meridian circle observations and AGK 3 are available.

Instrumental improvements include an external shutter for the PZT, reducing vibration, and use of a gold-plated dish for the mercury pool. The mechanical contacts for timing are to be replaced with a photo-electrical device.

The mean error of a single observation for latitude (compared with the mean for the night) has been reduced to $\pm 0''.17$; the mean departure of a single night's latitude from a smooth curve has been reduced to $\pm 0''.09$.

Comparisons of PZT latitude- with the ILS latitude-variations for Ottawa show an annual term with maximum range of $\pm 0''.10$, ascribable in part to $\Delta\delta_a$ errors in the Ottawa positions. These are roughly confirmed by analysis of the group differences. Efforts have been made to strengthen the group connexions by occasionally taking three to six groups a night.

Paris, France. The impersonal Danjon astrolabe (no. 00), constructed at the Paris Observatory, was operated continuously for determination of latitude and time. In July

1956 the first astrolabe (no. 01) of a series, manufactured by Société Optique et Précision de Lavallois (O.P.L.), was put in service. The new programme consists of twelve groups each containing twenty-eight stars taken from FK 3 and FK 3 supp. This programme of observation will be available for forty years without any modification.

The same person observes at least two successive groups in the middle of the night in order to cancel a possible personal error in the accordance of groups. The mean error of the latitude determined by a single group is $\pm 0''.05$. There are no personal errors. The closing sum as obtained from the first year of observation is about $-0''.03$. The sign of this error would imply a value of the constant of aberration greater than the adopted one.

The two instruments are in fairly good agreement with each other.

It is intended in the near future to replace astrolabe no. 00 by the second astrolabe O.P.L.

Poltava, U.S.S.R. Latitude observations have been continued, using two zenith telescopes: Zeiss of 135 mm aperture and focal length of 1760 mm and Bamberg of 110 mm aperture and focal length of 1290 mm. Four groups of stars each of two hours duration have been observed with both instruments according to a common programme. This programme described in [3] is a prototype of those adopted by the Engelhardt, Poznan and Irkutsk observatories.

During the period from 1 January 1955 to 1 October 1957 totals of 4644 and 4600 observations were made with the Zeiss and Bamberg instruments respectively. In addition the observations with the Zeiss telescope of the near-zenith stars α Persei and η Ursae Majoris have been continued. During the same period 2126 observations of these stars were made.

Potsdam, G.D.R. Observations with a Danjon astrolabe were commenced in October 1957.

Poznan, Poland. Latitude observations with the Ertel 76 mm aperture transit instrument (focal length 720 mm) were commenced in September 1957 at the Poznan University Observatory. W. Struve's method of observations in the prime vertical was adopted.

Pulkovo, U.S.S.R. Latitude observations with the zenith telescope ZTF-135 were continued. This instrument of 135 mm aperture and 1760 mm focal length was constructed in 1904 by H. A. Freiberg, then a mechanic of the Pulkovo Observatory. The observing list designed for observations during nineteen years consists of ninety-three pairs and nine zenith stars. Beginning with 1955 observations have been carried through the whole night from sunset to sunrise according to an expanded programme. Apart from obtaining the most accurate data concerning latitude variations, the specific aim of this programme is to investigate short-period and irregular latitude changes. A total of 8212 observations was obtained from 1 September 1955 to 1 October 1957.

In 1957 a new visual zenith telescope ZTL–180 was installed at Pulkovo. Regular latitude observations commenced on 1 July 1957 after a thorough investigation of this instrument.

The star list is the same as for the ZTF–135, but observations are confined to two consecutive groups centred around midnight.

The new photographic zenith tube designed and manufactured in Leningrad has also been installed.

As was already mentioned, a new latitude station of the Pulkovo observatory at Blagoveschensk (Far East) has been built. The survey for the choice of a site, and the organization of this station, are described by I. F. Korbut and B. A. Orlov (in two papers in *Trans. of 12th U.S.S.R. Astrometrical Conference*).

Definitive discussion of all the previous series of latitude observations made at the Pulkovo Observatory is progressing. Mme S. V. Romanskaya continues a joint reduction of the series 1915–41. Latitude variations for the whole period have been obtained by her on the basis of a uniform system of declinations and proper motions derived from latitude observations.

The series 1904–15 has been newly treated by I. F. Korbut. V. I. Sakharov has discussed latitude observations at the Pulkovo Observatory from 1948·8 to 1955·0.

Richmond, Florida, U.S.A. The determination of the variation of latitude with the photographic zenith tube no. 2 has continued.

Sternberg Astronomical Institute in Moscow, U.S.S.R. The new zenith telescope ZTL–180 was mounted in the summer of 1957 and observations with it were commenced. The observing list consists of 120 star pairs and twenty-nine zenith stars.

The new photographic zenith tube is being installed.

Tananarive, Madagascar. Regular observations for time and latitude with the Danjon astrolabe were commenced, but the weather conditions are far from being perfect: condensation of steam and formation of clouds interrupt observations every night. The observing list consists of FK 3 stars. Each group of $1^h\ 30^m$ duration comprises thirty stars. The mean error of a single observation of one group, as derived from internal accordance, is $\pm 0''.06$.

Tientsin, China. The new Latitude Station has been built near Tientsin. Its co-ordinates are: N. 39° 08′; E. 117° 03′; thus this station is situated on the parallel of the International Latitude Stations. The meteorological records showed that the average of clear days at this locality was about 160 a year.

The Tientsin Station is equipped with a zenith telescope manufactured in Leningrad.

Tokyo, Japan. Though no report has been received from the Tokyo Astronomical Observatory, it is understood that the programme of observations with the photographic zenith tube is being carried on continuously.

Washington, D.C., U.S.A. The determination of the variation of latitude with the photographic zenith tube no. 3 has continued. On 13 April 1956 it was moved a short distance from its temporary to its permanent housing.

The U.S. Naval Observatory and the Mizusawa Observatory are co-operating in a joint programme of observation with their PZT's. One-half of the respective fields are observed in common. The Naval Observatory computes the apparent places for both stations with an I.B.M. 650 electronic computer. Discussion was held at the I.U.G.G. meeting, Toronto 1957, relative to establishing a third PZT probably in Italy, for the purpose of having a complete chain on the same parallel of latitude.

Zi-Ka-Wei Observatory, Shanghai, China. The Danjon astrolabe has been installed in a temporary pavilion and some experimental observations have been made with it, A proper housing for the instrument is expected to be prepared in the near future, and then both time and latitude observations will commence.

No particular reports were received about some stations that intended to operate Danjon astrolabes during the International Geophysical Year, but it is understood that, in addition to observatories already mentioned, the following stations are proceeding with astrolabe observations for time- and latitude-determinations: *Alger-La Bouzareah* (France), *Buenos Aires* (Argentina), *Curacao* (Netherlands), *Dehra Dun* (India), *San Diego* (U.S.A.), *Hawaii* (U.S.A.), *Uccle* (Belgium), *Washington* (U.S.A.), *Wellington* (New Zealand).

COMPUTATION OF POLAR CO-ORDINATES

International Latitude Service

A total of 23 871 observations was made at Carloforte, Kitab, Mizusawa and Ukiah from 6 January 1955 to 6 July 1957 and reduced by the Central Bureau of the International Latitude Service. As the receipt of observations from Gaithersburg was delayed, it was impossible to take them into account for the computation of polar co-ordinates. The usual method of reduction has been followed, but modified in consequence of changes in the programme.

The calculation of polar co-ordinates has been made assuming certain constant values for the mean latitudes of the International Latitude Stations. These values were found by G. Cecchini for 1949 and have not been changed since. For Carloforte, Gaithersburg and Ukiah they are the same as obtained from observations in the years 1900–5, corrected for the change of the system of declinations, while for Mizusawa and Kitab some local changes of the mean latitudes are considered. In his paper [4] Cecchini has given facts which suggest this hypothesis.

By using this hypothesis Cecchini has reduced the polar co-ordinates for 1955·0–1957·4 to a certain system which he considered as a uniform basis for all co-ordinates of the pole obtained by the International Latitude Service.

The new programme has enabled the diurnal term of latitude variations to be investigated. The Central Bureau carried on the reduction of observations at La Plata to the date 1954·82.

Rapid Latitude Service

In view of the necessity of prompt determination of the polar motion for time determination the ninth General Assembly recommended that a Rapid Latitude Service should be established.

The following Observatories have co-operated in this Service: Belgrade, Carloforte, Mizusawa, Ottawa, Paris, Poltava, Pulkovo, Richmond, Tokyo and Washington. They have regularly sent the results of their latitude observations to the Central Bureau of the International Latitude Service and to the Bureau Internationale de l'Heure for use in computations of the polar co-ordinates. The Director of the Central Bureau has forwarded his results to the Bureau International de l'Heure and furnished them to the Observatories participating in the Rapid Service. The polar co-ordinates interpolated and extrapolated by the Bureau International de l'Heure have been included in the Circulars distributed by this Bureau to all time services.

The task of the Rapid Latitude Service was complicated by the existence of considerable systematic errors in the initial observational data. It was necessary to determine and exclude these errors previous to polar co-ordinate computation. To solve this problem Cecchini adopted as a system of reference the polar co-ordinates derived by the ILS. Utilizing them, he computed latitude variations for each station, and subtracted them from the observed latitude. The residuals were solved for the mean latitude of the station and the annual z-term, which was attributed mainly to systematic errors of the adopted declinations of observed stars.

The Bureau Internationale de l'Heure tried various methods of treatment of observational data. The detailed discussion of the results thus obtained is given in the paper by Mme A. Stoyko and N. Stoyko [5]. The authors arrived at the following conclusion:

> Nous avons pu remarquer que les latitudes moyennes varient plus ou moins d'une période à l'autre et que leurs variations ne correspondent pas toujours aux variations respectives du pôle moyen. Cela montre qu'il existe des variations de latitude des stations qui ne dépendent pas du mouvement du pôle; il faut donc éliminer ces variations non polaires. Comme on ne connaît pas les variations progressives du pôle moyen, il est préférable d'utiliser dans ce cas la méthode d'Orlov.

N. I. Panchenko has computed the co-ordinates of the pole from 1946·1 to 1955·0 taking into account all available results of latitude observations. Corrections for declinations have been found by him for each station independently without using the polar co-ordinates obtained by the ILS.

The Poltava Observatory has continued the calculation of the polar motion for the use by the Soviet Time Service. Orlov's method [6] has been followed and observations at Pulkovo, Poltava, the Engelhardt Observatory and Kitab used in this calculation.

The preliminary results of latitude observations at the U.S. Naval Observatory, Washington, have been sent weekly to the Royal Greenwich Observatory for use in the time service.

ANALYSIS OF LATITUDE VARIATIONS AND THE MOTION OF THE POLE; THEORETICAL INVESTIGATIONS

The problem of mean latitude variations and the mean polar motion continued to attract particular attention. P. Melchior and V. I. Sakharov discussed Orlov's formula for a mean latitude computation; a new method, securing practically complete elimination of

all periodic terms, was proposed by P. Melchior. Miss Obrezkova obtained some new evidence that changes of mean latitudes could not be wholly ascribed to the polar motion.

P. Melchior pointed out that changes in the programme of the ILS could well turn out to be the explanation of the changes in the direction of the mean polar motion. This idea was criticized by A. E. Philippov and N. Sekiguchi. The latter advanced some arguments in favour of the reality of the mean polar motion, but these in turn were criticized by Philippov, who came to the conclusion that the existence of non-polar variations of the mean latitudes of the International Stations raised a natural doubt as to the reliability of all results on the secular motion of the pole hitherto obtained. The theoretical aspect of the problem was discussed by T. Gold, W. H. Munk and B. Gutenberg.

T. Hattori and B. A. Orlov investigated periodic components of latitude variation, the former with a particular view to the possibility of a prediction of latitude variation and polar motion. Some methods of practical application of prediction were tried by N. Stoyko and E. P. Fedorov.

Considering the polar motion as a process subject to damping, A. M. Walker and A. Young applied modern methods of statistical analysis of the observational data to a determination of the free period and the relaxation time of this motion. This problem was also dealt with in Melchior's papers.

Mention should be made of several investigations in which latitude observations were used for a determination of astronomical constants. J. O. Fleckenstein has obtained the constant of aberration from observations made at Basle in 1951–52. An effect of spectral class on this constant was investigated with particular care. N. A. Popov investigated periodic terms in the observations of the near-zenith stars at the Poltava Observatory. Harmonic analysis over a period of six years revealed a periodic term, which could be explained by some inaccuracy of the theoretical expression of the semi-annual nutation. The lag of phase in nutation has been derived by E. P. Fedorov from observations made at the International Latitude Stations during 1900–34. His previous conclusion that the ratio of the axes of the nutational ellipse had needed some positive correction, was not confirmed by the analysis of these observations.

In collaboration, H. Jeffreys and R. O. Vicente have published two papers dealing with the theory of the bodily tide and the various nutations. Elasticity of the shell and fluidity of the core were taken into account. In the first paper the model used for the shell was Takeuchi's Model 2. The core was replaced by a homogeneous incompressible fluid, with an additional particle at the centre chosen to make the mass and moment of inertia of the core correct. In the second paper this theory was modified by the use of a core, the density of which is a quadratic function of the radius.

N. Sekiguchi has studied extensively a group of problems related to the motion of the Earth's axis both in space and relative to the Earth itself. N. N. Parijsky has investigated the variations of the Earth's angular momentum due to atmospheric circulation and has shown that these variations should contribute substantially to the annual motion of the pole.

In conclusion, mention should be made of three monographs in which a general review of the latitude problem and bibliography are given [6,7,8]. The bibliography compiled by B. Sevarlić in collaboration with N. Stoyko is the most complete: it comprises a total of 1761 monographs and papers pertaining to latitude work.

MERIDIAN OBSERVATIONS OF LATITUDE STARS

To keep the mean zenith distances of star groups in admissible limits the Central Bureau of the ILS was compelled to change the observing programme five times during the fifty-eight years elapsed since the foundation of the ILS. In consequence of these changes observations at the International Stations were broken into separate series. To connect them, first H. Kimura, then L. Carnera and G. Cecchini, suggested meridian re-observations of latitude stars. According to this suggestion, declinations of stars taken from all the observing lists used by the ILS were to be determined in a uniform system. At the

General Assembly of the I.G.G.U. held at Brussels in 1957 the Belgian Royal Observatory offered its assistance in the realization of this plan. The joint star list had been prepared by L. Carnera and then supplemented with stars taken from the new programme put into service in 1955. Observations in FK 3R system were commenced by H. Becq and P. J. Melchior on 21 November 1952 and completed on 6 May 1957. Each star has been observed with the Askania meridian circle from five to eight times in each position of the tube.

Some of the isolated observatories (i.e. not belonging to the number of international stations) were also anxious to have declinations of their latitude stars redetermined with meridian instruments. Provisional star places of the PZT stars of the Royal Greenwich Observatory were deduced from observations made at this observatory with the Airy Transit Circle during 1949–51; declinations of stars for latitude observations at the Engelhardt and Poltava Observatories were determined at the Engelhardt, Kiev and Odessa Observatories with meridian instruments.

In reductions of latitude observations it is usual to derive corrections for provisional declinations from the observations themselves. But any attempt to determine the system of corrected declinations, thus obtained, usually gives no satisfactory results. Comparison with FK 3 fails to reveal the systematic errors because of the lack of common stars; comparison with GC reveals little, because of the large accidental errors of star places in this catalogue. Observations should be made of different pairs to balance out the effect of these errors. Such an attempt was made by Mme K. S. Mansurova at the Poltava Observatory. During the years 1956–7 she observed a programme containing 675 pairs of GC stars and 422 pairs of AGK2A stars. Each pair was observed, as a rule, only twice a year. Though no corrections were applied to the original declinations, it was possible to obtain two fairly good curves representing the latitude variations in the system of each catalogue. Nevertheless, such a programme can by no means be recommended as a pattern for latitude programmes.

So we are compelled to recognize the fact that systems of declinations used for reduction of latitude observations are uncertain. We may suppose it highly probable that these systems are different for different isolated stations. This fact was often pointed out as a most important obstacle to the use of latitude observations at isolated stations in the computation of polar co-ordinates.

To overcome this handicap meridian observations of all latitude stars can be suggested. A plan of such observations has been initiated by M. S. Zverev, President of Commission 8. According to this plan, a general list should be compiled, comprising stars taken from observing programmes of all the observatories conducting latitude observations. It is intended to discuss this plan at the next General Assembly. Then some observatories should be invited to co-operate in observations of latitude stars with their meridian instruments. It is expected that as a result of these observations we shall obtain declinations of all latitude stars determined in a common system. Apart from the object already explained this work would promote the investigation of the local z-terms in latitude variations.

From what has been said, it is clear that the main aim of this plan is different from that of meridian re-observations of the stars taken solely from the programmes of the ILS.

MATTERS FOR DISCUSSION

H. Spencer Jones suggests that the time has come for a complete examination of the functions of the International Latitude Service. He bases this suggestion on the following facts and considerations.

There are now a number of observatories which are making determinations of the variation of latitude by means of photographic zenith tubes, impersonal prismatic astrolabes, and in other ways, and these observations are capable of a higher precision than is attainable with visual zenith telescopes at the observing stations of the ILS. During the International

Geophysical Year several observatories are installing Danjon astrolabes and photographic zenith telescopes and the collective observations from the observatories engaged in this type of work should, in my opinion, give data on the variation of latitude which are of higher precision than those obtained from the four stations on the 39° parallel of latitude which form the basis of the ILS results.

A question that I think now has to be faced is whether any really useful purpose is being served by the continuation of observations at the four stations Mizusawa, Kitab, Carloforte and Ukiah, or whether, on the other hand, they should be continued for a few years more until the PZT's and Danjon prismatic astrolabes have been in use for a sufficient period for smoothing out the star places and the group corrections.

There is of course a great advantage in having observations made at several stations on the same parallel of latitude with a common star programme. What would be desirable would be for the present international stations to be re-equipped with new instruments of the photographic zenith tube type.

D. A. Rice, the Chief of the Gravity and Astronomy Branch of the U.S. Coast and Geodetic Survey points out that in planning future astronomical work of that organization it would be most helpful to have an approximate estimate of how long the ILS stations will continue to be fundamental in the determination of polar motion.

The question raised by H. Spencer Jones is of such a fundamental character that it is worthy of consideration with the utmost attention and care. Several years ago the common opinion was that the photographic zenith tube had maintained an unrivalled position in determining the latitude. It was believed that this instrument had to be adopted for equipping new latitude stations. The replacement of ordinary zenith telescopes by PZT's at International Stations was considered as highly desirable too. But since then new facts have raised a doubt as to whether this view is well-grounded. First, considerable systematic errors in observations with PZT's have been noticed. Secondly, application of the Danjon astrolabe to latitude observations has shown that this instrument is capable of giving almost perfect results. Lastly, a series of large zenith telescopes of a new type has been manufactured and put into service at several latitude stations of the Soviet Union. The first results obtained with these instruments are promising.

Thus, it must be admitted that the question of the comparative advantages of different instruments employed now for latitude observations is still far from being settled. We do not have even any true criteria to decide this question. The mean error of a single observation, based on internal accordance, can by no means serve as such a criterion. Cases are not rare in which an instrument, for which a small mean error is peculiar, gave for several days and even a month such anomalous values of the latitude that it was impossible to draw a smooth curve through them and to make use of the results for the computation of the polar motion.

For what has been said, it is clear that at present we have insufficient material to make definitive recommendations as to the re-equipment of the International Stations and to the more general question of planning future organization of latitude work. Thus it seems better to hold to the following recommendation adopted at the Meeting of the International Geodetic Association in 1954:

> During the International Geophysical Year there would be observations with several PZT's and with several Danjon impersonal prismatic astrolabes. In the light of the results given by these instruments, in conjunction with those given by the ILS, the two inter-related questions of changes in the instruments of the ILS and changes in the programme of observation should be considered jointly.

However, to make it possible it is necessary to publish in detail all results of latitude observations made during the I.G.Y. so as to make them available to all interested astronomers who may wish to examine these results and to draw their own conclusions on the advantages and disadvantages of various instruments.

The following proposals were made by N. Stoyko, the Chief of Bureau International de l'Heure:

D'après la décision de l'Assemblée Générale de l'Union Astronomique Internationale à Dublin en 1955, le Bureau International de l'Heure calcule, à partir du 1er Janvier 1956, les coordonnées du pôle extrapolées et interpolées d'après les résultats de 10 stations des latitudes. Par conséquent, il est nécessaire à l'Assemblée Générale de l'U.A.I. à Moscou en 1958 de résoudre des questions liées avec l'organisation du service nouvellement créé:

1. Il est nécessaire que toutes les stations des latitudes communiquent régulièrement au Bureau Internationale de l'Heure les résultats de leurs observations. Cela permettrai d'accélérer les calculs des coordonnées du pôle, ainsi qu'augmenter la précision d'interpolation et d'extrapolation de ces coordonnées pour les services horaires.

2. En tenant compte que le pôle moyen (1900–1905) qu'utilise le Service International des Latitudes ne se trouve pas au centre de la polhodie et que la détermination du mouvement séculaire du pôle rencontre des difficultés, il est nécessaire de décider quel pôle moyen il faut utiliser pour les services horaires: pôle moyen d'après la définition de A. J. Orlov, ou celui d'après le Service International des Latitudes.

3. Etant donné l'introduction dans le service des instruments nouveaux pour la détermination des latitudes, il est désirable d'établir parallèlement à la chaîne des lunettes zénithales du Service International des Latitudes, une chaîne des lunettes zénithales photographiques (PZT) ainsi qu'une chaîne des astrolabes impersonnels de Danjon.

The following suggestion for discussion was made by J. P. Blaser, the Director of the Neuchâtel Observatory:

La comparaison des résultats fournis par des instruments différents montre les erreurs considérables qui proviennent des erreurs systématiques des instruments ainsi que des erreurs de zone des catalogues. En vue de l'élaboration d'un catalogue fondamental définitif, des observations spéciales d'égalisation de catalogue devraient être encouragées. Des observations s'étendant sur des nuits de 12 ou même 14 heures consécutives permettent, avec des instruments tels que le PZT et l'astrolabe, de bien déterminer les erreurs de catalogue $\Delta\delta_a$. La collaboration entre des stations équipées de ces instruments et situées sur des latitudes différentes complèterait le travail des services méridiens.

Stoyko's second suggestion has raised the general problem of methods for computing the polar motion, which is one of the most important problems to be faced at the coming General Assembly in Moscow.

E. P. FEDOROV
President of the Commission

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COMMISSION 19

Comptes rendus des Séances. 14 et 16 août 1958

PRÉSIDENT: E. P. Fedorov.

SÉCRETAIRE: J. Witkowski.

Première Séance. 14 août

Après une discussion rapide du *Draft Report*, le Président, en constatant que le Prof. Cecchini est absent, invite le Dr Melchior à donner un resumé du rapport du Bureau Central du Service International des Latitudes.

Le Directeur de la station internationale de Kitab, Dr Kalmikov, présente les résultats des observations effectuées simultanément à deux lunettes zénithales, l'une de Bamberg, l'autre de construction russe récente. On n'a tenu compte pour cette comparaison que des nuits d'observations complètes: on relève entre les deux instruments une différence présentant un caractère annuel évident. Le Dr Kalmikov remarque que la méthode de réduction appliquée par le SIL postule que le terme local est même pour toutes les stations alors que l'on voit ici que deux instruments placés dans la même station et appliquant le même programme, présentent un terme annuel distinct.

Le Prof. Danjon s'étonne que l'on utilise un ancien pôle moyen pour réduire les observations du nouveau programme. Il demande quel est l'intérêt de centrer la polhodie sur l'origine des coordonnées et quel est le sens exact des dérives constatées.

Le Dr Melchior répond que dans le système actuel de réduction la dérive du pôle moyen s'introduit entièrement dans les corrections de variations de longitude utilisées par le Bureau International de l'Heure. Or les plus grands doutes existent sur la réalité de cette dérive et de multiples arguments montrent qu'elle est pour la plus grande partie fictive. Cependant le Dr Melchior n'est pas d'avis de changer brusquement le pôle moyen actuel pour en adopter un autre fixe qu'il faudra sans doute changer pour les mêmes raisons dans quelques années. La seule solution lui paraît être d'écarter la dérive du pôle moyen par un procédé de réduction du type d'Orlov mais plus raffiné.

Le Dr Stoyko fait remarquer que les coordonnées publiées par le Prof. Cecchini sous le titre 'Service Rapide' ne sont pas du tout celles du Service rapide et devraient seulement être appelées 'coordonnées du pôle d'après les stations libres'. En effet, ces coordonnées lui parviennent de Turin avec un retard supérieur à un mois de sorte que le BIH doit effectuer lui-même les calculs à partir des observations qui lui sont envoyées directement par les stations de latitude. Le gain de temps est appréciable; la différence entre les coordonnées conclues par le BIH et celles du Prof. Cecchini (stations libres) est parfois supérieure à $0''.1$.

Le Dr Markowitz relève qu'à l'Assemblée du Dublin il avait été recommandé que l'envoi des résultats de Turin à Paris se fasse très vite. Il apparaît que cela n'a pas été possible pour le Bureau Central de Turin qui est sans doute fort occupé par le travail fondamental de réduction du SIL. Comme le BIH a cependant besoin de ces coordonnées il faudrait lui confier directement la charge de ce calcul puisqu'aussi bien c'est la situation de fait.

Le Prof. Shcheglov signale que depuis la fondation du SIL le Bureau Central a fourni à toutes les stations les positions apparentes des étoiles. Cependant la station de Kitab ne les reçoit plus. Il demande que cet envoi soit repris.

Le Prof. Danjon remarque que l'erreur de fermeture trouvée par le Prof. Cecchini ($-0''.124$) correspond presqu'exactement à la correction que l'on devrait apporter à la constante d'aberration selon d'autres méthodes de détermination. Il considère que cette interpretation de l'erreur de fermeture doit être prise en considération avant de discuter d'effets de réfractions anormales. Le Dr Melchior partage cet avis. Le Dr Markowitz par contre pense que cela prête à discussion car les observations des PZT ne donnent pas la correction attendue pour la constante d'aberration.

Le Dr Fedorov aborde la question importante de l'avenir du SIL. Il considère que quatre problèmes se posent: (*a*) combien de temps le SIL actuel fonctionnera-t-il encore? (*b*) comment introduire les observations des stations indépendantes dans le calcul de la

polhodie? (*c*) où placer de nouvelles stations et de quels instruments les doter? (*d*) faut-il réequiper les anciennes stations et de quels instruments?

Le Dr Fedorov considère que nous ne sommes pas préparés à prendre de telles décisions engageant tout l'avenir de ce problème. Il faut d'abord réexaminer tout le materiel d'observations disponibles et juger des mérites comparatifs des différents instruments. L'on dispose de tout le détail des observations faites aux télescopes zénithaux et aux télescopes flottants (Cookson) des stations internationales ainsi que de Greenwich, Pulkovo et Poltava. Mais la situation est toute différente pour les observations faites aux PZT et aux astrolabes et il est absolument nécessaire que celles-ci soient publiées avec les mêmes détails, si l'on veut juger réellement de leurs qualités. Tous les astronomes désireux de discuter et d'analyser ces données doivent pouvoir les utiliser. Le Dr Fedorov note avec satisfaction que les mêmes désidérata sont exprimés par la Prof. Cecchini dans ses conclusions. Il proposera donc une résolution dans ce sens.

De toute manière il reste tant de points obscurs à clarifier qu'il est impossible de les traiter dans les limites étroites d'un meeting tel que celui-ci. Le Dr Fedorov propose que toutes ces questions soient reprises et discutées au cours de la prochaine année dans un volume spécialement édité et réunissant les opinions de tous les spécialistes et qu'ensuite soit organisé un symposium sur cette question.

Le Dr Dawson de l'Observatoire de La Plata demande l'avis de la commission sur l'opportunité de continuer les observations dans cette station qui se trouve sur un autre parallèle et observe d'autres étoiles avec un fort ancien appareil. Le Dr Melchior remarque que ce n'est pas au moment où l'on s'efforce de promouvoir l'établissement de nouvelles stations dans le monde que l'on pourrait se passer de la seule station existant actuellement dans tout l'hémisphère sud. La commission ne pourrait que recommander l'acquisition d'un instrument plus moderne. Le Dr Markowitz appuie cette idée et dit que l'observatoire de La Plata pourrait trouver sans doute une certaine aide pour l'acquisition d'un PZT.

Le Dr Sakharov a lu le rapport sur la nouvelle lunette zénithale de Poulkovo.

Summary of 'The new zenith telescope ZTL-180 of the Soviet Latitude Service' by I. F. Korbut and V. I. Sakharov

In connexion with the I.G.Y. a series of new large zenith telescopes was manufactured in Leningrad in 1956–7. The technical requirements for this instrument were drawn up by V. I. Sakharov and I. F. Korbut and those for its objective glass by Prof. D. D. Maksutov. The new instrument was designated ZTL-180, which denotes zenith telescope, Leningrad, diameter of the objective 180 mm. Its focal length is 2360 mm. The objective mounting, designed by L. A. Sukharev, is self-centering. It is possible to observe with the ZTL-180 stars up to 9^m2 magnitude.

The field is 1° 45′ in declination. It enables latitude programmes to be observed during some 200 years without making any changes in the list of stars, this being very important for the study of secular latitude variation.

The reticle is cut on a glass plate and consists of thirteen lines for measuring the differences of the zenith distances of stars. The distance between each of the 'working lines' equals twenty revolutions of the micrometer screw. Thus, it requires not more than ten revolutions of the screw to set the nearest line on a stellar image. On the glass plate, in the middle between the working lines, twelve double lines are cut. They are used for the observations of faint stars and for the investigation of the screw.

The optical scheme is based on S. N. Blazhko's propositions that the stellar image be formed in the principal focal plane before the rays pass through the reflecting prism, thereby eliminating observational errors that might arise from instability of the prism.

The value of one revolution of the screw is 21″9; its temperature coefficient is −0″0001 for 1° C. The periodic and progressive errors do not exceed 0″01. The value of one division of the Talcott levels is about 1″. The zenith telescope is equipped with cameras for photographic registering the readings of the micrometer and the levels, as well as with a special quartz prism

which together with an auto-collimating device gives a possibility of obtaining a standard angle for the determination of the screw value.

Instruments of the type ZTL-180 were mounted at Pulkovo, Kitab, Irkutsk, Blagoveschensk, the Engelhardt Observatory near Kasan, and at the new Tientsin Latitude Station in the Chinese People's Republic ($\phi = +39° 08'$). One instrument was sent to the Brussels International Exhibition.

On 1957 July 1, the new zenith telescope ZTL-180 was put into operation at the Pulkovo Observatory, and concurrent observations with this instrument and the Freiberg-Kondratyev zenith telescope (ZTF-135) have been carried on. The ZTF-135 is known to be one of the best instruments participating in the Rapid Latitude Service. So it may serve as a standard for checking the quality of other instruments.

The first annual series of observations with the ZTL-180 has given the following results: (1) The mean error of a single observation of one star pair is $\pm 0''.14$. There are still some possibilities for increasing the accuracy of observation. (2) The systematic difference between the latitudes given by the ZTL-180 and the ZTF-135 was found to be $+0''.025 \pm 0''.007$. (3) The closing error is $-0''.16$, corresponding to a small positive correction to the adopted value of the constant of aberration. (4) The annual non-polar term is small.

It is intended to undertake after the I.G.Y. a more detailed investigation of the ZTL-180 so as to compare the advantages of diverse instruments in the light of the data obtained during the I.G.Y.

Deuxième Séance. 16 août

Le Président ouvre la séance et procède à la lecture d'un télegramme du Prof. Cecchini. D'après la proposition du Dr Markowitz la Commission charge le Président d'envoyer une réponse au Prof. Cecchini.

La parole est à MM. Prodan et Nesterov qui présentent une communication sur les observations des paires d'échelle à la lunette zénithale. Les auteurs ont déterminé la valeur du tour de vis du micromètre oculaire de la grande lunette zénithale récemment installée à l'Observatoire de Moscou. Ils ont appliqué la méthode des paires d'échelle (difference en déclinaison 20'–25' qui peut être poussée jusqu'à $1^{\circ}5$ en faisant usage de fils supplémentaires). On constate que la précision obtenue à l'aide des paires distantes est beaucoup supérieure à celle que donnent les paires ordinaires (erreur moyenne quadratique 8 fois moindre). Ce fait est d'une grande importance pour une nouvelle réduction des observations du SIL à la base d'un système unique de déclinaisons et avec des valeurs du tour de vis plus précises. D'après le Dr Fedorov il serait très utile de déduire les corrections des déclinaisons des paires de Kimura et de Batterman à l'aide de lunettes zénithales nouvelles qui permettent de déterminer le tour de vis du micromètre par la méthode de paires distantes. Les différences de déclinaisons peuvent être obtenues avec une erreur de $0''.01$–$0''.02$, ce qui est inférieur aux erreurs des catalogues et aux erreurs de détermination de ces différences par les Stations du SIL.

Le Prof. Blaser présente une note sur le terme diurne en latitude. Les observations faites avec la lunette zénithale photographique (P.Z.T.) à Neuchâtel dès 1956 s'étendent en général sur la nuit entière. Lors de l'égalisation des positions d'étoiles un fort effet soir-matin en latitude s'est manifesté. On a cherché, par un calcul des moindres carrés partant des différences observées entre les groupes, à établir la variation de la latitude avec l'heure locale. Remarquons qu'un effet analogue a été trouvé dans les résultats du SIL. Sa valeur ($0''.01$ par groupe de 2 heures) est à peu près compatible avec la tangente aux environs de minuit. Avec le P.Z.T. du Royal Greenwich Observatory on trouve presque la même amplitude totale au cours de la nuit, mais il en est tenu compte par un terme de la forme $0''.1 \sin T$ (T étant l'heure locale).

L'effet soir-matin peut être une source d'erreur importante dans l'égalisation des positions d'étoiles par la méthode des observations en chaîne. La durée de la nuit étant variable, des erreurs $\Delta\alpha_\alpha$ et $\Delta\delta_\alpha$ peuvent en résulter, même si les observations sont centrées sur minuit. Les causes de cet effet sont sans doute principalement atmosphériques ou

instrumentales. D'autres observations executées en des lieux et avec des instruments différents seraient nécessaires pour établir si une erreur de la constante d'aberration contribue à cet effet.

Suit une discussion dans laquelle prennent part MM. Melchior, Guinot, Markowitz.

Le Dr Melchior parle sur le calcul des mouvements propres des étoiles du Service des Latitudes.

Le catalogue des déclinaisons entrepris au grand cercle méridien Ascania de l'Observatoire d'Uccle étant terminé avec l'observation de 11 000 positions d'étoiles, on a entrepris, à la demande de l'Association Internationale de Géodesie (Assemblée de Toronto 1957) le calcul des mouvements propres des 440 étoiles composant tous les programmes utilisés depuis 1900.

On a déjà établi trois volumes qui comprennent pour chaque étoile tous les renseignements utiles; positions dans les catalogues de Boss, éventuellement FK3R, Yale zone, mouvements propres, magnitudes, spectres, noms, n° B.D. et n° Draper et la liste de toutes les observations faites de chaque étoile avec leurs conclusions quant à la déclinaison, la date moyenne des observations et le nombre d'observations.

On a ainsi dépouillé 296 catalogues méridiens et inscrit 8958 positions (soit 22 en moyenne par étoile). En particulier on a inscrit toutes les positions de la *Geschichte des Fixsternhimmels* et du Bergedorf Index. Il reste quelques catalogues récents à dépouiller.

On a commencé la réduction des positions de 1875·0 à 1950·0, la réduction au système de Boss à l'aide des tables de Boss ou de Gyllenberg et l'attribution des poids. Ce travail n'est cependant qu'à son début.

On se propose de rapporter toutes les positions au système du FK4 par l'intermédiaire du système Boss.

On se propose d'adopter comme positions provisoires celles qu'adopta le Bureau Central et ceci afin de permettre l'introduction dans les calculs des déclinaisons moyennes et des mouvements propres des résidus systématiques mis en évidence dans les observations de latitude elles-mêmes et qui ont un très grand poids. On traiterait ainsi en bloc chaque groupe d'étoiles des divers programmes du SIL. Cela permettra d'assurer une plus grande homogénéité spécialement dans les cas assez fréquents d'étoiles ne présentant que peu d'observations méridiennes.

Un autre intérêt de cette méthode serait d'assurer une liaison plus étroite lors des changements de programme car il y a toujours un pourcentage important d'étoiles conservées. On pourrait ainsi raccorder avec précision les groupes correspondants des programmes successifs.

Les positions conclues devraient être adoptées sans autre correction dans les réductions à refaire, les résidus devant permettre une étude plus sûre des variations de pas de vis dans le temps et avec la saison.

Les calculs étant faits avec une machine à cartes perforées, plusieures solutions pourraient être obtenues (par exemple avec ou sans la considération des résidus du SIL.).

Les remarques faites par Panchenko, Fedorov, Smith, Zverev, Sakharov, Yakovkin soulignent l'importance du travail entrepris à Uccle. Smith fait connaître les résultats des observations de *Polaris* à Greenwich durant la période 1850–1940.

Le Président présente le projet des Recommandations de la Commission arrêté par le comité (MM. Fedorov, Lavallois, Melchior, Stoyko, Witkowski). Après la discussion de ce projet on est finalement arrivé à un accord de ce que

(1) Les données des observations de latitude faites pendant l'A.G.I. doivent être accessibles à toutes les institutions scientifiques et à tous les savants pour faire possibles leur analyse et leur discussion aux points de vue différents et pour les buts divers et que ces données peuvent être utilisées pour la meilleure planification des observations de latitude ultérieures.

(2) L'état actuel du travail de latitude nécessite une révision complète et que beaucoup de problèmes obscurs doivent être éclaircis pour assurer les conditions de l'adoption de toute résolution bien argumentée concernant le plan de l'organisation future de ce travail.

(3) Les réobservations des paires de Kimura doivent être organisées à l'aide de nouveaux télescopes zénithaux ZTL-180 dans le but d'obtenir les différences précises des déclinaisons des étoiles.

(4) Les observations à l'aide de nouveaux instruments-astrolabes de Danjon et les PZTs doivent être analysées dans le but d'obtenir par les méthodes astronomiques une valeur plus précise de $1+k-l$.

(5) En tenant compte de ce que le BIH peut à présent calculer lui-même le mouvement du pôle pour l'utiliser dans les déterminations de l'heure, il faut envoyer les résultats préliminaires des observations de latitude au BIH de même qu'au Bureau Central du SIR afin que le BIH puisse faire ces calculs comme il lui faut.

Le Dr Markowitz propose que le texte du projet des Recommandations soit reproduit et distribué parmi les membres de la Commission afin qu'ils puissent l'examiner avec attention. Le Président prie de son côté le Dr Markowitz de prendre part à la rédaction de ce texte.

La résolution a été adoptée définitivement par la Commission 19 à la séance collective avec la Commission 8 le 20 août 1958.

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