



OUTSTANDING PULKOVO LATITUDE OBSERVERS

LIDIA KOSTINA AND NATALIA PERSIYANINOVA

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L.D.Kostina at the ZTF-135. 1956.

N.R.Persiyaninova at ZTF-135. The 1970s.

Pulkovo astrometrists Lidia Dmitrievna Kostina (December 8, 1926 – June 4, 2010) and Natalia Romanovna Persiyaninova (August 26, 1929 – January 16, 2003) left a bright mark in the history of the Pulkovo Observatory, as well as in the domestic and international latitude services.

Both of them graduated from the Leningrad (now St. Petersburg) State University and almost simultaneously came at Pulkovo, devoting nearly half a century of their life to it. Kostina and Persiyaninova spent 45 years working together in the same latitudinal group and in the same room of the Eastern building of the Pulkovo Observatory.

First, Lidia Kostina and Natalia Persiyaninova have been known as outstanding observers at the famous zenith-telescope ZTF-135 (The Large Pulkovo Zenith telescope with the lens diameter of 135 mm constructed in 1899–1904 in the mechanical workshop of the Pulkovo Observatory by Heinrich Andreevich Freiberg).

Together they obtained 39% of all observations on this instrument in its more than a century history, including 59% of all post-WW2 observations. They were the absolute leaders among Pulkovo (and most likely all domestic) observers in the number of observing nights, as well as ZTF-135 was the leader among Pulkovo instruments. They were repeatedly awarded with the first and other prizes in the "Best Pulkovo Observer of the Year" competition.

Kostina and Persiyaninova also made a very large contribution to the research of the instrument, to the theory and practice of observation processing, interpreting changes in latitude and studying the motion of the Earth's pole, determining astronomical constants. In these fields, they deserved great prestige among their colleagues too. It is known that ZTF-135 was recognized as the best zenith telescope in the world. However, the glory of this instrument was deserved not only by the art of its creator, but also by the highly qualified work of the observers. The Pleiades of the remarkable observers of the ZTF-135 zenith telescope, the brightest representatives of which were Persiyaninova and Kostina, contributed a lot to the fact that such an assessment remained close to the truth even after more than a hundred years, at least with respect to this instrument.



L.Kostina and N.Persiyaninova at the ZTF-135. The 1960s.



L.D.Kostina. 1958.



L.Kostina with astronomers from Mongolia. 1958.



L.D. Kostina at the ZTF-135 pavilion. 1958.

Natalia Persiyaninova graduated from the astronomical department of the Faculty of mathematics and mechanics of the Leningrad State University in 1953 and came to work to the same department of the Pulkovo Observatory. Just at that time, preparations for the International Geophysical Year began at the observatory and a new zenith telescope ZTL-180 (Zenith Telescope Leningradsky with a lens diameter of 180 mm), manufactured by the Leningrad enterprise GOMZ was installed at Pulkovo. The first works of Natalia Romanovna are devoted to the study of the new instrument. She started as a calculator, then, since 1955, she participated in observations at both Pulkovo zenith telescopes, but, in the end, she connected her further scientific life with ZTF-135.

The variety of scientific interests of Natalia Romanovna is demonstrated by the list of topics of her publications. They include the connection of latitude variations with meteorological factors, non-polar latitude (z-term), impact of errors in star positions, the determination of the principal term of nutation, investigations of the main components in the polar movement, inter-technique comparison of latitude variations. In particular, she studied the distribution of clear weather depending on the moon phases.

Everything new that appeared in the mathematical processing of observations, she immediately considered and put into practice. As soon as the first computer appeared in the observatory in 1967, Natalia Persiyaninova mastered it and provided both zenith telescopes with programs for processing of the observations. One of the main topics in her work was the application of spectral analysis to the study of variations of latitudes. Her dissertation defended in 1969 and devoted on investigation of non-polar variations was one of the first study in which correlation and spectral analysis was used for astrometric problems.

Natalia Romanovna, as well as Lidia Dmitrievna, always had a high sense of responsibility. This was especially true for observations. During the period from 08.01.1955 till 16.11.2001 she obtained **33996 instantaneous latitudes during 2414 nights** (the record for ZTF-135!). Numerous observations aimed at the determination of instrument constants, near-pole stars in elongations, scale pairs and time series for determining the screw revolution should be added to this value. She also took part on latitude observations in Blagoveshchensk (ZTL-180) and Kitab (ZTL-180 and Bamberg ZT).

The scientific authority of Natalia Romanovna was very high. The same was her public authority. She not only taught students and trainees astrometric wisdom, but also became an adviser in worldly affairs. Contacts established during common work continued to exist in correspondence. When a scientific conference was held at Pulkovo, discussions in her cozy house were even more active than in and around the conference room.

Although L.D. Kostina and N.R. Persiyaninova each had their own research topics of interest to them, being members of the same Pulkovo latitudinal group, they naturally had many general publications and reports at conferences (and in those years astrometric and specialized latitudinal conferences took place in our much more often than now), based primarily on observations with ZTF-135. Almost two-thirds of the group's publications were written together. These are articles on the studies of the of the Pulkovo latitude variations, the instrumental studies, the determination of nutation coefficients, the analysis of non-polar variations in latitude observations, and the improvement of the catalog of coordinates of latitudinal stars.

Very productive was long-term cooperation of L.D. Kostina and V.I. Sakharov, many-year head of the ZTF-135 group. They published 17 articles devoted to study of the Chandler, annual and secular components of the pole motion. In 1977, they first investigated the relationship between the pole motion and solar activity. The presence of common cycles in the variations of the main components of the pole motion and Wolf numbers led them to conclude that some of them are generated by solar processes (for example, an 11-year cycle) [1].

Studying the Chandler oscillation, the authors were among the first to study the phase changes of this oscillation, in particular, around 1925 and drew attention to the fact that neglecting the phase variations can lead to constructing of a wrong model of the polar motion. The value of the Chandler period of 1.189 ± 0.002 yr obtained by them corresponds to the theoretical estimation for the second model of the Earth's structure developed by M.S. Molodensky (elastic mantle, liquid core with a solid inner core) [2]. The authors proposed the theory of extreme cycles in the variation of the amplitude of the Chandler wobble. Analyzing the maximum amplitudes, they estimated the main low-frequency period in the variations of the Chandler wobble of 43.8 yr. Their assumption is that the maximum of the third extreme cycle will fall on 1989, turned out to be close to the truth (the maximum was observed in the early 1990s).

Very interesting was also the joint work of Natalia Romanovna with N.P. Godisov. In this study of the main components of the pole motion, the method of sequential separation of components was used with parabolic interpolation in the region of the maximum spectral function, which was then used by many authors. In the spectrum of amplitudes of the Chandler pole motion, a component with a period of 44 yr was found, which corresponds to the conclusions of Sakharov and Kostina.

Over their nearly half-century scientific and, in particular, observing lives, Lidia Kostina and Natalia Persiyaninova observed 66071 high-precision latitudes, distributed approximately equally between them. A simple estimate (four latitudes per hour in a typical observing program) shows that to obtain such a result, each of them spent about 8300 hours with the instrument or about 345 days— about a whole year! If one takes into account also auxiliary, but necessary observations, this will be even more than a year.

During preparation of this presentation, materials Pulkovo Observatory archive was used [3-6].

References

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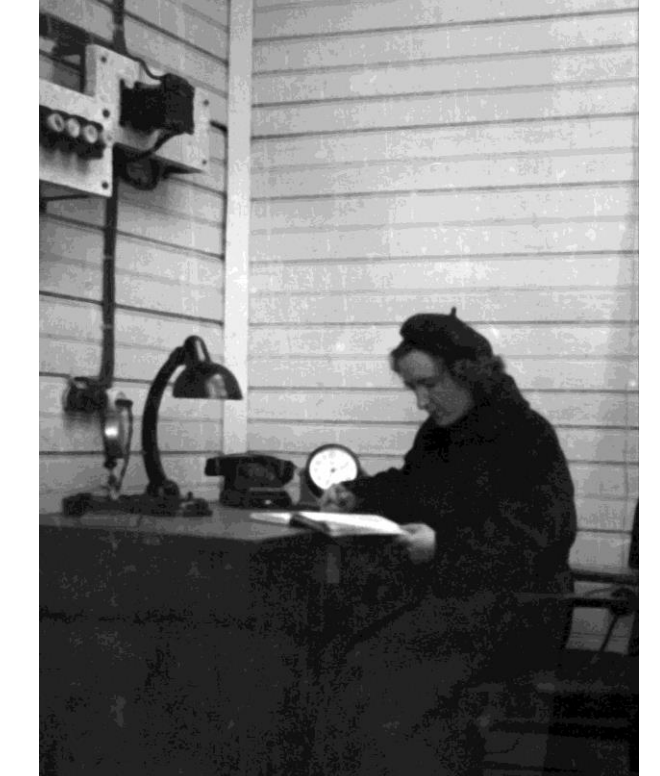
N.Persiyaninova. The 1960s.



Kitab international latitude station. October 1964.



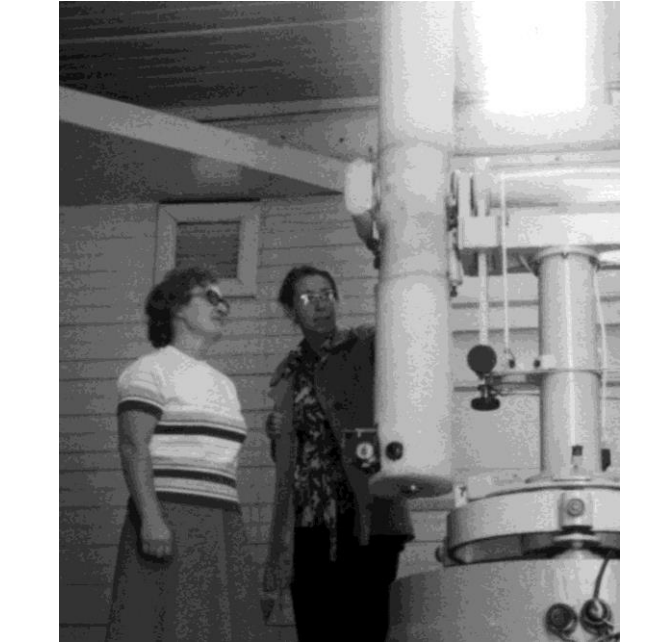
Poltava. 1967.



N.Persiyaninova inside the ZTF-135 pavilion. The 1970s.



N.Persiyaninova at the ZTF-135. The 1970s.



N.Persiyaninova and E.Prudnikova at the ZTF-135. The 1980s.



N.R.Persiyaninova. 1998.



L.D.Kostina and N.R. Persiyaninova in ?



N.Persiyaninova and E.Prudnikova at the ZTF-135. The 1980s.



Meeting on occasion of the 100th anniversary of ZTF-135. 2004.
Left foto: L.D.Kostina. Right foto: from left: (first row) Z.M.Malkin, L.D.Kostina; (second row) I.A.Zykov, V.A.Naumov, N.V.Fomina (Vytnova), E.Ya.Prudnikova.

