

Development of SLR facilities of VNIIFTRI and it's East-Siberian Branch

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VNIIFTRI – National Metrological Institute

Federal State Unitary Enterprise (FSUE) “National Research Institute for Physical-Technical and Radio Engineering Measurements” (VNIIFTRI) is subordinated to Federal Agency on technical regulation and metrology of Russia. It has the status of the State scientific metrological center and is one of the main centers of the State standards of Russia. The VNIIFTRI plays role of the Main Metrological Center (MMC) of State service of time, frequency and EOP evaluation (SSTF).

SLR activity – Observations

Currently, satellite laser ranging (SLR) facilities of the FSUE “VNIIFTRI” include: measuring SLR stations located in the Mendeleevo (VNIIFTRI) and Irkutsk city (East-Siberian Branch of VNIIFTRI), each of which is equipped with measuring SLR instruments of the old and new generations (“Sazhen-TM-Bis” and “Tochka”), as well as software and hardware for secondary processing and analysis of SLR measurement data. They operate both in a daily SLR service and in the interests of individual measurement campaigns.



Fig.1. Sazhen-TM-Bis in Mendeleevo



Fig.2. Sazhen-TM-Bis in Irkutsk

One of the main observation program is the providing of observations of the geodetic passive satellites Lageos-1 and Lageos-2 as such as Etalon-1 and Etalon-2 for purpose of Eath's orientation parameters evaluation (LOD variation and terrestrial pole).

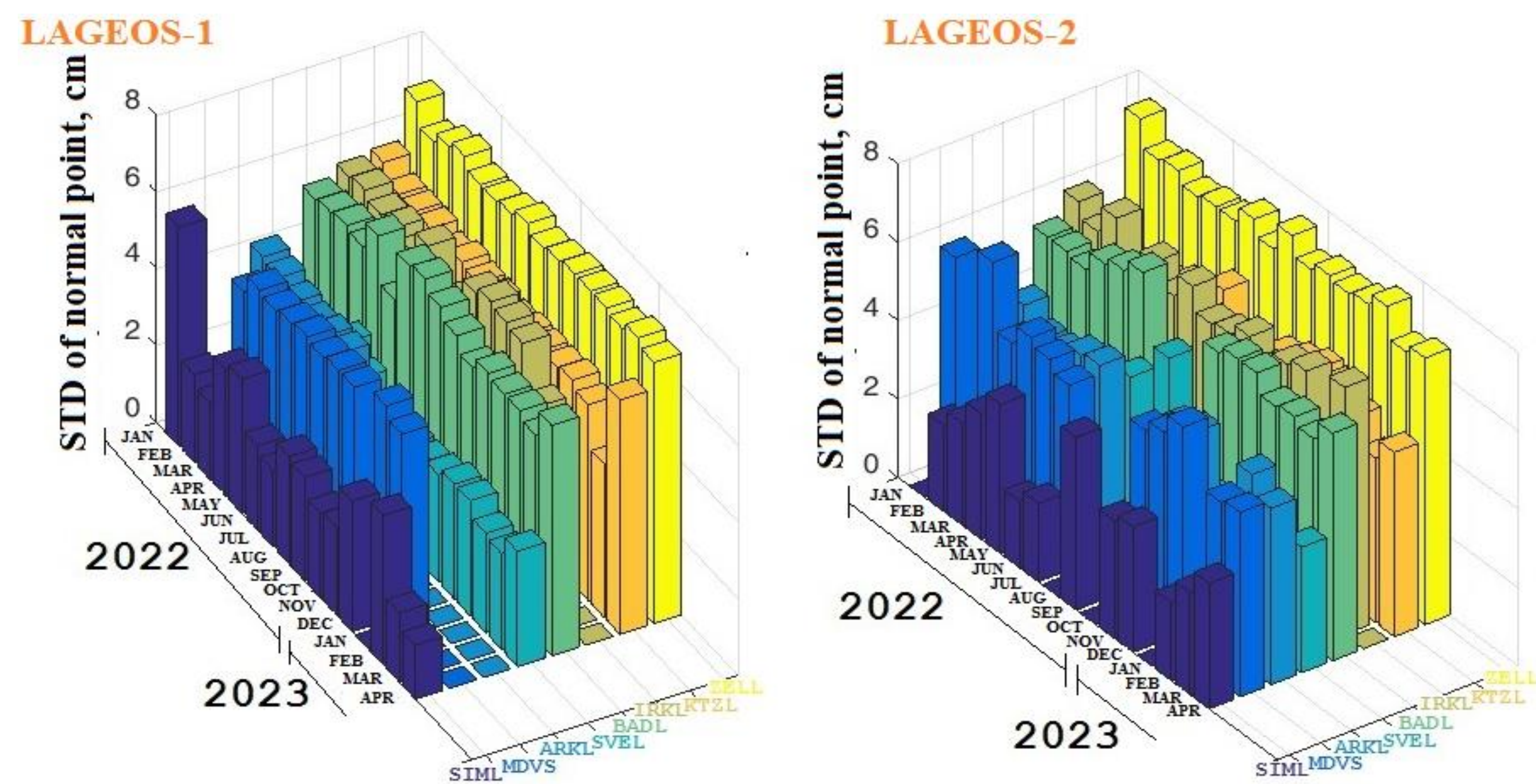


Fig.3. STD of normal point of some russian SLR stations (according to EDC normal point files)

The observations of other satellites (such as GNSS satellites, including Beidou and Galileo satellites, and others missions satellites such as hy2c, geoik2, jason3, starlette, sentinella, stella, ajisai and so on) are providing also.



Fig.4. The calibration column



Fig.5. The Special Standard of Length to 60 m

The SLR equipment is calibrated on calibration distance which length is periodically controlled by laser instrument which is calibrated by the Long Distance Standard. The time scale of SLR stations are calibrated by the comparison with Primary Time and Frequency Standard.

1. Tsyba E.N. Calculation of Earth communication parameters based on the results of satellite laser ranging of the international ILRS network// Proceedings of the Institute of Applied Astronomy of the Russian Academy of Sciences. 2016. No. 38. pp. 66-70.
2. E.N.Tsyba, O.A.Volkova, Improving software tools for determining global geodynamic parameters using satellite laser ranging at the Federal State Unitary Enterprise "VNIIFTRI", presented on this Workshop.



Fig.6. “Tochka” in Mendeleevo



Fig.7. “Tochka” tower in Irkutsk

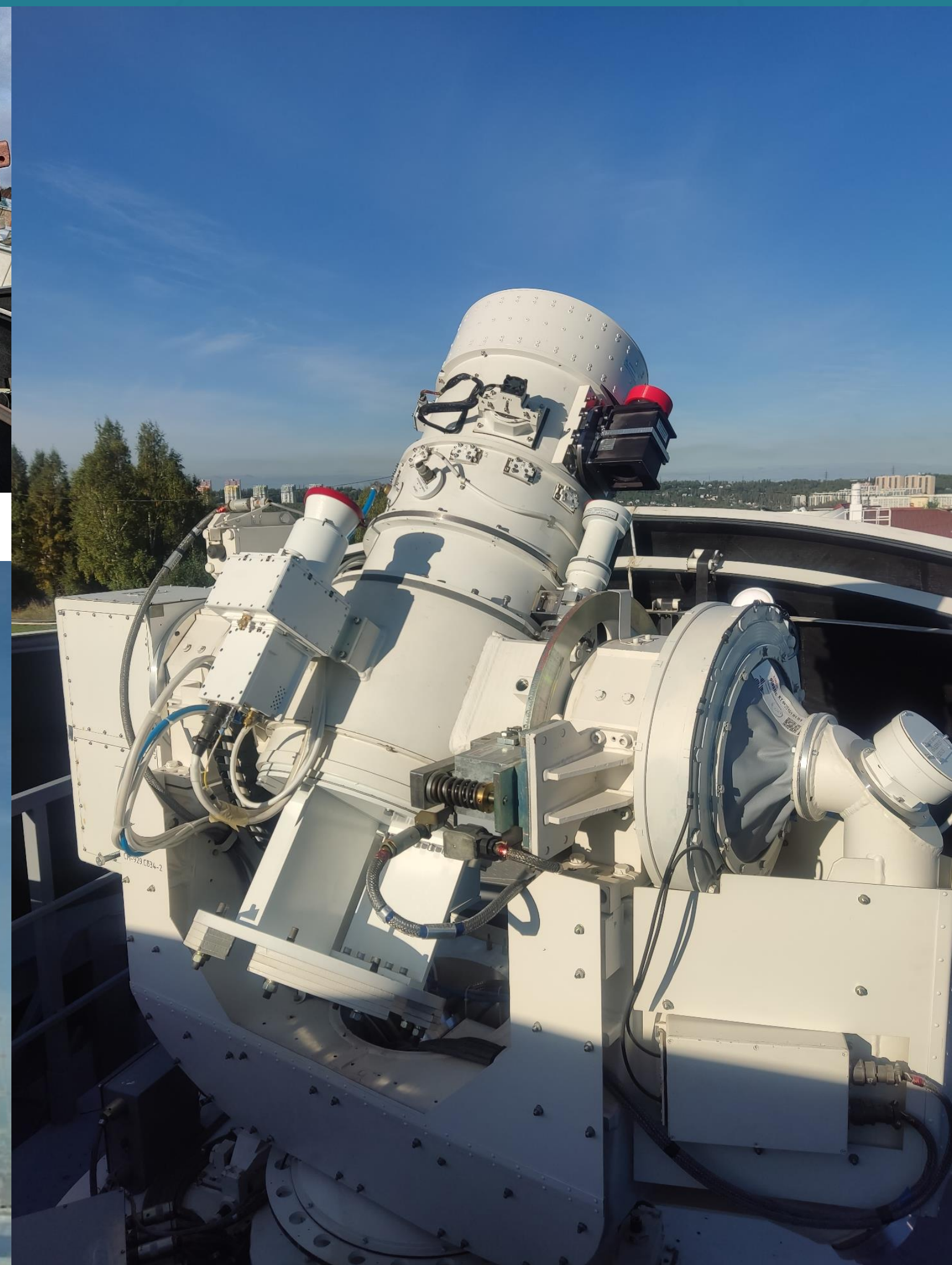


Fig.8. “Tochka” in Irkutsk

The two SLR instruments of the new generation of the type “Tochka” are started experimental measurements in Mendeleevo (VNIIFTRI) and Irkutsk city (East-Siberian Branch of VNIIFTRI) with millimeter accuracy.

SLR activity – Data processing

The daily EOP evaluations are providing in VNIIFTRI which plays role of MMC SSTF. The combined EOP values are evaluated as a VLBI, SLR and GNSS EOP raws data combination result in everyday EOP service mode.

The secondary SLR processing for terresrial pole coordinates evaluation is providing with the help of software which had developed by E.Tsyba [1] in daily mode.

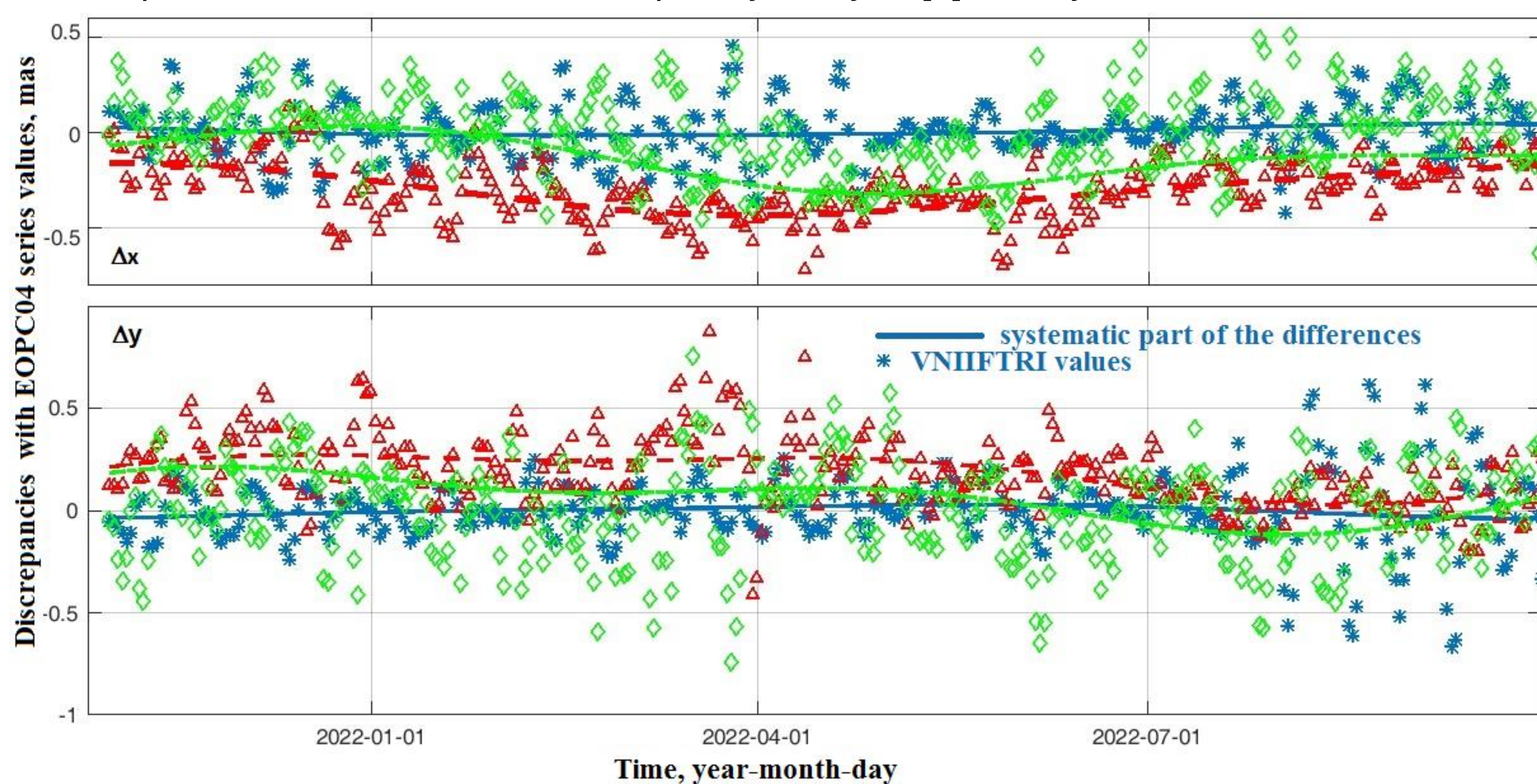


Fig.9. Differences x and y VNIIFTRI and EOPC04 values (asterisks) and some other centers.

The SLR terresrial pole coordinates are published in Bulletines E SSTF every quarter of year.

Fig.10. The SLR terresrial pole coordinates in Bulletines E SSTF for second quarter of 2024

11. ЗНАЧЕНИЯ ПОСРЕДСТВЕННОЙ ПОСКОРОСТИ ИСК. ДВИЖЕНИЯ, В СИСТЕМЕ ВРЕМЕНИ И КООРДИНАТ ПОЛОСА									
Дата, 00-00-00	X	Y	Дата, 00-00-00	X	Y	Дата, 00-00-00	X	Y	Дата, 00-00-00
2024-01-01	1.000000000	0.000000000	2024-01-01	1.000000000	0.000000000	2024-01-01	1.000000000	0.000000000	2024-01-01
2024-01-02	1.000000000	0.000000000	2024-01-02	1.000000000	0.000000000	2024-01-02	1.000000000	0.000000000	2024-01-02
2024-01-03	1.000000000	0.000000000	2024-01-03	1.000000000	0.000000000	2024-01-03	1.000000000	0.000000000	2024-01-03
2024-01-04	1.000000000	0.000000000	2024-01-04	1.000000000	0.000000000	2024-01-04	1.000000000	0.000000000	2024-01-04
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2024-01-08	1.000000000	0.000000000	2024-01-08	1.000000000	0.000000000	2024-01-08	1.000000000	0.000000000	2024-01-08
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2024-01-18	1.000000000	0.000000000	2024-01-18	1.000000000	0.000000000	2024-01-18	1.000000000	0.000000000	2024-01-18
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2024-01-27	1.000000000	0.000000000	2024-01-27	1.000000000	0.000000000	2024-01-27	1.000000000	0.000000000	2024-01-27
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2024-01-30	1.000000000	0.000000000	2024-01-30	1.000000000	0.000000000	2024-01-30	1.000000000	0.000000000	2024-01-30
2024-01-31	1.000000000	0.000000000	2024-01-31	1.000000000	0.000000000	2024-01-31	1.000000000	0.000000000	2024-01-31

Now, the new SLR processing software is under developing in VNIIFTRI. Something of this can be work with LLR observational data, calculate geocenter coordinates, gravity and other geodynamical parameters. Detailed discreaption one can be find in [2].

Conclusions

The SLR activity in VNIIFTRI has a quite satisfactory results. The nearest plans are to start observations on new SLR instruments “Tochka” in service mode and to update SLR processing hardware and software.