SNO-M SEXTANT CALIBRATION

USING OBSERVATIONS FROM KNOWN POSITON

Tested sextant: SNO-M (made in 1972). I aquired it in 2019. It is a Soviet clone of C. Plath sextant from WW2 period.

Problem: When I got this sextant in my hands it did not had any certificate of the arc correction with it. Besides it's performance was hardly predictable, because even similar angles showed different results. For example, the individual measurments in one lunar set differed typicaly 0,05- 0,15'. But after an hour another set gave considerably different error than the first set. Again individual measurments in second lunar set differed only insignificantly, the full degree value on the main arc was the same, but the final error could be different by 0,5' or more. It was clear that there is not only the main arc error involved here.

Solution: I measured 3 types of errors to be additionaly applied to the sextant reading as 3 different corrections:

1) the micrometer correction;

2) the correction of the shades;

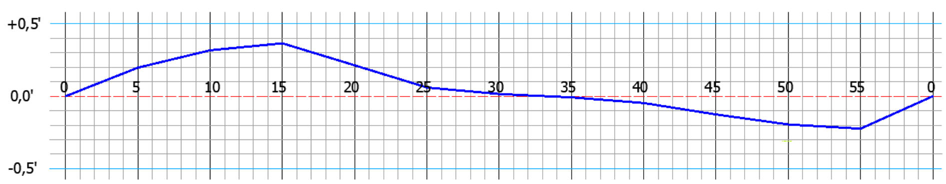
3) the main arc corrections.

MICROMETER CORRECTION

I put the instrument on the massive table and masured small angles (range 0º-1º; step 5') between 13 lines which were arranged in equal distances on the laptop's monitor. Monitor was situated about 6m distant. Then I avaraged the results of many sets and put them into graph.

As we can see from the graph below the sextant readings can reach 0,35' error only depending on position of the micrometer. The extremes are at 15' and 55' micrometer readings.

MICROMETER CORRECTION



THE CORRECTION OF THE SHADES

I measured SD of the Sun and Moon with different shade combinations. And then measured SD without mirror shades. I put special shades on the telescope to avoid mirror shade influcence (my SNO-M had 2 such filters for telescope). I found that some shade combinations gave 0,3’error.

CORRECTIONS OF THE MIRROR SHADES				
Index mirror	Y	R	B	G
	0,1	0,05	0	0,1
Horizon mirror		R	B	G
		-0,05	0,1	0,1

THE MAIN ARC CORRECTION

3 types of measurements were used to find the main arc correction :

1) Lunar distances;

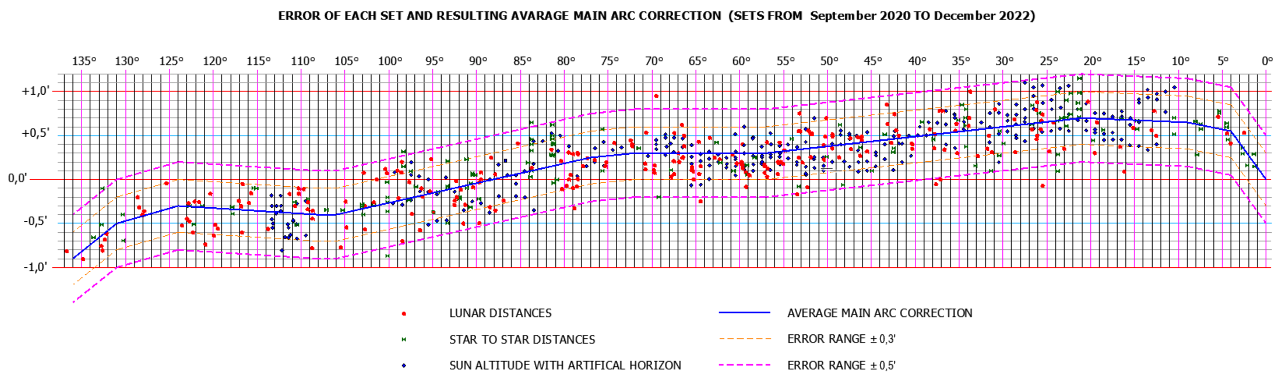
2) Star to star distances;

3) The Sun’s altitude with artifical horizon. Measured angle was compared with F. Reed’s GPS Antispoof app’s reading.

I corrected measured angles by applaying IC, micrometer correction, filter correction and then calculated difference between measured and calculated angle. All the results I ploted into a graph.

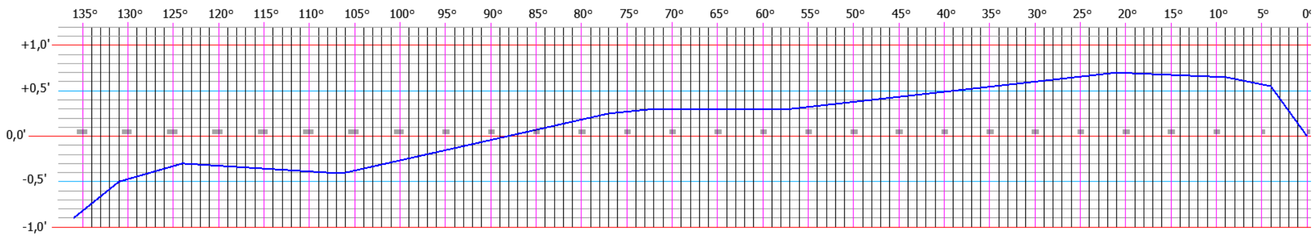
Measurements are made in very different conditions, including low temperatures, bad visibility etc.

In the graph below we can see **645** dots which represent 645 sets of observations (each set contains typically 3-7 measurements; it is approximately 3000 measurements in total).



Below we can see the final main arc correction graph:

MAIN ARC CORRECTION (SETS FROM September 2020 TO December 2022)



CONCLUSIONS

1) 88% of all sets are within range +/-0,3’.

2) Only 1,5% of sets are out of +/-0,5’ range.

3) The worst result is in error of 0,75’.

4) Micrometer can produce quite large errors.

5) The shades can produce additional errors.

When I aquired this sextant the error of readings could easily reach 1,5’. It is a good result for traditional navigation. But it is not enough good for lunar. After calibrating I have the same sextant with typical error +/-0,3’. Typical intercepts with the artifical horizon are now 0,05’-0,15’.