

# **Readiness of Maidanak observatory to the observations of optical transients during the O4 run**

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# Outline

- Introduction
  - UBAI
  - Maidanak observatory
  - 4m telescope named after Ulugh Beg
- Maidanak site characteristics for optical astronomy
- New cameras
- New telescope and camera
- Conclusion

# Uzbekistan



# Ulugh Beg Astronomical Institute (UBAI)

UBAI is one of the oldest institutions of  
Uzbekistan



# Ulugh Beg Astronomical Institute (UBAI)

- Scientific staff 51 of 140
- Main observational facility is Maidanak



# Main fields of research

- Minor planets
- Galactic Astronomy
- Physical variable stars, exoplanets and close binary systems
- Extragalactic objects (AGN, GLS)
- Space geodynamics
- Astroclimate (site testing)
- Theoretical astrophysics of compact objects, GR and gravitation effects

# Maidanak Observatory

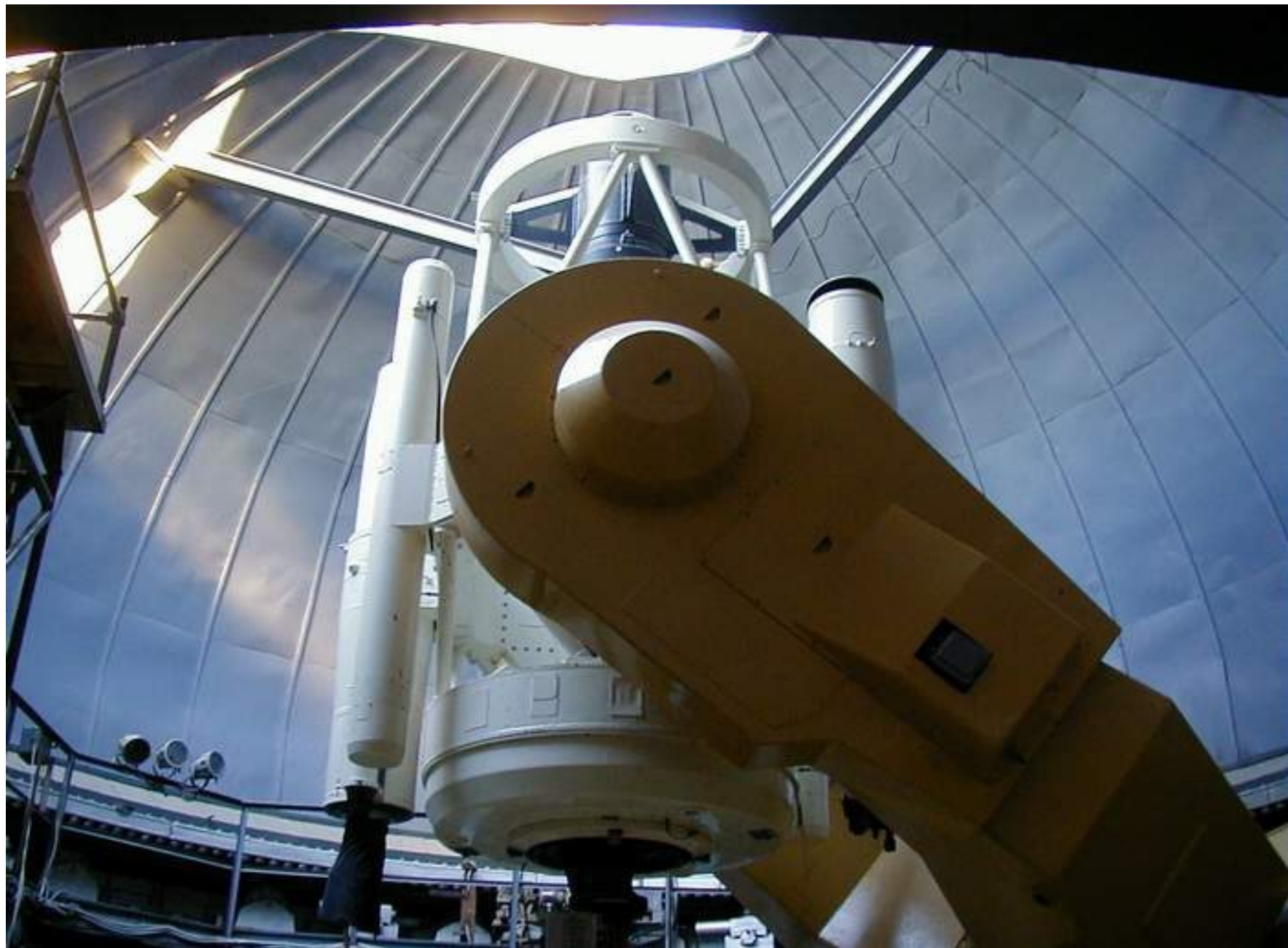
66°56"E, 38°41"N

2700 m asl





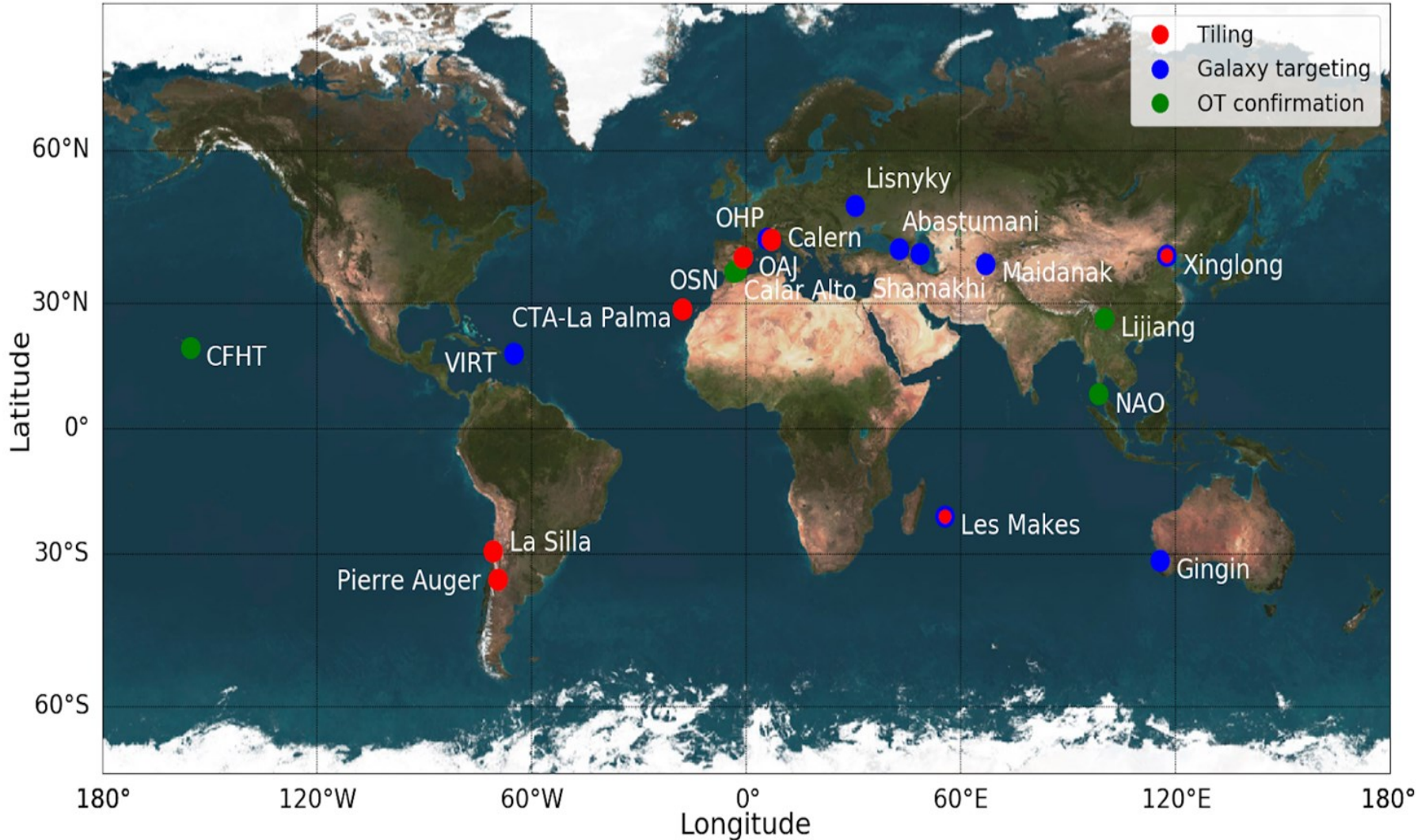








# GRANDMA



# Maidanak observatory

- Participates in GRANDMA with two 60 cm telescopes – Northern Zeiss-600 (NT) and Southern Zeiss-600 (ST)



# Telescopes of MAO

Focal instrumentation	Programs	Partners
<b>1.5 meter AZT-22 telescope (D = 1500 mm, F = 11500 mm (+long focus is f/11.5))</b>		
<b>SI 600 Series 4096x4096 CCD (Seoul National university)</b> <b>FOV 18' x 18'</b>	Near by galaxy Gravitational lenses Asteroids Blazars Seyfert galaxies GRB objects	Korea Russia Ukraine Japan Italy
<b>1 meter Zeiss-1000 telescope (D=1.0m, f=13300 mm)</b>		
<b>Apogee Alta-U 9000 CCD 3056x3056</b>	SAGE project - 70% of time UBAI - 30% available	NAOC
<b>Zeiss-600 0.6m telescope "North" (D = 600 mm, F = 7200 mm)</b>		
<b>FLI ML0580911 1024x1024</b>	Asteroids Exoplanets	Japan
<b>Zeiss-600 0.6m telescope "South" (D = 600 mm, F = 7200 mm)</b>		
<b>FLI IMG ProLine 1024x1024 CCD</b>	Blazars Variable stars	Italy
<b>Zeiss-600 0.6m telescope "East" (D = 600 mm, F = 7200 mm)</b>		
<b>AMT-1 0.5m telescope (D=51 cm, Corrected Ritchey–Chretien f/8)</b>		
<b>Apogee Alta-U16M CCD</b>	Exoplanets (Under discuss)	

Observation schedule h \*

January 2019

Duration of night h

12 hours

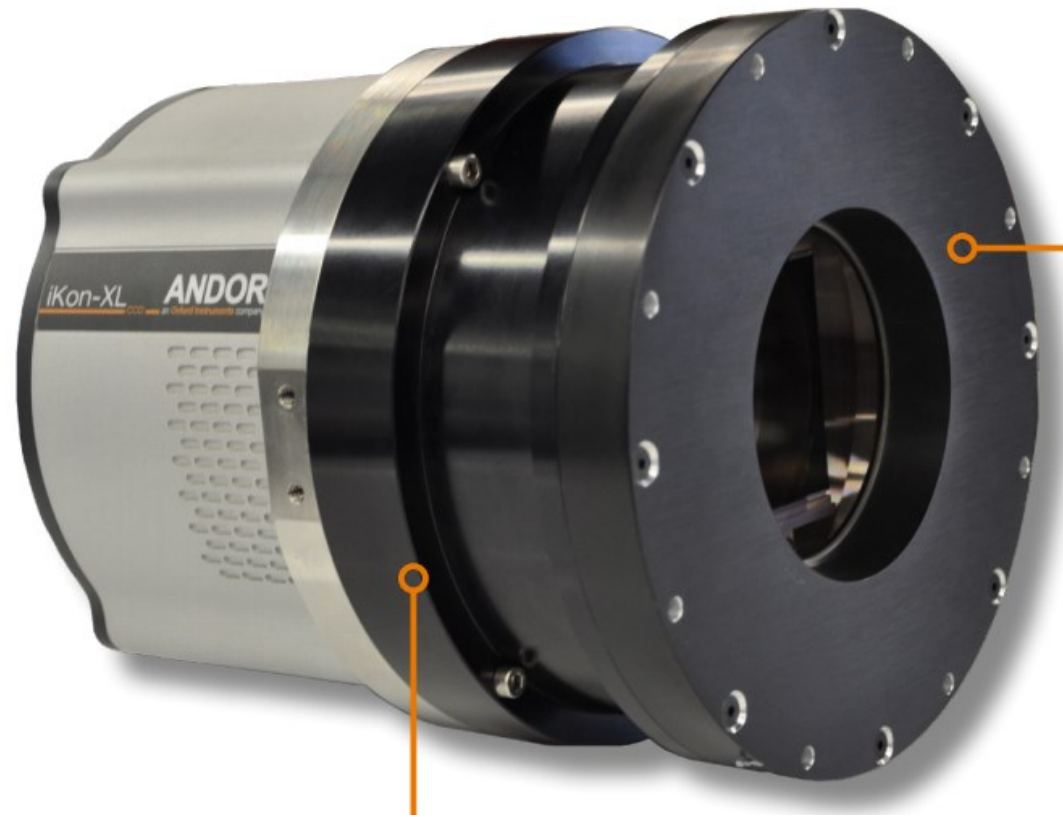
Telescope "AZT-22"

Lunar phases																
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1. GRB objects				2 h	2 h	2 h	1 h 30 m	1 h 30 m	1 h 30 m	1 h 30 m	1 h 30 m	1 h 30 m	2 h	2 h	2 h	
2. Nearby galaxies				3 h 30 m	3 h 30 m	3 h 30 m	2 h 30 m	2 h	2 h 30 m	2 h	2 h 30 m	2 h	3 h 30 m	3 h 30 m	3 h 30 m	
3. Gravitational lenses				3 h 30 m	3 h 30 m	3 h 30 m	2 h	2 h 30 m	2 h	2 h 30 m	2 h	2 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	
4. Asteroids							4 h 30 m	4 h 30 m	4 h 30 m	4 h 30 m	4 h 30 m	4 h 30 m				
5. Blazars				1 h 30 m	1 h 30 m	1 h 30 m		1 h		1 h		1 h	1 h 30 m	1 h 30 m	1 h 30 m	
6. Seyfert galaxies + OC				1 h	1 h	1 h	1 h		1 h		1 h		1 h	1 h	1 h	
7. Urgent observations				30m	30m	30m	30m	30m	30m	30m	30m	30m	30m	30m	30m	

Lunar phases																	
Date	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
1. GRB objects	1 h 30 m	1 h 30 m	2 h	2 h	2 h	2 h	2 h	2 h	2 h	2 h	2 h	1 h 30 m	1 h 30 m	1 h 30 m	1 h 30 m	2 h	
2. Nearby galaxies	2 h 30 m	2 h	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	2 h 30 m	2 h 30 m	2 h 30 m	2 h 30 m	3 h 30 m	
3. Gravitational lenses	2 h	2 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	3 h 30 m	2 h	2 h	2 h	2 h	3 h 30 m	
4. Asteroids	4 h 30 m	4 h 30 m										4 h 30 m	4 h 30 m	4 h 30 m	4 h 30 m		
5. Blazars		1 h	1 h 30 m	1 h 30 m	1 h 30 m	1 h 30 m	1 h 30 m	1 h 30 m	1 h 30 m	1 h 30 m	1 h 30 m	1 h		1 h		1 h 30 m	
6. Seyfert galaxies + OC	1 h		1 h	1 h	1 h	1 h	1 h	1 h	1 h	1 h	1 h		1 h		1 h	1 h	

# New set of Andor cameras

- Three Andor cameras purchased for ~400kEUR
- iKon-XL (XL-EA07-DS)
- iKon-L (DZ 936N-BEX2-DD)
- Apogee Aspen CG 230-1-G09-S58



# 4 m telescope initiative

- New telescope project



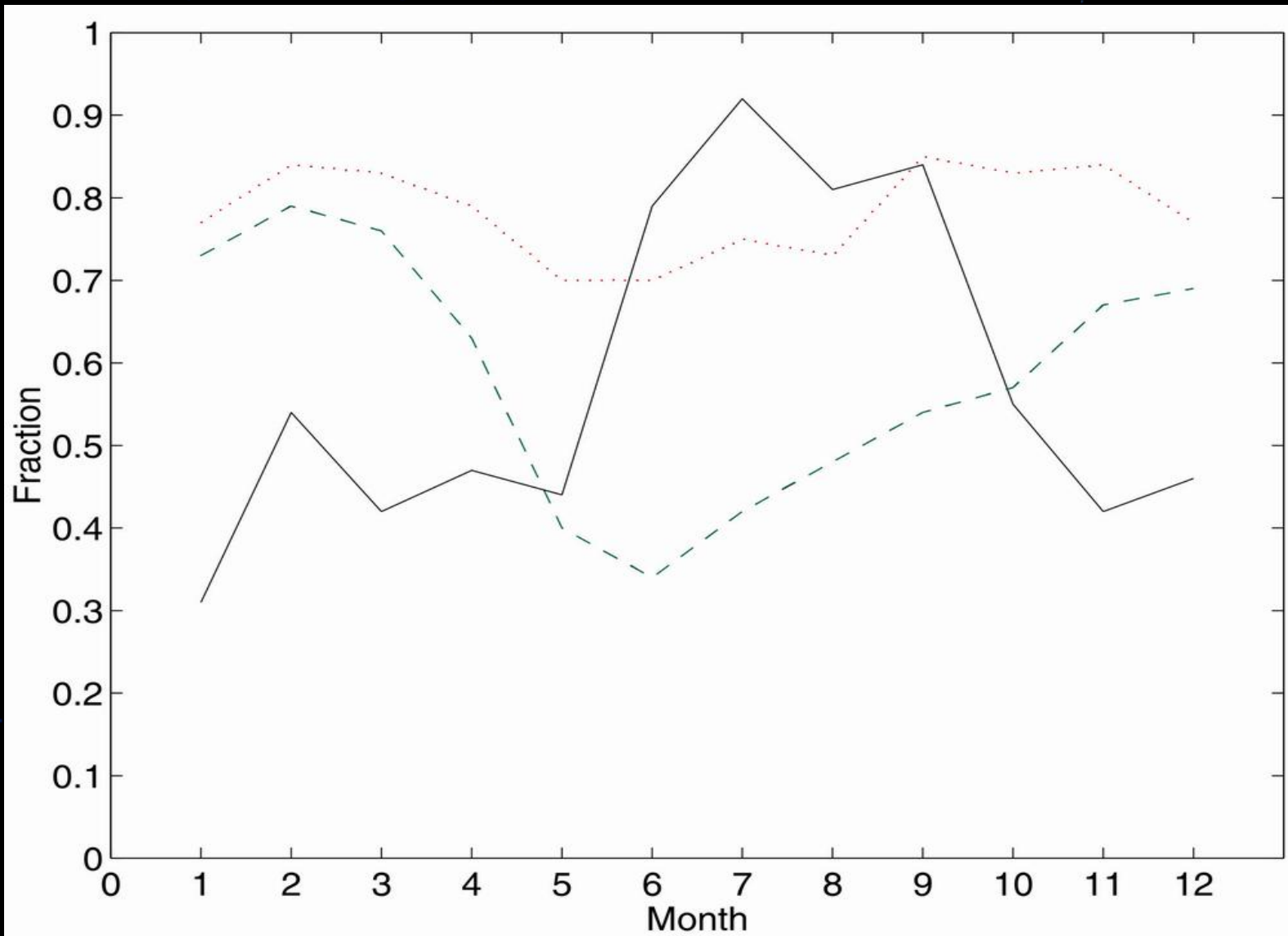
# Atmospheric conditions at the Maidanak observatory

- Site testing (astroclimate)
- The parameters of the atmosphere above the observatory relevant to optical astronomy

# New studies of astroclimate

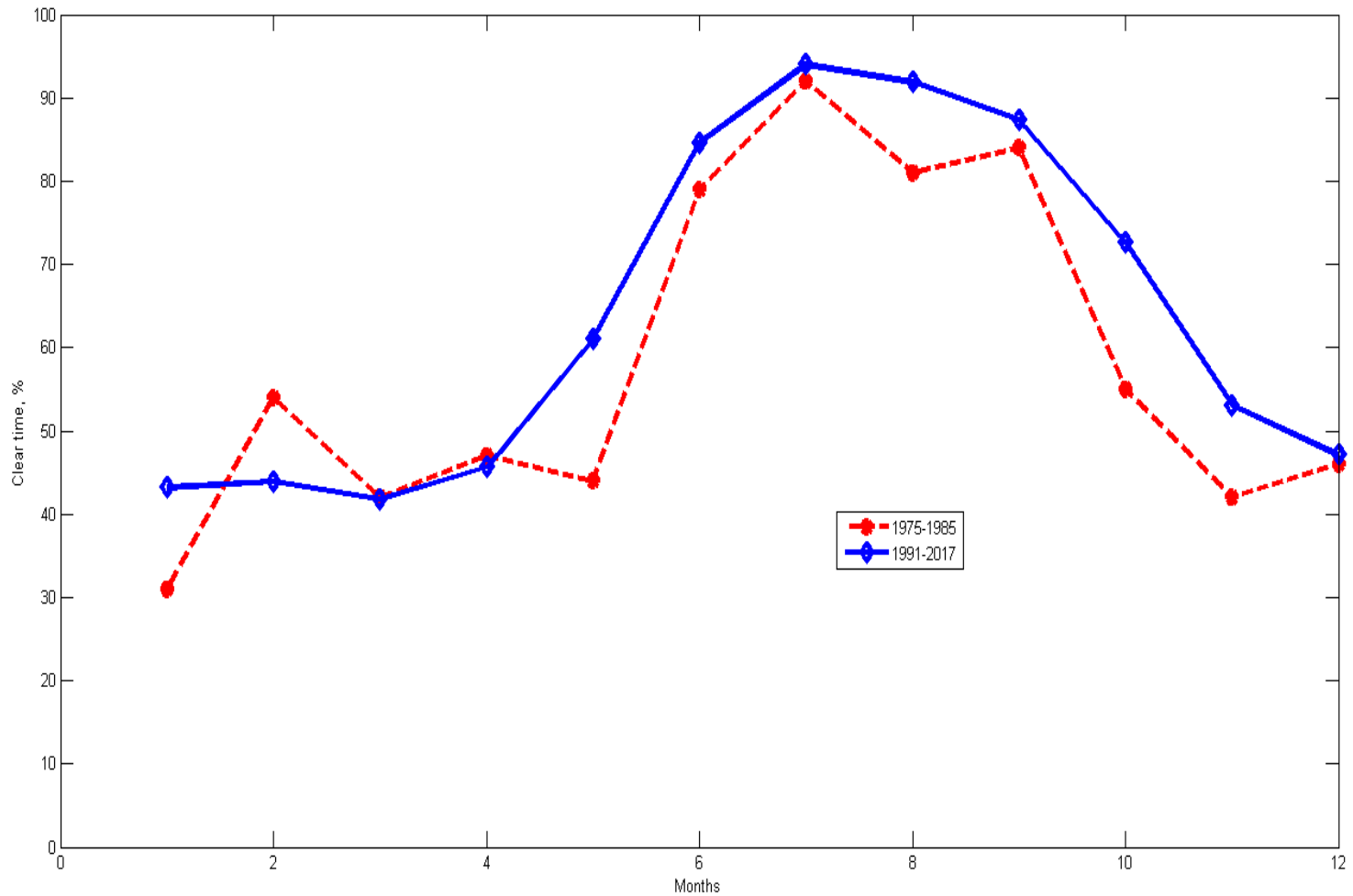
- The project of 4-meter telescope acted as a new motivation to re-initialize site testing measurements
- The next slides show new data about atmospheric conditions of Maidanak observatory

# Monthly fraction of clear nights



Ehgamberdiev et al, 2000 *Astron.Astrophys.Suppl.Ser.*, v. 145. p.293.

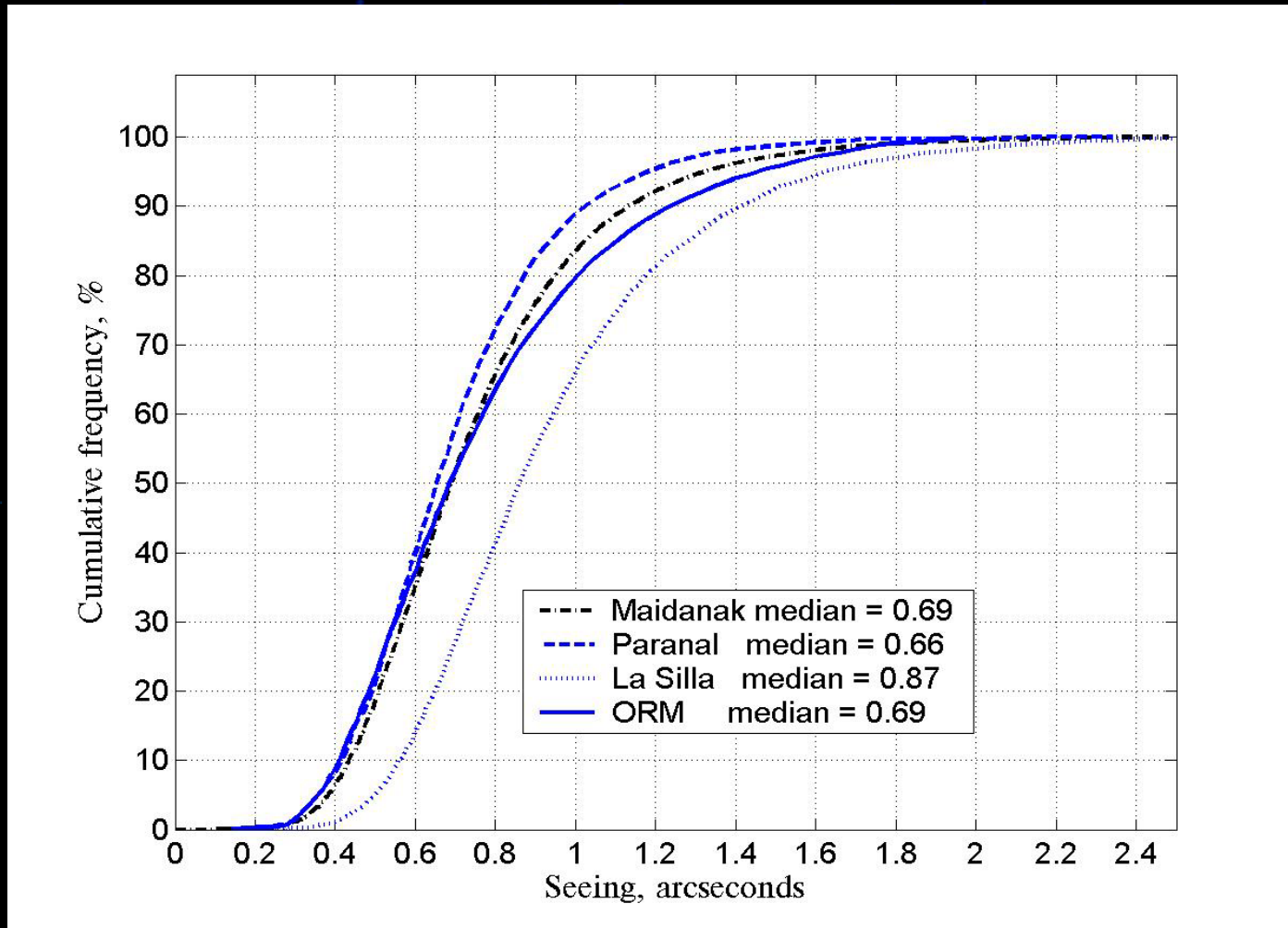
# Data of 1991-2017



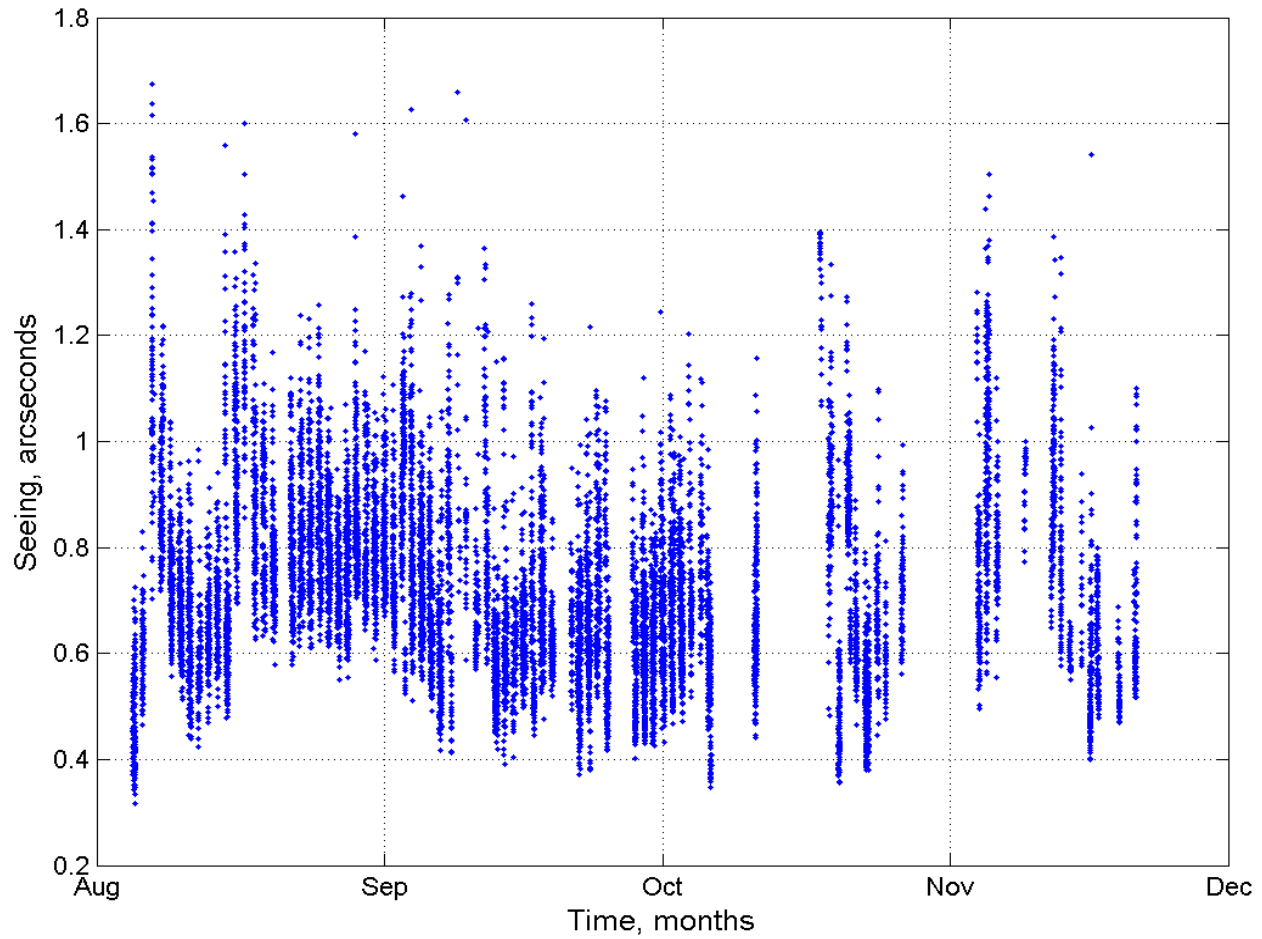
# Differential image motion monitor (DIMM)



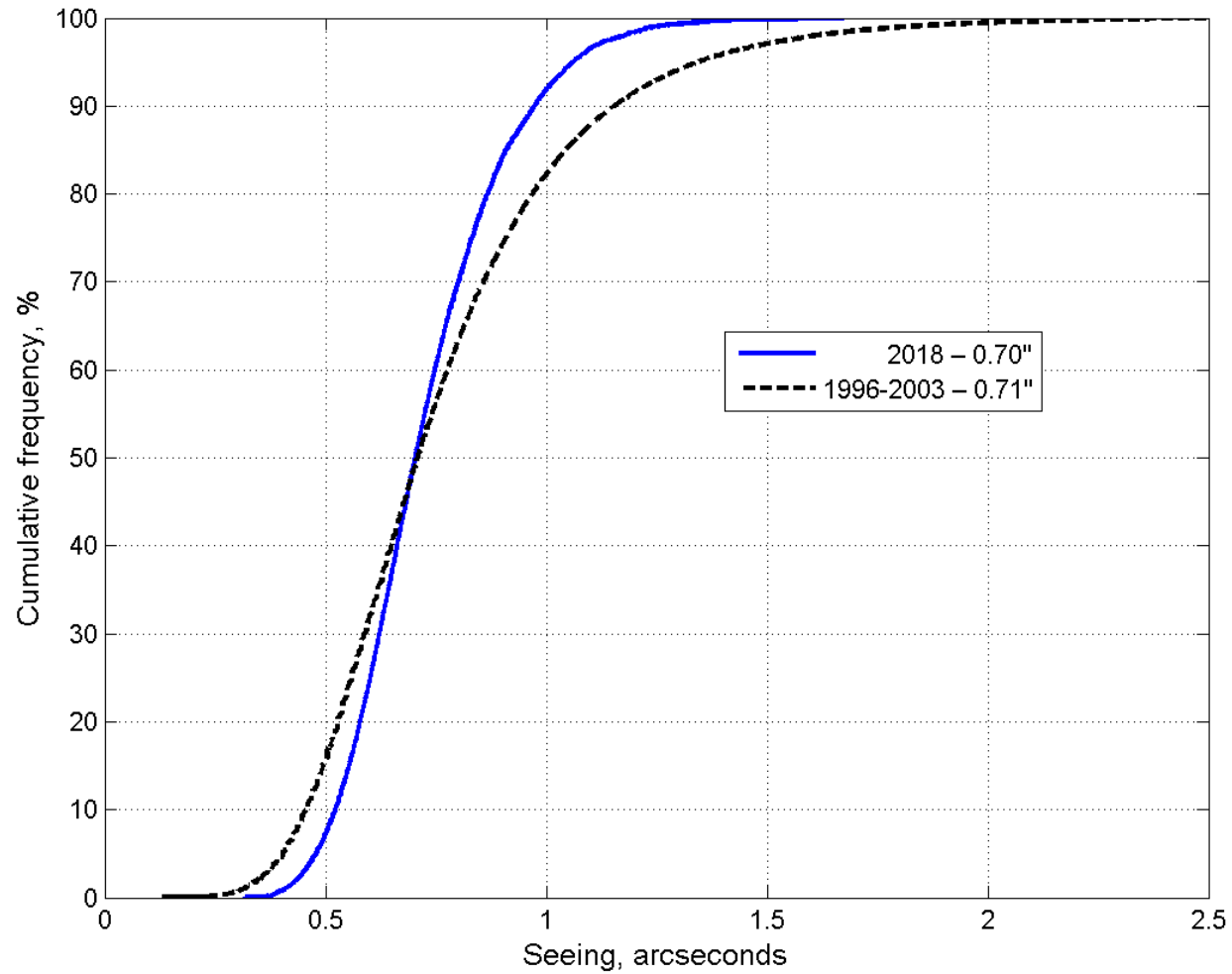
# Seeing conditions at Mt. Maidanak



# Seeing data of 2018



# Seeing – data of 2018

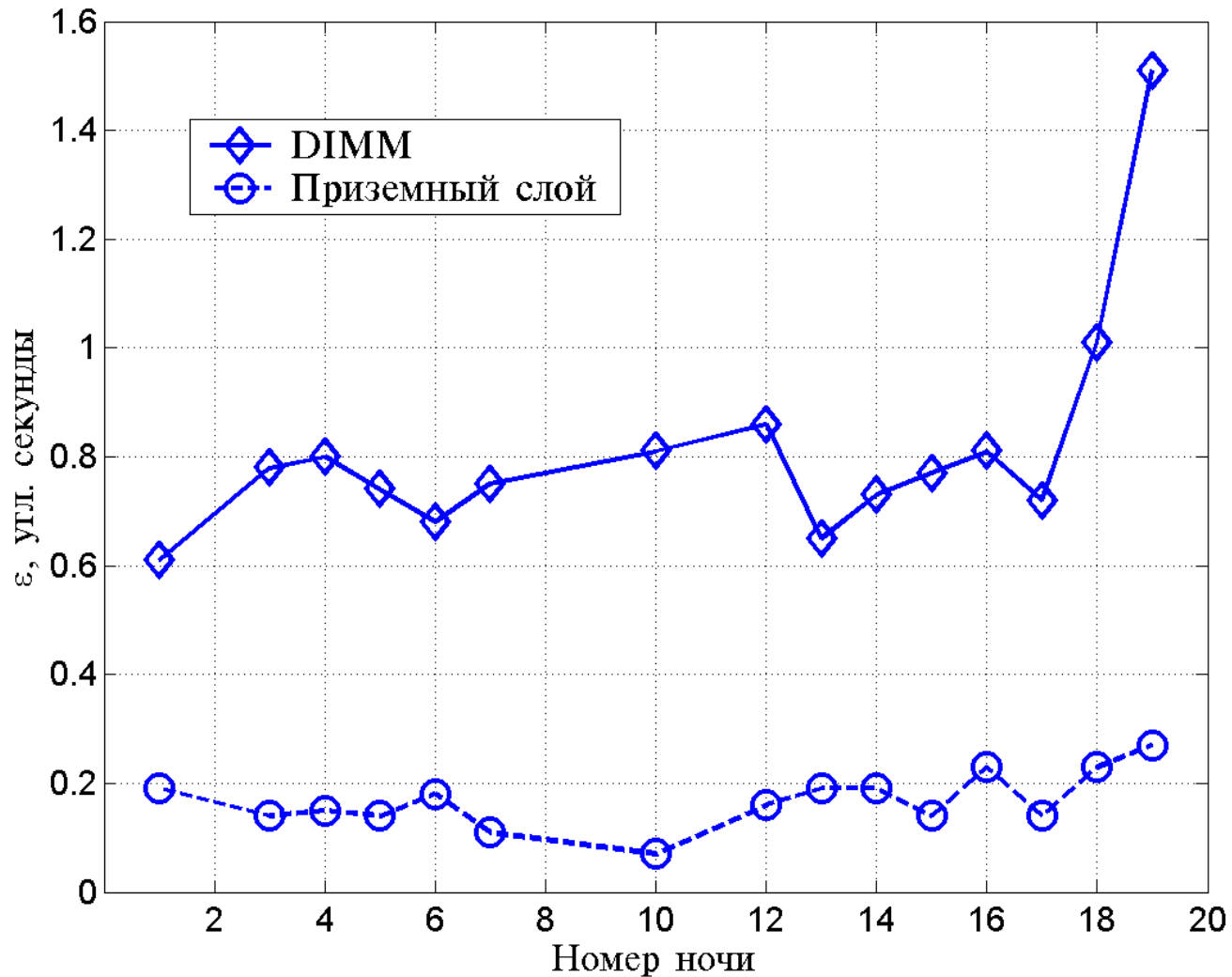




# Seeing-data of 2018

Months	1996-2003 ( $\epsilon_{\text{FWHM}}$ , arcseconds)	2018 ( $\epsilon_{\text{FWHM}}$ , arcseconds)	Difference
August	0.72	0.77	+0.05
September	0.70	0.66	-0.04
October	0.69	0.65	-0.03
November	0.65	0.75	+0.10
<b>Total</b>	<b>0.71</b>	<b>0.70</b>	<b>-0.01</b>

# Contribution of the surface layer



# UBAI participation in GRANDMA

Since 2019

Yusuf Tillayev

Otabek Burkhonov

Tatyana Sadibekova

Yodgor Rajabov (pre-PhD student)

# Uzbekistan team telescopes

Responsible person for observations Yodgor Rajabov

## **For observations we are going to use:**

- 0.6 meter “North” telescope – NT-60
- 0.6 meter “South” telescope – ST-60
- Probably we will be able to use the 1.5 meter telescope (under discussion) if:
  - It is possible to interrupt the telescope program
  - The object is fainter

All of the telescopes have CCD and UBVRI filters.

# UBAI ST-60 and NT-60 photometry

- Photometry contact person – Otabek Burkhonov
- Photometry routine
  - Real-time astrometry on the telescope MaxIm DL (UCAC 4 catalogue)
  - custom aperture photometry via MaxIm DL
  - full field source checking by SExtractor software
  - Final photometry using custom STDPipe-based pipeline, run manually
  - Alternative independent processing based on IRAF by using our own scripts

# New telescope

- GRB and GW optical counterparts
- Target of opportunity objects (ToO) become more and more important
- Since the 4-m telescope is a long term project, a small but powerful telescope required.

# 80-cm telescope

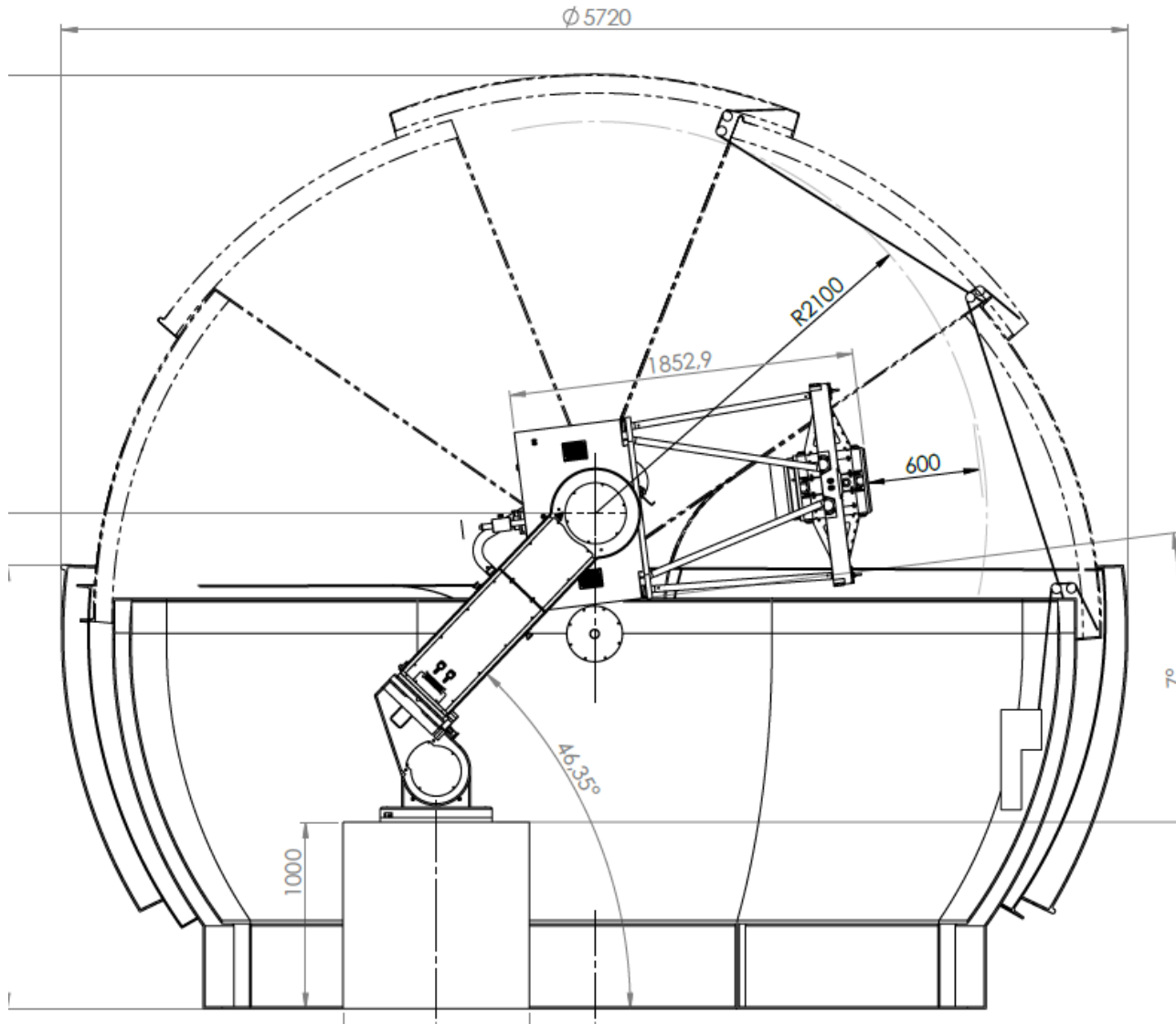
- In collaboration with GRANDMA
- With financial support of the ministry of Innovative development

# Budget

	Estimated (keuros)	Proposition (keuros)
Mount+ wheel filter	400	ASA: 340
Camera	50	QHYCCD: 50
Dome	100	ASA: 50
Installation	40	ASA: 10 (+5 for outside Europe)
Maintenance	20/yr	



# EQ800PF f2,26





# Conclusion

- A project of the 4 m telescope has been initiated
- New measurements of the atmospheric parameters have been carried out
- New studies confirm high quality conditions for optical astronomy
- Installation of 80 cm telescope is in progress for GW, GRB counterparts observations

# Thanks for your attention!

