On collaboration between UBAI and FAI: instrumentation development, installation and upgrade in Maidanak

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Central Asia: unique location for observational astronomy

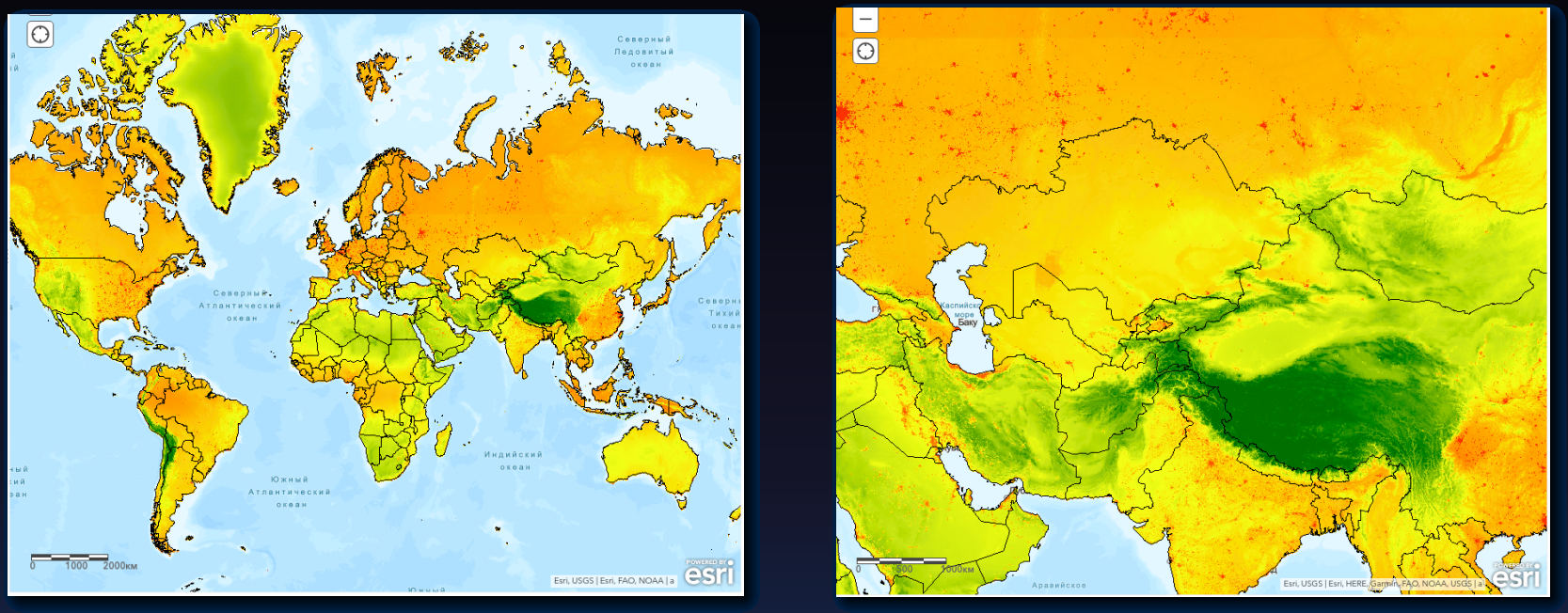
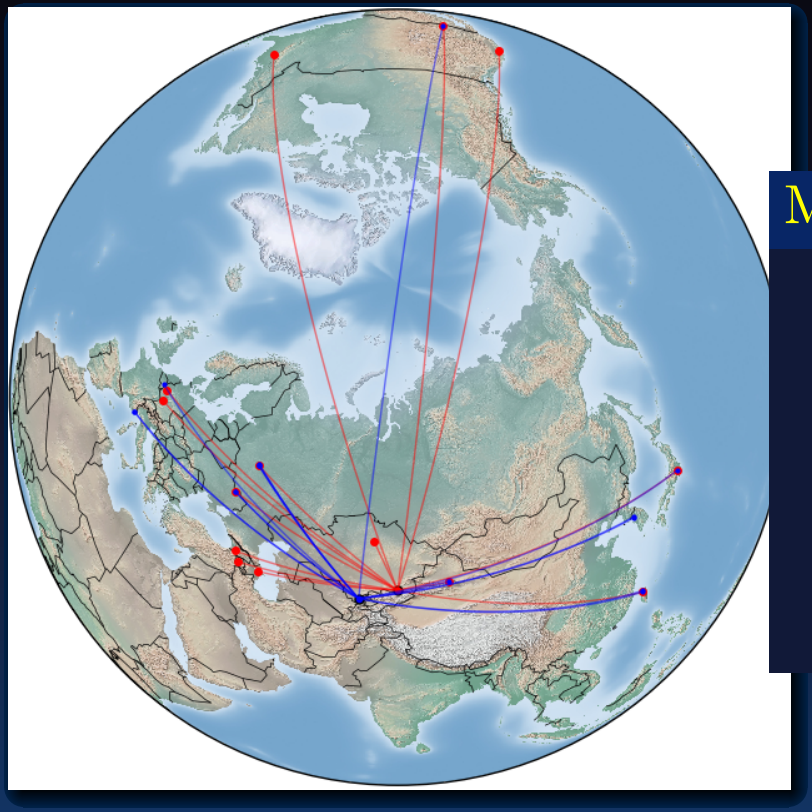


Figure from: N. Aksaker, S. K. Yerli, M. A. Erdoğan, Z. Kurt, K. Kaba, M. Bayazit, C. Yesilyaprak Global Site Selection for Astronomy //MNRAS. - 2020. - V.493. - P.1204–1216 https://doi.org/10.1093/mnras/staa201

"...Therefore, a location having a high SIAS series D value would be chosen for an observatory site, for example, working in the infrared band or expecting higher resolutions in both imaging and spectroscopy. This series will thus be called seeing preferred."

See https://www.astrogis.org/database/dbCU - for more details

UBAI & FAI: common past and ties



Main pro and cons

- "Close geographical location" - poor communication !
- "Different scientific Schools" - No cross-pollination !
- "Diverse international collaborations" - No three-parties grants and projects !

How about the future?

On some possible collaboration:

- Share experience on automation & remote control
- AZT-22 upgrade using our experience with AZT-20
- Spectroscopic instrumentation and spectral data analysis
- Making domes yourself
- Zeiss-800 upgrade: installation on Maidanak?
- Wide-field system as a new instrument for Maidanak
- Sharing experience in data processing
- Astroclimate research at Assy-Turgen in collaboration with UBAI

Share experience on automation & remote control

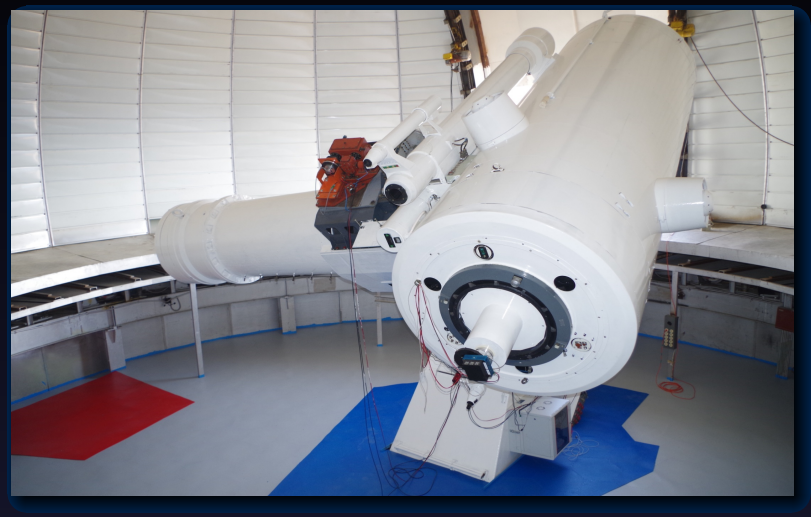
What was done at FAI

1. Two “Zeiss-1000” renovation: telescope optics, telescope control, dome control, remote operation
2. Developing infrastructure at Assy-Turgen: make it plug-and-play

What is useful for UBAI

- Upgrade 60-cm telescope on Maidanak (fully automated, remote control)
- Maidanak infrastructure developing (easy to install more instruments)

AZT-20 reincarnation & upgrade

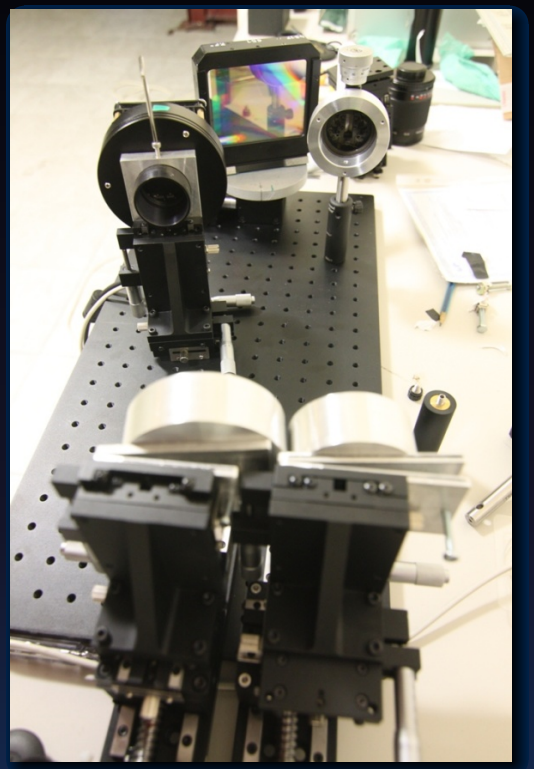


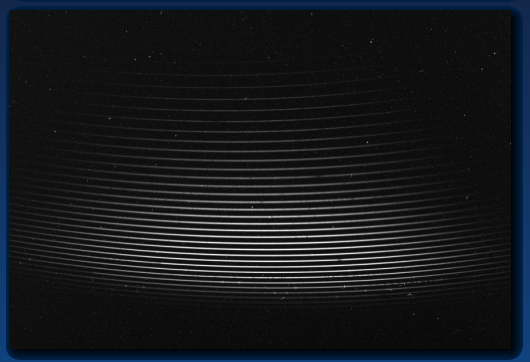
- Total renovation in 2 years: from “not finished” to “fully operational”
- New optical system: it was f/16, it is now f/3.8
- New telescope control
- Dome reconstruction and automation
- Control-room and leaving-rooms on tower

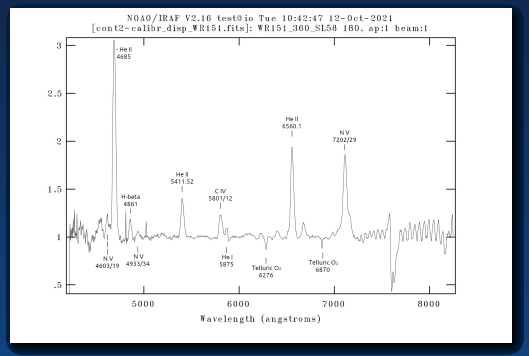
How to use it for Maidanak

We may share our experience to upgrade AZT-22. Team of engineers from UBAI may visit FAI in near future.

Spectroscopic instrumentation and data analysis







What was done at FAI

1. Slit and echelle spectroscopy on Zeiss-1000
2. Slit spectroscopy on AZT-20 using VPH gratings
3. Master-class or summer schools on spectroscopic data analysis

How this might be useful for Maidanak

- Design spectrograph for AZT-22
- New field of research at UBAI - new funding (grants, projects)

Dome constructions experience

What was done at FAI

1. Dome for NUTELLA
2. Dome for RC500

How this might be useful for Maidanak

- Upgrade existing facilities at Maidanak
- Further development of observing sites in Uzbekistan (Educational Observatories Network)
- Telescope relocation from other sites to Maidanak

Zeiss-800 upgrade

What was done at FAI

1. Mechanics upgrade of Zeiss-800: D=800 mm, F=6400 mm
2. Control system upgrade of Zeiss-800

How this might be useful for Maidanak

- Installation on Maidanak ?
- GRB observations ?
- UBAI-FAI projects ?

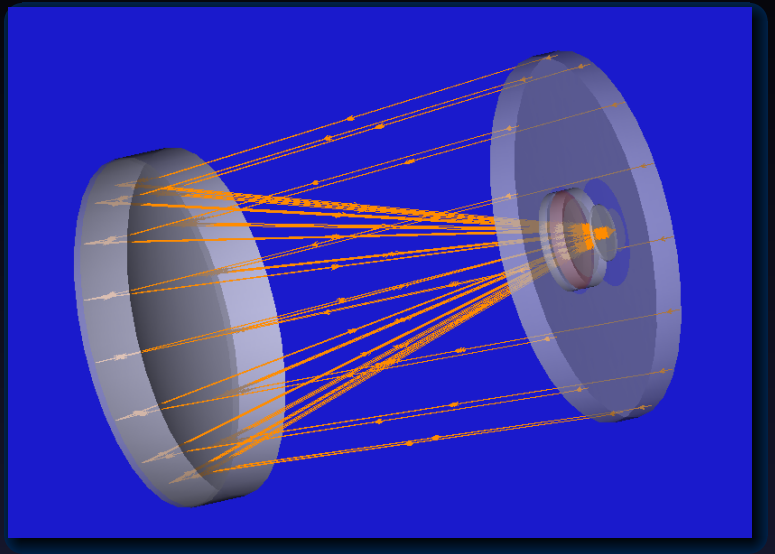
Wide-field systems

What was done at FAI

1. Design wide-field optical system: D=400 mm, F=550 mm, f=1/1.37
2. Mount on Direct-Drive (up to 60 deg/sec)
3. Install in new dome (local production)
4. Apply project to develop regional SSA system

How this might be useful for Maidanak

- New project for regional SSA system development at Maidanak (Sufa ?)
- New capabilities to observe LEO
- Effective systems to search for space debris



Sharing experience in data processing

What was done and should be continued

1. Summer school on photometric and spectroscopic data analysis in 2016. One more summer school after pandemic ?
2. On-line seminars UBAI-NU-FAI
3. Code sharing
4. Experience in astroplates processing and analysis

Astroclimate research at Assy-Turgen in collaboration with UBAI

What should be done

Very reach experience of UBAI in astroclimate research might be useful for:

1. Refined astroclimate parameters of Assy-Turgen
2. Apply for funding this project one more time ?
3. Search for not competitive but complementary features of two sites
4. Search for other sites around the Central Asia and Kazakhstan

Final remarks

On benefits for UBAI and FAI

1. Observations at Maidanak and Assy-Turgen:
   - Avoid weather issue
   - Complementary
   - Data sharing
2. Data analysis:
   - Faster reduction (on-board data processing)
   - Diversifying methods and algorithms (error free!)
3. Engineering at FAI $\rightarrow$ new instrumentation for UBAI
   - Spectroscopy on Maidanak
   - Wide-field systems
   - Upgrading existing instruments of UBAI

Together we may do more and better!