Astronomy for the developing world
IAU Special Session no. 5, 2006
J.B. Hearnshaw and P. Martinez, eds.

doi:10.1017/S1743921307006928

Astronomy in the former Soviet Union 15 years after the breakup of the USSR

Nikolai G. Bochkarev[1]

[1]Eurasian Astronomical Soc. (EAAS) and Sternberg Astronomical Inst. (SAI), Moscow, Russia
email: boch@sai.msu.ru

Abstract. During the immediate post-Soviet period, the main infrastructure of astronomy over the territory of the former Soviet Union (FSU) was saved, in spite of dramatic decreases in financial support. Overall the situation for FSU astronomy is now stable. In Latvia, the 32-m radio-dish is in working order. This allows it to participate in VLBI programmes. In Russia, all three 32-metre radio dishes of the QUASAR VLBI system are operational, as well as the 2-m telescope with a high-resolution spectrograph (up to resolution $R \simeq 500\,000$) and the horizontal solar telescope ($R = 320\,000$) of the Russian-Ukrainian Observatory on Peak Terskol (Caucasus, altitude 3100 m). However the situation with the observatory itself is worrying, because of the regional authorities' attempt to privatize its infrastructure.

The process of equipping a number of Commonwealth of Independent States (CIS) (including Russian) observatories with CCD-cameras is in progress. To solve staff problems, Kazakhstan, Tajikistan and Uzbekistan have begun to prepare national specialists in astronomy, and the Baltic States, Armenia, Azerbaijan, Georgia, Russia, and Ukraine continue to prepare astronomers.

Teaching of astronomy at schools is obligatory only in the Ukraine and partially in the Baltic states. To maintain a "common astronomical area", the Eurasian Astronomical Society (EAAS) continues its programme of reduced-price subscription to Russian-language astronomical journals and magazines in the territory of FSU, the organization of international conferences and Olympiads for school students, and lectures for school teachers and planetarium lecturers, etc.

Telescopes in Russia and other CIS territories permit to monitor an object more then 12 hours and can be used in global monitoring programmes. The Central Asian sites have some of the very best astro-climates in the world. They are similar to (or a little better than) the well known Chilean sites (median seeing $0.7''$, very high fraction of clear nights, no light pollution and no high wind). It is imperative that these sites be protected and intensively used by the international astronomical community.

Keywords. Astronomy, former Soviet Union

1. General features of the development of astronomy in the USSR

- The "Golden Age" at the beginning of space-flights epoch.
- Equipment gradually getting out of date: large telescopes (specially, the optical ones), IR, sub-mm instruments, light receivers (mainly multi-channel), computers.
- Adherence to the "classic" fields of research.
- The world's largest experience in small-telescopes usage.
- Predominance of wide-field researches.
- Distinguished science-organizers and theoreticians.
- A high level of comprehension, analysis, interpretation of the results.

2. The situation in different regions

2.1. *The Baltic states*

- Most prosperous economically but scientific budget is less than 0.5% of GNP (compared with 2–4% in developed countries).
- Most alien from CIS politically – EC members.
- About 30 astronomers in each country working in 2–3 organizations.
- Contacts between astronomers of the Baltic States are still rare: shared journal "Baltic Astronomy" (created after the Soviet disintegration).
- Cooperation mainly with Western Europe.
- Fields of research mainly the same as under Soviet Union, with gradually increasing deviations.
- The internet and the main journals are accessible.
- Every country prepares astronomers of its own; the problem of retention of young scientists is not solved but the situation is improving progressively.
- Astronomical societies in every state are uniting professionals and amateurs.
- National language books and magazines for amateurs are being published.
- Astronomy is taught in schools (within physics courses), and manuals are available.

2.1.1. *Estonia*

- Financial base of science: 0.9 million euros (0.5% GNP): 10% via national grants, 20% via infrastructure development program.
- The Academy of Science as a national association of research institutions has been abolished.
- Astronomers: at Astronomical Observ. of Tartu University (Toravere, former IAAP), at the universities of Tartu and Tallinn.
- The staff reduced by a factor of 2 (Sweden experts were attracted used); ?40 researchers now.
- Salary: Euro 500–1000 per month.
- Equipment and instrumentation mostly inherited from SU: (150-cm telescope + CCD camera, a new one to be installed soon); real possibility to use the ESO telescopes and those at Canary Islands has opened and is taken advantage.
- The main fields of research remain the same: stellar physics and extragalactic astronomy (interpretation and theory), WR star observations (on Canary Islands now).
- Cooperation mainly with European countries (the most extensive one with Sweden) and Baltic States, at a lower level, with Russia and Finland.
- The problem of the young scientists is on the way of being solved.

2.1.2. *Latvia*

- Astronomers at: the Inst. of Astronomy (Univ. of Latvia, Riga), and Ventspils International Radioastronomy Centre (VIRC, Ventspils College, near Ventspils).
- Main fields of research: continuing: stellar astronomy, SLR, GPS and time service, ISM; growing: radio-astronomy; decreasing: solar astronomy.
- Collaboration: with western Europe (specially, Sweden), Baltic States, Russia. Basic equipment and infrastructure:
- Baldone Astronomical Observ. (is now part of Inst. of Astronomy): 0.8-m Schmidt tel. with small amateur-class CCD (new CCD is under installation); solar radio tel. RT-10 dismounted.
- Satellite laser station of Inst. Astronomy (at Riga) keeps world level of observations.

https://doi.org/10.1017/S1743921307006928 Published online by Cambridge University Press

• VIRC: Radio telescope RT-32 is rebuilt out of a communication antenna left by the Russian Army in non-working order. Now it is the largest radio-telescope in north-west Europe. It is almost ready for VLBI work. Repairing of RT-16 (near RT 32) is now starting.

2.1.3. *Lithuania*

• Astronomers at: Inst. of Theoretical Physics and Astronomy (ITPA) of Vilnius Univ., Astronomical Observ. of Vilnius Univ. and State Inst. of Physics.

• Fields of research: continuing: Galactic structure, interstellar absorption, open clusters in the Galaxy, stars; new: asteroids (NEO), galaxies. For the last 10 years investigations of galaxies are successfully carried on at the Institute of Physics.

• Instrumentation: Moletai Observatory of ITPA: precision photometry, measurement of radial velocity of stars, CCD-photometry of stars and asteroids are carried out using 165-cm and 63-cm reflectors, 35-cm Maksutov meniscus telescope.

• Observations at Canary Islands (NOT), USA (Arizona), Turkey (Antalia), and the Subaru telescope are being intensified.

• Small-scale cooperation with CIS (with Russia and probably Uzbekistan).

• A planetarium was recently built in Vilnius (the only functioning one in all the Baltic States).

2.2. *East European CIS*

2.2.1. *Belarus*

• Still no professional astronomy.

• Several physicists at different pedagogical universities sometimes publish articles at the border of physics and astronomy.

• Planetarium continues to work in Minsk.

• There are some advanced amateur astronomers that carry out observations of variable stars. Some of them have publications in refereed journals. The amateurs cooperate with Ukrainian and Russian astronomers.

2.2.2. *Moldova*

• Very feeble professional astronomy: 60-cm telescope of Kishinev Univ. in working condition, but variable stars observers Smykov and Shakun are elderly and presently not active.

• Formerly active theoreticians: Chernobai died in 2004 and Gaina is not in full health.

• EAAS member Sholokhov teaches astronomy at Tiraspol Univ., where, moreover, an Astronomy Chair of Odessa Natl. Univ. has been recently opened (Andrievsky).

• Collaboration: with Romania and (a little) with Ukraine.

2.2.3. *Ukraine*

• About 1000 astronomers (1 per 50 000 citizens) work in 15 main astronomical observatories, institutes or departments (AO/AI/AD) of the National Academy of Science (NAS) or of National Universities (NU): in Kyiv: Main Astron. Observ. (MAO) NAS, AO & AD NU and Intl. (Ukraine-Russia) Centre for Astronomy, Medical and Ecological Res. (ICAMER); in Kharkiv: Inst. of Radio Astronomy (IRA NAS), AO & AD NU; in Nikolaev: (Mykolaev): AO NAS & AO NU; in Crimea: Crimean Astrophysical Observ. (CrAO) and former USSR Centre of Far Space Communication (near Yevpatoria, now a branch of IRA); Poltava: Gravimetrical Observ. NAS; AO NUs in Odessa, in Lviv, and in Uzhgorod – Crimean Lab. of Sternberg Astronomical Inst. (Moscow, Russia).

• Salary: $100–300 per month.

https://doi.org/10.1017/S1743921307006928 Published online by Cambridge University Press

• Researches cover all the fields of modern astronomy and astrophysics.

• The first private astronomical observatory for professional basic research was created several years ago.

• A state programm for financial support of existing unique equipment is being started.

Main instrumentation:

• Radio: Radio-telescopes: UTR-2 near Kharkiv (IRA); RT-70 near Yevpatoria (IRA branch); RT-22 in Katsievely (in Crimea, CrAO branch); radio-interferometer URAN (for $\lambda = 8 - 10$ m, baseline ~ 1000 km) consists of UTR and URAN-1 (IRA, Kharkiv) + URAN-4 (Odessa branch of IRA), + URAN-2 (Lviv Phys.-Tech. Inst.) + URAN-3 (at Poltava).

• Optics: in CrAO: 2.6-m, 1.25-m (for polarimetry), 1.22-m, large solar telescope, etc.; at Peak Terskol Observ.(ICAMER: Caucasus, Russia): 2-m telescope + échelle spectrographs (R up to 500 000) + professional CCD and horizontal solar telescope + spectrograph ($R = 320\,000$); 1-m telescope at Mt Koshka (CrAO branch: Simeiz; Crimea); robotic meridian circle (AO NAS, Nikolaev).

• Gamma-rays: Cherenkov gamma-telescope at CrAO.

Publications, societies, teaching and popularization:

• There are national scientific (four titles) and amateur-addressed periodicals in astronomy, both continued from the Soviet times and newly started.

• Internet, scientific literature accessible (with limitations in some places).

• Astronomical Societies: professional: Ukrainian Astronomical Assoc. (UAA), Odessa AS and Lviv AS; many amateur organizations.

• Astronomy is obligatory in schools; textbooks exist; conferences of teachers of astronomy are held on a regular basis.

• Planetariums: seven working ones; public lecture-hall at Odessa NU (the only one in CIS).

• Weekly TV-programmes on astronomy (in Odessa).

• Astronomy summer schools for young astronomers and for school teachers.

Some of the existing problems:

• At universities and astronomical observatories, financial support has been reduced (by 30% during 2005–6).

• Large age gap of staff at CrAO: serious danger that a very large experience in many fields of research in astrophysics may be lost. Main reason: no living quarters for young specialists.

• Peak Terskol Observ. (ICAMER): dangerous conflict with local (KBR) Russian authorities: the authorities are making attempts to privatize the infrastructure (hotel for observers, etc.).

• Attempts of buildings erection on the property of AO NU in the central part of Kyiv.

• Photo plate archives: no money to keep it in proper order, or to e-archive it.

2.3. *Trans-Caucasus CIS*

• Number of astronomers: several tens in each state.

• Besides one leading astronomical institution there are others related to astronomy.

• Internet is accessible, but with limitations and breaks; astronomical literature accessible, but with strict limitation (financial problems).

• National Universities prepare astronomers, but the lack of young specialists is an acute problem and is not solved.

• National professional Astronomical Societies were created during the last 15 years.

• The countries have passed through civil wars, deep economic crisis, breaks in power supply; close contacts of astronomical institutes' officers with the state leaders helped astronomy survive.

• Main optical instruments are saved and in working order.

• Researcher salary: $70–200 per month in Azerbaijan, $30–60 in Armenia and Georgia.

2.3.1. *Armenia*

• During the period of the war and blockade the Armenian Diaspora had helped (the Ajastan Foundation, headed by astronomer V. Petrosian); the Byurakan Astrophysical Observ. (BAO) director A. Petrosian held for some time the post of the Minister of Science.

• Energy deficit problem was solved after reviving the Metsamor Atomic Power station.

• The Armenian Astronomical Soc. (headed by A. Mikaelian) joins astronomers of Armenian nationality from all over the world (including, e.g., Terzian from Cornell Univ., USA).

• The journal "Astrofizika" (Astrophysics) is published in Russian and in English.

• Astronomers work at BAO NAS (Byurakan); Inst. for Radio Measurements (NIIRI NAS, Yerevan, dir. P. Herouni, Inst. of Space Astrophysics (Garni, G. Gurzadian), Yerevan Univ.

• The Cosmic Ray Station of Mt Aragats (3200 m) is functioning.

• The National Virtual Observ. is in planning, to be based on supercomputer of NAS and BAO photo-archive.

• Collaboration: with institutions in USA, Germany, France, Italy, Japan, Russia, etc.

• Scientific conferences in astronomy and Astronomical Olympiads for school students are held.

• In 2006 a summer school and scientific conference in honour of BAO's 60th anniversary was held.

• In 2007 Armenia is to host JENAM-2007 (Joint European and Natl. Astronomical Meeting).

Main instrumentation:

• BAO (1500 m, Mt Aragats slope, light pollution from Yerevan): 2.6-m telescope works with professional class CCD + modern spectrograph "SCORPIO" (up to 24 mag.) and 3D-spectrograph "VARG"; 1-m Schmidt telescope (in working condition, not in use); 0.5-m Schmidt telescope works; a radio-telescope is not in working condition.

• NIIRI testing area (about 1700 m, Mt Aragats slope): radio-optical telescope (54 m/2.6 m), not adjusted, no cooled receivers, no active specialists.

• Byurakan Station of St Petersburg State Univ. (at BAO): preserved, but does not operate now because of financial constraints. Property of Russia.

2.3.2. *Azerbaijan*

• Until 1997 there was no e-mail service, nor phone communication, so nothing was known about the fate of astronomy. In 1998 contacts were renewed.

• Significant "brain drain" to Turkey and Israel took place in early 1990s.

• Astronomers work at Shemakha Astrophysical Observ. NAS (ShAO, near Shemakha; office in Baku); at Nakhichevan highland station (created in 2003 on the base of Batabad Solar Observ.); at Scientific Centre "Caspian" (Baku); at Inst. Physics NAS (Baku).

• Main fields of research: Sun, comets, planets, Ap stars, variable stars, theoretical astrophysics.

https://doi.org/10.1017/S1743921307006928 Published online by Cambridge University Press

- Since 1998 astronomical conferences and schools are held on a regular basis.
- Light pollution problem at ShAO has arisen but is kept under control.
- No national grants, but a number of astronomers have international grants.
- A new astronomical journal is being started this year (in English).

Instrumentation:

- ShAO: 2-m telescope was inactive for seven years, now at work; there are two amateur class CCD and a professional class one, three échelle spectrographs. Mirrors need aluminizing.
- Batabad Observ.: functions; the coronagraph has been damaged, now under repair.
- Paraga astrometry station (Paraga, Rep. Nakhichevan – an autonomous region of Azerbaijan, but geographically within Armenia) of Pulkovo Observ. (Russia): everything preserved. Mirrors need aluminizing. The station does not operate now.

2.3.3. *Georgia*

Situation in astronomy in Georgia is worse than in other Trans-Caucasus countries.

- Astronomers work at Abastumani Astrophysical Observ. (AbAO, Mt Kanabili, 1700 m), at AbAO Tbilisi Lab., Tbilisi National Univ.
- AbAO is an international standard of pure atmosphere, good seeing (average $\sim 1''$).
- In 1990s AbAO could survive, in a great measure thanks to Prof. J. Lominadze, then a member of the Central Election Commission.
- AbAO staff apartments: heated by metal chimneys. Breaks in power supply continue.
- Electronic communication is difficult.
- The problem of attracting young scientists remains completely unsolved.
- All the instrumentation (stellar, solar and atmospheric observatory facilities) are preserved, but need at least mirror aluminizing, change of electronic equipment at AZT-11 (1.25-m). Observations are carried out mainly by pure enthusiasm, (most actively by Omar Kurtanidze, the observatory director since May 2006): at 1.25 m + amateur-class CCD, 70-cm + amateur-class CCD, 40-cm + electro-photometer.

2.4. *Central Asia*

- Sites with the best astro-climate all over the former USSR territory (and generally, the best in Eurasia and all the eastern hemisphere of the Earth). They are similar to (or a little better than) Chilean astronomical sites: median seeing $0.7''$, clear sky, no light pollution and no high wind. These sites must be protected and intensively used by all the astronomical community!
- Issues of political stability.
- Salaries for scientists are low: from about $10–20 (Turkmenistan) to $20–60 (Uzbekistan).
- Internet and communications are available in the main cities, but not at the observatories.
- Attraction of young scientists is not a critical problem (reasons are different, see below).
- No astronomy in schools; only one planetarium (in Tashkent, Uzbekistan).

2.4.1. *Kyrgyzstan*

- No professional astronomy currently, nor in foreseeable future.
- The city Osh, is a transit point on the way to East Pamirs, including Shorbulak Observ. (4350 m), but in the post-Soviet epoch this is not in use, and has been inspected only once.

https://doi.org/10.1017/S1743921307006928 Published online by Cambridge University Press

2.4.2. *Tajikistan*

During the civil war there was no salary for scientists for one year. Many astronomers emigrated to Germany, Russia, Ukraine, or went into business.

Presently:

- Good contacts of astronomers with the Government.
- 27 researchers (9 young ones) + probationers and post-graduate students.
- Astronomers work at Inst. of Astronomy (IA) of NAS at Dushanbe and its branch, Guissar Observ.; Tajik State Natl. Univ. (Dushanbe) has recently created a Dept. of Astronomy.
- Fields of research: comets, asteroids, meteors, variable stars, star formation regions, structure of galaxies, seismic-ionosphere effects, geostationary satellites observations.
- Astronomers welcome international collaboration.
- Very good astro-climate at mountain observatories (see below for details).
- Free access to internet and to main astronomical journals exists for about the last three years (a result of international help).
- There are small state grants for researchers; astronomers have one international research grant.
- Tajik Astronomical Soc. (scientists + pedagogical university teachers) and EAAS branch exist.

Equipment:

- Mirrors of all refractors need re-aluminizing.
- Guissar Observ. of IA NAS (about 30 km west of Dushanbe along the valley): the wide-field camera VAU-75 is "alive", but not used; 0.7-m and 0.4-m telescopes: photo-electric photometry.
- Mt Sanglokh Observ. of IA NAS (2300 m): median seeing is a little better than on Mt Maidanak: $0.6 - 0.7''$): the road and bridges are restored; is used now for meteor observations only; 1-m and 0.6-m telescopes are "alive" but not in use.
- Shorbulak Observ. (4350 m, on a hill on East Pamirs plateau), good site for sub-millimetre astronomy (1–2 mm of precipitate water); former branch of Pulkovo Observ. (Russia), now belonging to IA NAS: 70-cm telescope, in 2001 was in order, but not in use.
- Ak-Arkhar Cosmic Ray station (East Pamirs, 4200 m): does not work (?).

2.4.3. *Turkmenistan*

- Academy of Science has been abolished; the Phys.-Tech. Inst. that used to host several astronomical teams (solar investigations, meteors, radioastronomy) is closed; the State does not need basic research (including physics and astronomy). The fall of a meteorite (a chondrite of a mass of about 1 ton) named after Turkmenbashi could not awake any interest towards astronomy.
- S. Mukhamednazarov is a member of the President Council on Science. This permits keeping the main optical telescopes in working state for use by visitors.
- Internet and e-mail resources are strictly limited and under severe government control.

Equipment:

- Optical Astronomical instrumentation, including 1-m (focus = 2 m) telescope and 0.8-m telescope of AO NU of Odessa (Ukraine) at Mt Dushak-Erekdag (2300 m, very good astro-climate) are kept in working order (for climatological and ecological needs), but are used only by visitors from abroad (Dorokhov & Dorokhova from Odessa, Ukraine).

https://doi.org/10.1017/S1743921307006928 Published online by Cambridge University Press

• The radio telescope RT-12 and metal components of RT-32 (for the initial six dishes Soviet-era version of "Quasar" VLBI system) are probably lost.
• Solar Observ. (at Vanovskoe, near Firyuza) does not work (no longer in existence?).

2.4.4. *Uzbekistan*

• Astronomers work at AI NAS (Tashkent + Kitab), at the Astronomical Depts. of Tashkent, Samarkand and Karshi universities.
• There are young observing assistants but mostly without astronomical education.
• Salary: $20–60 per month. Additional earnings are necessary.
• Financial support of science: only grants for institutions, no basic support; AI NAS has seven national grants of about $ 1000/year/person (for salary, travels, equipment, tax, etc.).
• The present director of AI NAS Sh. Ehgamberdiev held for several years the post of the President Councilor on Science.
• AI NAS has custom privileges for equipment importing; Maidanak Observ. has special financial support as a unique scientific object; the total AI NAS budget has increased several times up to $50 000–100 000/year.
• Space Agency has been created and is working.
• Fields of research as under USSR: astrometry, solar physics, helio-seismology, variable stars; physics of galaxies, with the addition in recent years of international collaborative AGN monitoring.
• Cooperation: mainly with South Korea, Russia, Ukraine, West Europe, USA.
• A planetarium is in operation.
• No astronomy at schools.

Equipment and infrastructure:

• Kitab: latitude station (branch of AI NAS, in valley near Kitab): classic astrometric equipment and GPS.
• Mt Maidanak Observ. (branch of AI NAS, 2600 m, three peaks several km from each other, including Kurganak, with no telescope yet): 1.5-m telescope + professional CCD (2000 × 800 pixels) for imaging and photometry; 1-m telescope + amateur class CCD; five 60-cm and one 48-cm telescopes (photoelectric photometers + two amateur class CCDs);
• Helio-seismology station of AI NAS: moved from Mt Kumbel (2300 m, near Mt Big Chimgan) to Parkent (already at work?).
• Military facilities for satellite laser location (Mt Maidanak, 2600 m): two 1.1-m quick-rotating telescopes (in working order, but not used since 2004).
• Plato Suffa (2500 m): the site for Russian-Uzbek mm range RT-70: temporarily shut down.
• Samarkand Univ. station (on the outskirts of the city): 0.48-m telescope is installed, and a 1-m is under construction.

2.5. *Kazakhstan and Russia*

2.5.1. *Kazakhstan*

• The Academy of Science as an independent institution has been abolished and replaced with scientific or science-technical centres joining, under three research institutes.
• National Space Research Program (SRP) is carried on since 2005 in cooperation with Russia.
• There is one astronomical institution: the Fessenkov Astrophysical Inst. (API). Now API is a part of Astrophysical Research Centre (other parts are National Space Research Inst. and Ionosphere Research Inst.).

• There are about 30 astronomers: in API and Almaty (Alma-Ata) State Univ. (ASU); two astronomers are still members of Sternberg Astronomical Inst. (Moscow, Russia)
• Staff researcher salary: $150–300 per month.
• Astronomy students are trained at ASU and in Lomonosov Moscow State Univ.
• The young scientists problem is not still solved. Several graduates are on API staff.
• The main fields of research are as in the Soviet epoch: dynamics of gravitating systems, spectrophotometry, polarimetry, ISM, AGN (observations and theory); solar investigations are reduced to solar cosmic rays propagation; atmosphere optics research is stopped. Satellite monitoring and theory of their motion are open in frame of SRP.
• Collaboration: with Russia; on a small level with Germany, UK and USA.
• There is a branch of EAAS.
• Internet and e-mail facilities: at API main building since 2005, before it, home addresses were used. Mostly no e-communications with API observatories yet.
• API Bulletin is published (in Russian).
• No astronomy in schools. Equipment and infrastructure:
• API main site at Kamenskoe Plato (suburbs of Almaty, 1500 m): used mainly 70-cm refractor (with 3-cascade image tube and amateur class CCD); 70-cm Maksutov meniscus telescope and other instruments in working order.
• Tian-Shan Observ. of API (2700 m, about 40 km from Almaty, former branch of Sternberg Astron. Inst., Moscow): place with very good atmospheric transparency, but bad seeing; used for photoelectric photometry; the road is in poor condition; two 1-m telescopes (one in near working order, another in non-working order; neither is used: no light receivers); 48-cm telescope with photoelectric photometer and amateur CCD is in regular use; solar instruments out of order; the lab. building and the living quarters are in excellent condition, supported on commercial basis ("scientific tourism"). Nearby former API Solar Observ. is not functioning.
• High Altitude station of Ionosphere Research Inst. (very close to API Tian-Shan Observ.): 10-m rotating dish for ionosphere radio-observatory was functioning; now under repair for SRP.
• Cosmic Ray station (3340 m, near API Tian-Shan Observ.) of Lebedev Physical Inst. RAS (Moscow, Russia) is functioning.
• Assy-Turgen Observ. of API (2800 m plateau, about 100 km from Almaty): electricity from diesel engine; 1-m telescope (+ spectropolarimeter) is used by visiting API observers; empty tall dome for 1.5-m telescope (erected to the end of 1980s) needs complete rebuilding.

2.5.2. *Russia – several topics only*

• Russian astronomers have lost real access to the main part of the FSU observatories.
• Practically all the astronomical infrastructure Russia has inherited from the USSR has been preserved. Many places are presently equipped with new light receivers. New equipment: In post-Soviet epoch new astronomical instruments and even new observatories equipped with modern facilities have been created:
• Radio-interferometer network "Quazar" consists of three radio-telescopes RT-32 located in new sites: at Svetloe near St Petersburg; near Zelenchukskaya (North Caucasus); at Badary valley, (Rep. Buryatia, Sayany mountains, Siberia);
• RT-64 at Kalyazino;
• Ukraine-Russian Observ. at Peak Terskol (3120 m) equipped by 2-m telescope and large horizontal solar telescope (both with high resolution échelle spectrographs), modern hotel and telecommunication facilities;
• 1.7-m IR telescope of ISTP (Irkutsk) at Mondy Observ. (Rep. Buryatia);

https://doi.org/10.1017/S1743921307006928 Published online by Cambridge University Press

- 1.5-m telescope of Kazan SU in Antalia (Turkey).
- E-mail and internet service accessible everywhere.
- Facilities for optical and radio observations cover eight time zones and could be used for international programmes of 24-h monitoring of astronomical objects (with other CIS astronomical observatories).
- Astronomer preparation system is being "upgraded": Departments of astronomy are newly open in Tomsk and Stavropol State universities, many students can get a good training at SAO RAS.
- There is a system of financial support for active scientists: RFBR grants, Scientific School Support Program, Government research grants for young doctors of science, etc.
- Main problem. The government frequently does not recognize the significance of basic science and takes measures towards destroying the existing basic science infrastructure (as well as towards weakening the system of preparation of young scientists). Up to now it has been possible to "dampen" most of such attempts, but government pressure remains strong. Therefore the fate of fundamental science (astronomy, in particular) in Russia remains unclear. The same is true in respect to Russian Academy of Sciences and the universities.

3. Conclusions

- Overall, astronomy in all of the former Soviet territory has managed to preserve much of its former infrastructure, human potential and "common astronomical area" (partially shared by some former communist countries).
- All this has been achieved in spite of policies of our countries and thanks to the active position of the "leaders" of our national astronomical communities, and, to EAAS activity.
- Astronomy has suffered less damage compared with other basic sciences.
- In many fields the degradation process is now giving way to modest steps towards upgrading the technical base. However the rate of development is far below the world level.
- CIS astronomers seek counterparts for more effective usage of the available infrastructure. Main goals include: a progress in 24-h monitoring programmes; and increasing usage of unique world-class astro-climate of astronomical sites in Central Asia (Mt Maidanak, Mt Sanglokh, etc.).