

## **Global Astronomy Survey: Tajikistan**

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SpoC Approved : Yes

Professional Astronomy : Phase 2

Public Understanding of Astronomy: Phase 1

Astronomy in Schools : Phase 1

### **1. Professional (Research) Astronomy:**

(i) Number of universities offering Astronomy (and their names) – 6:

1. Tajik National University (Dushanbe – capital of Tajikistan),
2. Tajik State Pedagogical University (Dushanbe – capital of Tajikistan),
3. Khujand State University (Khujand – capital of Sugd region),
4. Khorog State University (Khorog – capital of Pamir region),
5. Kurgantube State University (Kurgantube – capital of Khatlon region),
6. Kulob State University (Kulob – city in Khatlon region).

(ii) Number of universities offering Physics (and their names) – 8:

1. Tajik National University (Dushanbe),
2. Tajik State Pedagogical University (Dushanbe),
3. Tajik Technical University (Dushanbe),
4. Tajik Technology University (Dushanbe),
5. Khujand State University (Khujand),
6. Khorog State University (Khorog, Pamir),
7. Kurgantube State University,
8. Kulob State University.

(iii) Number of academics who have been trained in Astronomy (ideally with their names and levels of qualification) – 4 members of the Academy of Sciences:

1. Babadzhanov Pulat – Doctor of Physics and Mathematics Sciences,
2. Ibadinov Khursand - Doctor of Physics and Mathematics Sciences,

3. Maksumov Muzaffar - Doctor of Physics and Mathematics Sciences,
4. Ibodov Subhon - Doctor of Physics and Mathematics Sciences.

(iv) Number of astronomical facilities (observatories, telescopes, etc)  
and as much detail about each as possible (websites/contact details):

1. Institute of Astrophysics of the Academy of Sciences of Tajikistan with 3 Astronomical observatories: Hisar (HisAO), Sanglokh, Pamir.

Astronomical climate of astronomical observatories of Tajikistan

Observatories
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$\lambda$ ,	deg	.
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$\varphi$ ,	deg.
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H, m
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N , h

A"

P

HisAO

68°.6

38°.5

730

1620

2.10

0.72

Sanglokh

69.0

38.2

2300

1700

0.54

0.78

Pamir

74

38

4350

1820

0.54
------

0.86
------

Note:  $\lambda$  – geographic longitude,  $\varphi$  – geographic latitude, H – height above sea level in meters,

N – number of the astronomical hours per year, A – astronomical index (image quality in arcsec), P – optical transmission factor of the atmosphere.

In the astronomical observatories there are:

1. Hisar observatory (the big observatory in Central Asia):

1 m reflector, 0,7 m reflector, 0,4 m reflector, 0,2 m refractor and much

small photographic chambers and 3 meteor patrols, devices for radio location of meteor and ionosphere and devices for laboratory modeling of comets.

2. Sanglokh observatory:

1 m Ritchey-Chrten reflector, 0,6 m reflector , 0,2 m reflector and

photographic chambers for meteor observations.

3. Pamir observatory:

4. 0,7 m reflector, Solar telescope.

5. Chamber for meteor observation.

Astronomy has deep historical roots in Tajikistan and other countries of Central Asia. Almost 3000 years, from times Reigning Jamshed, people celebrate NAVRUZ is Day of vernal equinox. Astronomic information is present in the book of Avesto. Recently on East Pamir found out astronomic building with age 2500 years). Achievements of astronomers of the State of Samanids, Samarkand astronomic school well-known.

Modern Astronomy in Tajikistan is related to the Tajik astronomic observatory, founded in 1932 years. In 1958 the observatory was regenerate in Institute of Astrophysics of Academy of Sciences of Tajikistan. The centre of astronomy in Tajikistan is the Institute of Astrophysics of the Academy of Sciences of Tajikistan. This institute brings in a noticeable deposit in training of astronomic personals and in astronomical education.

There are 3 astronomical observatories, 2 Departments and 5 scientific groups in the Institute of Astrophysics:

Hisar astronomical observatory (HisAO) near Dushanbe (capital),

International astronomical observatory “Sanglokh” in the Dangara region,

Astronomical observatory “Pamir” in Murgab region (Pamir).

Department of Comets and Asteroids,

Department of Meteor astronomy,

Group of Experimental astrophysics

Group of Ionosphere,

Group of Astrometry,

Group of Variable stars,

Group of Structure and dynamics of the star systems.



Astronomical observatories on the map of Tajikistan

Hisar astronomical observatory (HisAO)

The International astronomical observatory of «Sanglokh». Building of

Astronomical climate of astronomical observatories of Tajikistan

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Note:  $\lambda$  – geographic longitude,  $\varphi$  – geographic latitude, H – height above sea level in meters,

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The main objects of scientific researches of Institute of Astrophysics are:

Small Bodies of Solar system (Comets, Asteroids, Meteoroids),

Variable stars,

Star formation complexes

Galaxy dynamic and structure,

Artificial Earth satellites,

Seismo-ionospheric effects.

## Astronomical education

Now in Tajikistan the reform of education continues. The astronomical information (data on the Earth, seasons, about the Sun and the Moon, about constellations, etc.) is given to pupils of initial classes of the school in a subject "Natural history".

In the senior classes astronomical themes in volume of 36 hours are studied as a part of a subject of "Physics". Since 2007 in the curriculum of high school astronomy as the independent subject does not enter. In the Certificate about secondary education the astronomy is not registered. It creates some difficulties. It creates certain complexities in astronomy studying at schools, for example, reduces responsibility and teachers and pupils.

In higher educational institutions the astronomy themes are studied in the subject curriculum «Concept of modern natural sciences» of all higher educational institutions of Tajikistan. In curriculums of physical and mathematical faculties of universities on astronomy it is taken away 36-72 hours.

So, at the Tajik national university in curriculums of a specialty of "Physicist" on "Astrophysics" 72 hours are taken away, on a specialty "Meteorology" on a subject «Bases of astronomy and methods of research of space» is taken away 72 h., and on «Astrophysics bases» 36 h. At mathematical faculty of this university on astronomy 36 h are taken away. At the Tajik state pedagogical university, at faculty of physics and at mathematical faculty on astronomy studying 72 h are taken away. Approximately so business with astronomy studying at physical and mathematical faculties of universities in the cities of Khujand, Kulob, Kurgon-teppa, Khorog is. Astronomical themes in very limited volume (6 h) are included. It is obvious that astronomy studying in the resulted volumes of hours is absolutely not enough for preparation of the teacher on astronomy for high schools.

With a view of preparation of the qualified teachers of physics and astronomy for high schools in 2007 at physical faculty of the Tajik state pedagogical university (TSPU) the specialty

"Physics-astronomy" is restored.

Measures are taken for the decision of problems of astronomical education. Work of comprehensive schools improves, textbooks on astronomy in the Tajik language prepare.

The system of education strongly suffered in the years of social-political no stability and civil war in Tajikistan (1992-1997 years) and economic crisis. The large outflow of specialists happened from Tajikistan, part of specialists-astronomers, passed teachers to work in other industries. All of it negatively influenced on a volume and quality of astronomic researches and astronomic education.

Institute of astrophysics of Academy of sciences of Tajikistan appealed to Government of republic with a solicitor about opening of specialty «Astronomy» in Tajik National University.

This solicitor was supported Department of education and Government of Tajikistan. In 1999 years on the physical faculty of TNU specialty was opened «Astronomy» and the department of astronomy is created. Preparation of on-line tutorials and plans, providing of department specialists, by equipment, by educational literature it was laid on Institute of astrophysics of Academy of Sciences of Tajikistan

Now most full the astronomy and astronomical subjects are studied at the Tajik National University (TNU) where there is a specialty "Astronomy" and the corresponding chair (since 1999) is created. Curriculums and plans of this specialty are approached to curriculums and plans of the Moscow State University of Russia.

Base research establishment for this specialty is Institute of Astrophysics of Academy of sciences. Astronomic practice students pass in Hisar astronomical observatory of institute. Here they execute term and diploma papers.



Reform of education goes in Tajikistan. From 2007 in TNU are entered the degrees "Bachelor" (4 years of training), "Specialist" (5 years) and "Magisterial" (6 years). A new curriculums and plans are developed. There are problems with level and quality of education, with inflow of capable youth to an astronomical science, etc.

With the purpose of bringing in of capable young people in science in Academy of sciences of Tajikistan from 2006 years Small Academy of Sciences (SAS) is recovered for scholars' middle schools.

In 2006 is restored the Small Academy of Sciences (SAS) of Tajikistan. At the Institute of Astrophysics of Tajik Academy of Sciences acts the section "Astrophysics" SAS for scholars.

Now in section are engaged more than ten pupils of 8-10 classes of high schools of a city of Dushanbe and adjoining areas. Once a week scientific employees and post-graduate students of institute spend theoretical and a practical training, astronomical observations (on the Hisar astronomical observatory of institute) with members of section. In the summer within 2 weeks in a suburban Rest house of Academy of sciences session's SAS are spent.



The cooperation agreement with Uranoscope of France where preparation and improvement of professional skill of experts in the field of astronomy are provided is concluded. Already one young expert passes training in France at the expense of Uranoscope. For improvement of quality of preparation of experts more fruitful cooperation with colleagues from other countries and with the international organizations is necessary.

There is a department of astronomy in the Tajik National University, where education of young astronomers goes. The employees of department execute scientific researches on physics of comets on the base of Institute of Astrophysics.

There is a branch of physics-astronomy in the Tajik State Pedagogical University, where the teachers of physics and astronomy study for secondary schools.

In middle schools and on the physical-mathematical faculties of higher educational establishments of Tajikistan astronomy is studied.

The section of «Astrophysics» of Small Academy of Sciences of Tajikistan operates at Institute of Astrophysics, where student of secondary schools begin the first steps in astronomy.

Astronomical Society of Tajikistan and Planetarium of city of Khujand execute propaganda of astronomy and scientific knowledge's about space, including through mass Medias (newspapers, radio, and television).

In International Year of Astronomy (IYA2009) in Tajikistan foreseen:

- It is convention of Astronomical Society of Tajikistan and conference of «Physicist and dynamics of small bodies of the Solar system» (Dushanbe, Institute of Astrophysics AS RT, May 2009),
- Meetings and lectures of astronomies with teaches, students, scholars, and population.
- Preparation the articles developed to IYA2009 and on astronomical topics in newspapers,
- Appearing on television and radio about IYA2009 and astronomical phenomenon's,
- Excursions on Hisar astronomical observatory for a scholars, students, teachers and population.





Project TAJASTRO

In conditions of radical reorganization of socio-economic and social-political bases of a society in Tajikistan a system of the middle and higher education, including astronomical education of the pupils, students and population experience serious difficulties. One of the reasons of religious fanaticism of a part of the population of Tajikistan is connected with wrong or deformed notion about cosmic space and place of the person in it.

With aim of strengthening of national potential in area of astronomy and training the teachers on astronomy and physics offers organization of the Training-Methodical Centre, which basic problem will be the realization of the information, resource and methodical support of schools and institutions and teachers on physics and astronomy of Tajikistan and increase of their qualification.

In 2006 Institute of Astrophysics, TNU and the Astronomical society of Tajikistan, with support IBSP/UNESCO, on the basis of the Hisar astronomical observatory have organized Training Methodical Centre "Tajastro" on astronomy. Listeners of the centre are students, post-graduate students, young employees of Institute and universities, teachers of physics and astronomy of high schools. Curriculum (40 ч.) are constructed taking into account level of preparation of listeners and specificity of their activity and include the questions connected with achievements and problems of astronomy, new methods, techniques and technology

TMC "Tajastro" forms on base:

1. Hisar astronomical observatory (HisAO) of the Institute of Astrophysics of Academy of Sciences of Republic of Tajikistan located in 20 km from Dushanbe at height 730 m above a



sea level.

Equipment: 70 cm reflector AZT-8, 40 cm astrograph, higher precisely astronomical installation (HPAI) with the diameter of the mirror 1 m, Educational telescope AVR-2 ( $D = 20$  cm,  $F = 300$  cm), much cameras meteor patrol, measuring equipments, service and living accommodations, laboratories and training audiences and other.

2. Faculty of astronomy of the Tajik National University (Dushanbe), where are available experienced specialists teachers, training audiences and laboratories.

TMC "Tajastro" is completed by modern means providing observations, information-computer technologies and modern means of support of education.

TMC "Tajastro" forms for the teachers on astronomy of institutes and middle schools, students and post-graduate students with the purpose of assimilation of modern methods of the astronomical observations, organization of the training-methodical process and using of information computer technologies during the training.

The training-methodical work will be carried out in the Institute of Astrophysics of Tajik Academy of Sciences, in Hisar Astronomical observatory of this institute and in some universities and schools of cities and areas of Tajikistan during of two years. The experts will trip in cities Khujand, Kulob, Kurgon-teppa, Khorug for training-methodical work in universities.

In Hisar Astronomical observatory will organized astronomical observation for participants of project from Dushanbe and near Dushanbe areas.

The Education Plan:

Lecture

1. Structure of Universe
2. Expansion of Universe
3. Star and star system formation
4. New information on Solar system
5. Illumination of atoms and molecules in space
6. Spectral investigation of cosmic objects
7. Use of CCD for Astrophysics
8. Space observatories

9. Universe in others spectral diapasons

10. Life in Universe. CETI

11. Modern methods of teaching of Astronomy

Practical training

12. Training on telescopes

13. Training on computers

The Training – Methodical Centre of astronomy “Tajastro” will be strengthening of national potential in area of astronomy and training the teachers on astronomy and physics offers organization, which basic problem will be the realization of the information, resource and methodical support of schools and institutions and teachers on physics and astronomy of Tajikistan and increase of their qualification.

1. Department of Astronomy in the Tajik National University.