

## Formation and technical equipment of the scientific basis related to the study of seismic processes in the Republic of Uzbekistan

Kurbanov Nodirjon Norboevich

Teacher of Tashkent State Pedagogical University named after Nizami

**Abstract:** *The history of seismic processes in Uzbekistan has long been known, and seismological scientists and specialists have been doing great work in the study of seismic processes in the country. Seismic mapping of the Central Asian Republics and the territory of Uzbekistan in the years of independence, the establishment of the Earthquake level has served as an important scientific basis for the stability of the population and the sustainable functioning of economic facilities. Historical analysis of the achievements of scientists of Uzbekistan's scientific research institutes, the activities of specialists working in the field, socio-economic effectiveness of the work done, as well as their dedication, achievements, mistakes and shortcomings in the preservation of human life.*

**Key words:** seismology, seismic process, seismic station, urbanism, world seismologists, Earthquake, Earth crust,

Central Asia, natural phenomena, natural waters, mud flows, important objects.

Earthquakes have had an impact on the lifestyle of the people of Central Asia among other nations. The effort to protect this natural disaster has led to changes in people's lives and their specific traditions. The aspiration to know the secrets of natural events has led to different thoughts. At the time when people were not conscious, and scientific genius did not develop, there were different myths and stories about the tremors in different nations. Systematic knowledge about the history of earthquakes has not been formulated yet.

However, data about this geological event has been written down by our ancestors. In his book "Kitobi Zainil-Ahbar" by Abu Said Gardizi, the 838-839 gave information about the earthquake in Fergana and Historian Juvainii in his

work "The history of Jahangir Genghis Khan" wrote about the earthquake in Khorezm which was happened in 1208, Muhammad Tahir bin Abdul Qasim in his book "Wonderful Tabokat" earthquake in Akhsikent in 1620, Muhammad Yoqub ibn Muhammad Doniyolbiy wrote about the Samarkand earthquake of 1797-1798 in his book "Gulshanam Mulk", N.V. Hannikov refers to the Bukhara earthquake of 1821-1822 in his book "About The Bukhara Khanate".

There are many historical facts about earthquakes and their consequences. The largest earthquake in history has been called as "Andizhan tragedy" which was caused most severe natural disaster in Uzbekistan. It was happened on December 3, 1902 and destroyed the city of Andizhan.

It even overturned the wagons on the railroad. Railways bend down from their places and were uprooted. Earths in the hills split, and oil, gas and springs flowed from the Earth for a while. As a result of the earthquake, Andizhan, which was a home to about 50,000 people, has been

ruined in just a few minutes. About 4652 people dead and about 7000 cattle died.

According to seismologists, one of the earthquakes in Central Asia and Uzbekistan, which was happened near the Kebin River, near the present-day Almaty city (Vernyi), on January 4, 1911. The earthquake caused major damage. The earthquake was very powerful in terms of its force and ground spread. It was a terrible blow to the sudden explosion of the energy that was hiding in the depths of the earth, and its sounds were scattered all over the globe and turned around three times. The appearance of the Earth in the tremendous center of the trembling has changed very unusually ... The surrounding slopes, the Kebin River valley, and all the mountain ranges south of Almaty have been shaken [1]. As a result of the Kebin earthquake many lands were damaged by cracks; most of these cracks were rounded up to several kilometers. The layers from the bottom of the earth were countless, and they were dark and under the white snow. [2]

Major Seismologist of the USSR P. M. Nikifirov during the calculation of the energy released from Earth's quake in Kebin found that, in order to supply the same energy the largest power plant in the USSR (Dnepro GES) should have to work 325 years without any stop [3].

This type of natural disaster can lead to other types of catastrophes. This can be seen in an example of earthquakes in Uzbekistan and its surroundings.

The location of Uzbekistan and its neighbor countries in seismic zones can also lead to the emergence of natural, man-made, ecologic and other types of emergencies. In particular, on February 18, 1911, at 18:41, with the hypocenter from 70-75 kilometers Depth, an earthquake measuring 9-10 on the MSK (Medvedov, Shponoher, Karlin) scale led to the "Usoy" movement of the earth in the Pomir Mountains of Muzkul. As a result, a 2.5 km<sup>3</sup> porosity rock was removed and passed a distance of 2.5 kilometers and blocked the Murgab River. The mass with the thickness 450-500 meters long, 3 kilometers in length,

and 1 kilometer width of sandstone, limestone, gypsum and other rocks moved from the place that the disaster happened[4]. The earthquake caused the death of total 136 which are 54 people in Usoy, 10 in Savnobe, 4 in Ruchche, 30 in Papseri, and 40 in Nisure. In October of this year, the village of Sarez was flooded as a result of the riverbed blockade. This lake entered the history with the name Sarez, and earth movement with Usoy earth movement. This earthquake is recorded in Petrburg's Pulkovo observatory and at Potidom, Germany.

Since 1914, water began to flow through the earth movement of Usoy. There was a danger that Lake Sarez could be opened.

What kind of situation would be happen when it opens? Until 1967, the area was studied plan less. However, from that year on, it began studied systematically. Since 1967 prominent scientific organizations of the former USSR have begun to attract. The analysis of the Lake Sarez Lake between 1967 and 1990 led to the following conclusions. In

1967, A.I. Sheko learned outer position of the earth movement of Usoy, and concluded that "it is stable and any flood, a rain and avalanche will not affect." He also learned the amount of water coming out of the plotena. The movement in the right and the left of the hills may be dangerous for the lake. He concluded that there would be a risk of movement in a strong earthquake. From 1970 to 1977, the water of the lake learned by the help of filtrating. The main risk was found in the right and left hills. If the water is released, it can raise the Bortang River up to 50-100%. While studying between 1981-84 the scientist of the MSU (Russia) V.S. Fedorenko found out that the main danger is under the lake Murgob avalanche.

Nowadays, due to the natural disintegration of the river bed, a dam with a height of 703-788 meters and a width of 4.3-5.3 kilometers has been appeared. Today, this natural dam is named after Lake Sarez. The total amount of water collected in this lake is 17.5 billion meter. This raises the risk of flooding in the

region. Experts examined the area of flooding when the Sarez lake cracks. This area will be 69,000 km<sup>2</sup> and will result in major socio-economic damage to Tajikistan, Uzbekistan, Turkmenistan and Afghanistan. Surkhandarya, Bukhara, Khorezm regions of Uzbekistan and the Republic of Karakalpakstan are in the flood zone. The water cycle is 70 hours [5]. More than 6 million people live in the direction of water, and it threatens to their lives.

Conversely, it should be noted that it doesn't important the earthquake's tremendous shake, but its destruction and destructions play an important role. Although the earthquake which was happened in Tashkent in 1966 resulted in the destruction of many seismically unstable buildings, it was not a unique phenomenon in terms of seismology. On the average, earthquakes occur in our country twice or three times a year. For example, after the earthquake in the capital, the earthquakes of 1977, 1980, 1987, 2008, 2010 and 2013 occurred.

None of these had serious consequences [6].

As we know, more than 330 settlements in Uzbekistan, 120 cities are located in areas with severe earthquakes point 7 or more (the areas with the earthquake 7 points or more are determined as seismic activity zones) [7]. Especially inhabitants of Andizhan, Fergana, Namangan, Tashkent region and Tashkent city live in a seismically active zone. Another fearsome source of earthquake dangers in these areas is that they have the high population density and industrial production is developed in the above-mentioned regions.

Researches on the study and prediction of seismic processes in Uzbekistan began in the second half of the XIX century. However, the strong earthquake in Tashkent in 1966 was a unique reason for the study of the subsoil structures of seismically dangerous areas and the study of the geological origin of the earthquake.

After the Tashkent earthquake, the Institute of Seismology named after

academician Mavlyananov has been established which is not only in Uzbekistan or in the Commonwealth of Independent States (CIS), but also the largest scientific center in the country, which has a unique place in the world seismology.

While establishing this institute the Resolution of the Government of Uzbekistan of August 31, 1966, № 449, and the Order of the Academy of Sciences of the Republic of Uzbekistan of 19 September 1966 № 19 have an important role.

Tashkent Physics and Tashkent Geophysics Observatory for research

It is also desirable to speak about the Observatory of the Tashkent Physics and Tashkent Geophysical Research Authorities.

The Tashkent Physics Observatory was founded in 1868, and the military typograph Captain K.V. Sharngorst guided this organization. This observatory has always been a good base for many years of scientific discoveries.

The initial magnetic equipment was brought to Tashkent in 1871 and episodic observations began [8]. In 1876, an astronomical observatory was set up in Tashkent. The Meteorological Observatory which was established in 1867, was incorporated into Physics Observatory [9].

Seismoscop named Sekki, which played an important role in the development of seismology in Tashkent, was first established in 1881 as part of the Physics Observatory. Installing and expanding this unit connected with G.V. Popov who was graduate student of University St. Petersburg. These devices were also installed in other parts of Turkistan. Seismic devices were installed in Tashkent, Andizhan, Kokand and Jizzakh, and their number reached 12. Since 1911, seismic observations have been assigned as a special service department.

During the last half-century, the Tashkent Physics Observatory has done a number of studies on topography and

magnetic measurements in the Central Asian region.

In the development of Geophysics in Turkistan the establishment of the Turkestan Meteorological Institute plays an important role which was adopted by the government in 1921. The Turkestan Meteorological Institute has been incorporated into the Tashkent Magnetic Meteorological Observatory, which has been a part of the Tashkent Physics Observatory. On the basis of it, established Tashkent Geophysical Research Observatory by the Decree of the Headquarters of Hydrometeorology which was under Central Seismology of the USSR in 1924.

The observatory was relocated to the town of Kelis in 1936 for technogenic causes related to the tram and intensification of traffic noise in Tashkent [10].

Scientific researches by Geophysical Observatory have begun to serve the development of the country and the national economy. One of the first

achievements was in 1924, the Kurshab earthquake in the region of Jalalabad, Fergana valley, predicted 12 hours ago according to the atmospheric electrons anomalous change in the area. Such a prediction was recorded in 1946 in Chatkal, in 1949 in Hait and in the 1966 earthquake in Tashkent.

During the difficult times of the 1930's and 1940s, observatories identified the composition and structure of the magnetic and gravitational area for the first time in the world. Scientists' generation had begun forming. At that time two doctors of sciences and 5 candidates of sciences were trained in the field of geophysics.

The observatory was transformed into the Republican Radio center under the Ministry of Communications of the USSR in 1956, the Mathematical Institute of the Academy of Sciences of the Republic of Uzbekistan in 1959, the Nuclear Physics Institute in 1963 and the Seismology Institute since 1967[11].

During this period his scientific potential and technical equipment

increased,, and scientific researches developed.

As soon as the Observatory joined the Seismology Institute, it had set the task of addressing the problems of new destructive earthquakes based on new plans.

In general, episodic observation of seismic activity in Tashkent was initially started in 1881-1900. The first seismic station in Tashkent was opened in 1892. Since 1910 the first seismic service was created in Uzbekistan. At that time, seven seismic stations were operating in Golitsin's system. By 1949, they were replaced by seismographers. In the 1968-76 years, there were 14 in Uzbekistan, and in 1990 their number reached 32. By 2005, 22 seismic stations and 12 integrated seismic stations started functioning [12]. At present, there are 60 seismic stations in our Republic, which makes up 4-5 stations in average per seismically active territory [13].

The Tashkent earthquake of 1966 prompted for the study of the subsoil structure of the areas that had seismic

danger and the organization of special complex studies to determine the geological causes of the earthquake.

Large-scale research had been done to detect the risk of Earthquake in Tashkent and adjacent territories. The necessity to strengthen the geological and geophysical survey of the crust of the seismic zone threatening the big cities and construction was admitted. During the strong earthquake the map of general seismic zoning will be completed by a scheme of high risk of land crust, and it will be clarified on the basis of seismotectonic research. The Seismology Institute of the Academy of Sciences of the Republic of Uzbekistan (1966) was established on the basis of Tashkent seismic station for carrying out these works.

Priority directions of scientific activity of this institute are the establishment of a comprehensive assessment of seismic danger and zoning, methodology of earthquake prediction. While compiling these tasks, a number of scientific results based on the

fundamental basis of the development of seismic surveys were identified.

Up today, the Institute of Seismology named after academician G.Mavlonov has been led by scientists not only from the republic but also from the abroad with a high scientific potential.

Today, the Institute consists of 6 scientific laboratories, 2 large scientific objects and three seismic services. Scientific Laboratory consists of regional seismic and seismic zoning, geophysical field, seismicodynamics, man-made seismicity, engineering seismology and geoecology. Large scientific objects include a magnetic ionosphere observatory complex with a seismological prediction system.

Seismological services include rapid information about strong earthquakes, cadaster of the areas with seismic dangers and information and analytical services.

The secretariat of International Strategy for Natural Disaster Reduction under the United Nations has concluded that: "Many residential buildings built in



Central Asia have been built without the full compliance with construction standards, and that it can lead to numerous losses, especially human deaths [14].

The Regional Seismic and Seismic zoning Laboratory was established in 1966 and its first head was seismic scientist V.I. Ulomov.

Over the past few years, the laboratory has established an automated system of optical meteorological observations firstly in the USSR [15].

At the same time, a system of permanent registration of all earthquakes on the Earth and their intensity has been formed.

The laboratory closely cooperates with the former Soviet Union's defense system to improve nuclear weapons and had activities on monitoring seismic processes in nuclear tests in the USSR and around the world.

As we know, earthquake predictions play an important role in maintaining security and preventing disasters at different levels. Therefore, the Regional

Seismic and Seismic Zoning Laboratory staff developed and patented the time and place of detection of seismic activity during seismic process.

An automatic method of identifying the first seismic points for different construction sites has been created;

Seismic process base, i.e. the database of seismic processes from ancient to the present was created.

This is called another field as polyseismology and was created by the Institute of Seismology for the first time in the world [16].

Over the years, a series of scientific and technical work has been undertaken in the country in order to study and reduce the risk of seismic activity.

One of these activities we can include that Uzbekistan has adopted a program for the development of schools for 2004-2009. One of the main objectives of this program was to increase seismic stability of the school buildings. In order to accomplish this task, 10,000 schools conducted inventory and seismic danger assessment. The findings indicate

that 25% of existing schools can partly damage from the earthquakes, and 10% can be completely ruined. Approximately 10% of school buildings should be dismantling according to the seismic resistance and construction. The rest of the school buildings need current and capital repairs [17].

According to scientists: it is desirable to repair buildings built in large cities every 40-50 years and increase seismic resistance [18].

As we have already mentioned, all nations living in our country and in our region have been doing the necessary work to protect from the effects of Earthquakes from the ancient times. It also influenced the appearance and development of our different values. It has also led to the formation of its own scientific schools.

However, this information and their social significance are very brief in the history sciences, as well as historians believe that this is a natural phenomenon. It has not analyzed its social significance on a historical basis.

These scientific developments serve as an important scientific basis for the well-being of the population and the sustainable functioning of economic facilities as a result of the determining Earthquake rate and under the creation of seismic maps of the Central Asian Republics and Uzbekistan in the years of independence,

Scientific analysis of seismic processes in Uzbekistan and measures to protect them has a significant place in the economic development of the country. The study of seismic processes is one of the important factors in the development of urban development in Uzbekistan, the construction and operation of important facilities, and the process of protection from earthquake. At present, the government has undertaken a number of activities to ensure the security of the country, the calm and peaceful life of the population, ensuring the stable functioning of the national economy.

The component of an important issue, such as ensuring stability in the country include predictions of possible

earthquakes, protection, and to minimize the amount of economic damage that may have caused, considering as a major task of historical analysis of tasks such as preventing people's death, makes the opportunity to eliminate future seismic dangers.

#### REFERENCES:

- [1]. G.P. Gorshkov. "Earthquake". United publishing house: "Red Uzbekistan" and "Pravda Vostoka". T.1952. P. 7-8
- [2]. G.P. Gorshkov. "Earthquake". United publishing house: "Red Uzbekistan" and "Pravda Vostoka". T.1952. P. 7-9
- [3]. G.P. Gorshkov. "Earthquake". United publishing house: "Red Uzbekistan" and "Pravda Vostoka". T.1952. P. 8
- [4]. Sh. Ubaydullaev, A. Norboev and others. "Initial preparation till the call" "Ilm - Ziyoyi", T. 2007. P. 19
- [5]. Z. Ilyasova. "Basics of Life Safety", "Finance", T. P.172
- [6]. The newspaper "Vecherniy Tashkent" 25. 01. 2016.
- [7]. Mavlyanova N.G. "Seismic danger in Uzbekistan" Author's abstract for dissertation for the degree of DSc. T.2007, p.3
- [8]. Academy of Sciences of the Republic of Uzbekistan. "The Institute of Seismology named after G.O. Mavlonov is 50 years old "(1966-2016). "LISSION PRESS".2017. P.69-70
- [9]. Academy of Sciences of the Republic of Uzbekistan. "The Institute of Seismology named after G.O. Mavlonov is 50 years old "(1966-2016). "LISSION PRESS".2017. P.70
- [10]. Academy of Sciences of the Republic of Uzbekistan. "The Institute of Seismology named after G.O. Mavlonov is 50 years old "(1966-2016). "LISSION PRESS".2017. P.69
- [11]. Academy of Sciences of the Republic of Uzbekistan. "The Institute of Seismology named after G.O. Mavlonov is 50 years old "(1966-2016). "LISSION PRESS".2017. P.70-71
- [12]. I. Kholikov, A. Norboev, M.Ishxujayeva. "The state system in emergencies in Uzbekistan and its role in

ensuring regional stability". TSPU.

T.2013 P.156

[13]. Republic of Uzbekistan FMI  
"Perspectives of earthquake monitoring  
and bases of development". Materials of  
scientific-practical seminar. UzR  
FMU.T.2018. P.21

[14]. A.Nigmatov, Sh.Muhammedov.  
"Safety of Human Life Activity",  
"Navruz", T.2014 P. 53

[15]. Academy of Sciences of the  
Republic of Uzbekistan. "The Institute of  
Seismology named after G.O. Mavlonov  
is 50 years old "(1966-2016). "LISSION  
PRESS".2017. P.30

[16]. Academy of Sciences of the  
Republic of Uzbekistan. "The Institute of  
Seismology named after G.O. Mavlonov  
is 50 years old "(1966-2016). "LISSION  
PRESS".2017. P.33

[17]. A.Nigmatov, Sh.Muhammedov.  
"Safety of Human Life Activity",  
"Navruz", T.2014 P. 54

[18]. A.Nigmatov, Sh.Muhammedov.  
"Safety of Human Life Activity",  
"Navruz", T.2014 P. 52