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ABOUT POSSIBILITY OF CREATION OF INTERNATIONAL GLOBAL SYSTEM OF FORECASTING THE EARTHQUAKES "ATROPATENA" (Baku-Yogyakarta-Islamabad)

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New technology of forecasting the earthquakes was established in Scientific-Research Institute on forecasting and studying the earthquakes (Baku) of the International Academy of Science/International Council for Scientific Development.

Since 2002 in the Institute have begun continuous changes of variations of gravity. We could determine the gravitational signals which precede the strong earthquakes, epicenters of which are in big distance (from 1 thousand km till 10 thousand km) from the registered station. Statistics shows that gravitational signals were registered in 90% of cases, on average, 5-15 days before strong earthquakes. This technology has Eurasia and PCT Patent.

Since 2005 for registration the strong earthquakes has been begun to be used the detector of super-long gravitational waves ATROPATENA, for which was received the international patent PCT, Fig.1.

In Fig. 1 is shown the photo of station of forecasting the earthquakes "ATROPATENA"

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Torsion detector of super-long gravitational variations registers the changing of gravitational field in three directions – X, Y, Z. Such nonstandard system of registration of variations of gravitational field allows to determine the direction on the center of future earthquake.

Some results of monitoring of variations of gravitational field of the Earth for 2005 is shown in the graph, Fig.2.

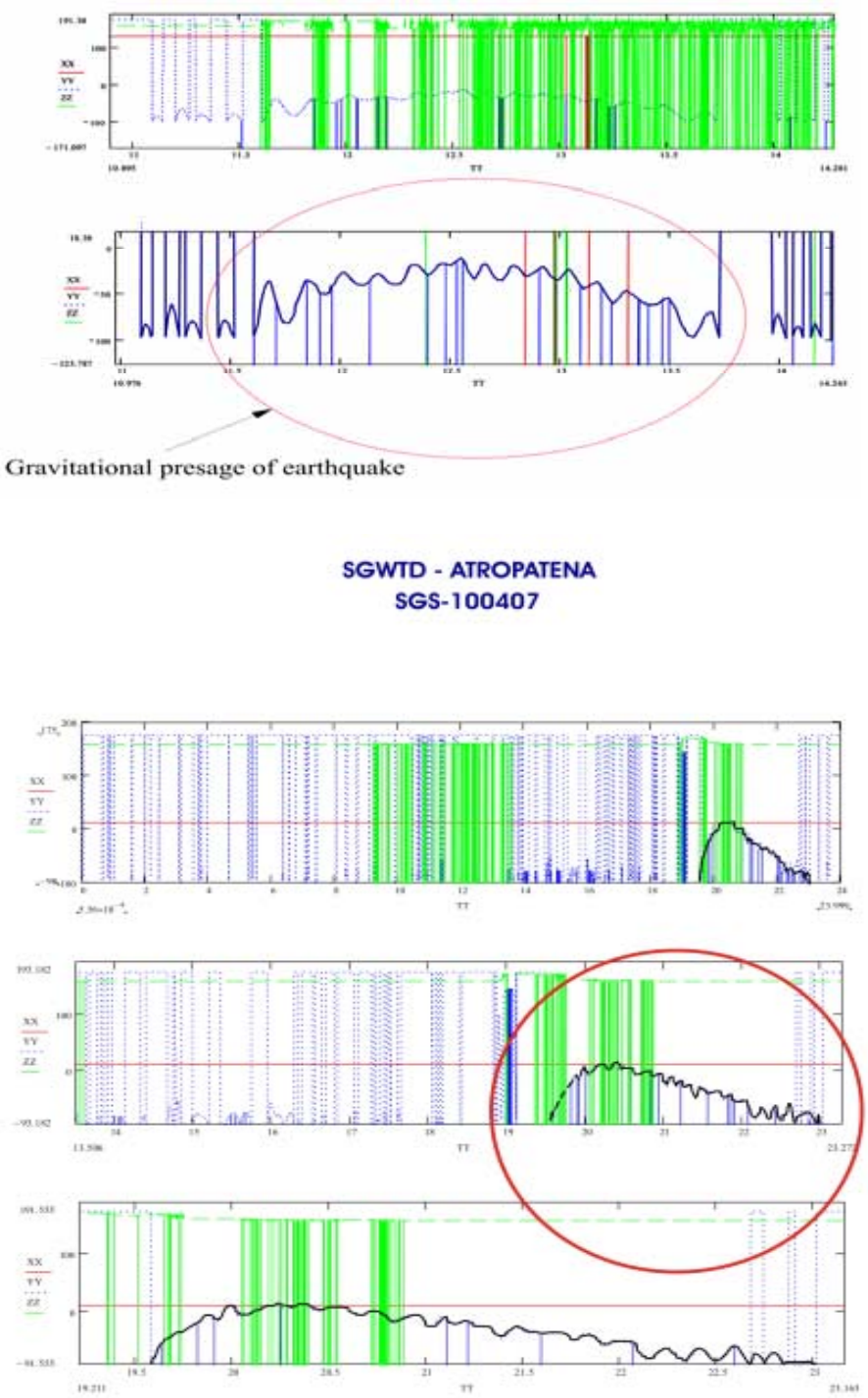

Fig. 2 Record of the station of forecasting the earthquakes ATROPATENA.

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In Fig. 2 is seen that the data from three sensors for three directions are simultaneously recorded and these data are shown in the form of three graphs of different colours – red, blue, and green.

In the graph it can be seen that before occurring the strong earthquakes, unusual low-frequency changing of gravitational field in one or several sensors is registered. There are peculiarities during registration of signals, which allow to increase the exactness of the forecast. These peculiarities are KNOW-HOW of the Institute.

The received results completely change the ideas about approaches in forecasting the earthquakes and the scales of influence of the zone of center of the imminent earthquake on geophysical parameters of the Earth's crust. To present day the centers of the earthquakes in radius till 200-300 km from the center of the earthquake were forecasted. However, as it was ascertained, the gravitational signals are registered from much distanced centers.

Therefore, the attempts to forecast the strong earthquakes on basis of standard ideas about revealing the physical presage of earthquakes not far from the center of the earthquake was not crowned with success.

Putting into operation the detector of SGW allows to considerably increase the exactness of the forecast. At the same time, in order to increase the reliability of determining the coordinates of future center of the earthquake, it is necessary to have, at the least, three forecasting stations with detectors of SGW, situated in the distance no less than 1000km from each other.

Detector of SGW registers the variations of gravitation field in three perpendicular directions – X, Y, Z. Sensitive system of the detector is completely isolated from the environment, is in the deep vacuum, at that even very weak displacements of sensitive elements of the system are registered by means of the laser beams and optical matrix. After it the signals in digital form are transferred to the computer and simultaneously recorded. On basis of these records are registered not only the variations of gravitational field of the Earth, but also its vector characterizations.

On basis of confirmed memorandums about cooperation, is planned the creation of global system of forecasting the earthquakes with placing the stations ATROPATENA in Baku (Azerbaijan), Yogyakarta (Indonesia) and Islamabad (Pakistan).

Simultaneously with the station ATROPATENA in the Institute on forecasting and studying the earthquakes is functioning during many years the station for forecasting the earthquakes BINAGADI–1. This station registers only vertical constituents of gravity and allows to forecast the time and power of distanced earthquakes 5-20 days before the tremor.

In this article we'll consider several results of forecasting the strong distanced earthquakes on basis of the data of stations BINAGADI–1.

Studying the tideless variations of gravity is the most important aspect of researches of modern geodynamics. This problem is at the heart of one of the most perspective directions of short-term forecasting of the earthquakes.

Professor Bart in many of his works gave his theoretical proves of possible changes of gravity of global character. These variations were substantiated by possible movement of the Earth core relative to its mantles, what, according to the scientist's opinion, should have brought to the changes of gravity about 0,5 mGal/year. Afterwards, these results didn't find their confirmation. Meanwhile, the calculations made by N.N.Pariisky show that if the variations of gravity were connected with the processes, made an influence on inequality of rotation of the Earth, then they can reach the first tens of mcGal/year (Pariisky, 1984). This conclusion is coordinated with the results of researches, made by E.Linder (1979).

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Influence of deformations, taking place inside the Earth, on the changes of gravity on its surface was theoretically calculate by Walsh (Walsh, Rice, 1979), and a number of other researchers (Tarakanov, Shleynikov, 1977; Bursha, 1972) and it turned out very little, within some mcGal.

Displacement of masses, caused by geodynamical processes, according to the opinion of Stolz, can bring to moving of the centre of the masses of the Earth on the value about 10 km, what must arouse the change of gravity on the surface of the Earth 2-3 mcGal/year (Stolz, 1976).

In his works R.Adams notes that before and after Heichen earthquake in Cina with M=7,3 in 1975 were recorded the changes of gravitational field up to 350 mcGal, a little fewer variations of gravitational field were observed in the period of disastrous earthquake in Tien Shan in 1976 (R.P.Adams, 1977).

When analyzing of the record of observations by means of gravimeter Askania during the periods including the strongest earthquakes Kizawa T. noted the before the earthquake in Alaska in 1964 (M=64), approximately 3 days before the earthquake appeared the so-called “vibration of the record” (relatively high-frequency oscillations of readings of gravimeter), which had finished right away after the end of the earthquake on 28.03.1964 (Kizawa T., 1970).

The changes of the gravity in the zone of epicenter of the preparing earthquake, as it was said above, were more than once observed by many researchers before the strong earthquakes. These variations of gravity near the center zone may be stipulated by a number of geophysical and tectonic reasons:

- Reached the critical level the stress condition of center zone brings either to squeezing and, consequently, to compacting of the rocks, or to stretching and decreasing of their density.
- The critical stresses in center zone of the preparing earthquake bring to active movements of fluids in the layers of the Earth, as a result of which, in the shafts and bores is observed either increasing or decreasing of the level of subsoil waters before the earthquakes;
- During reaching the stresses of critical sizes begins the mass cracking in center zone and in the sphere adjacent to it, which causes breaching of entirety of rocks and their demultiplexing;
- Deformational processes, arising in center zone before the earthquake bring to appearance of the area with high and low density.

Probably, there are also other factors, bringing to the changes of the gravity, but all of them don’t have big radius of range near center zones of the prepared strong earthquakes. It is connected with the fact that this effect of change of gravity connected, directly with geodynamical processes in center zone, is quickly decreased with distance and can be observed in the radius from tens till hundreds of kilometers from center zone.

Meanwhile, at “Binagadi” prognosis station of the ground of Scientific Research Institute on prognosis and studying of the earthquakes (Baku city) during several years are permanently registered the changes of gravity before strong earthquakes, the centers of which are in the distance of tens thousands kilometers from the station of registration.

So, since 2002 the Scientific-Research Institute on prognosis and studying of the earthquakes of the International Academy of Science has made uninterrupted measuring of tideless variations of gravity at “Binagadi” station, located on Absheron Peninsula in 25 km distance of Baku. Registration and primary processing of the data are made by the group of specialists under the

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leadership of B.Aslanov, which is a head of geophysical laboratory and a station on prognosis of the earthquakes.

The measurements are carried out by simultaneously four high-accuracy quartz gravimeter of KV and KS type.

The gravimeters are chosen so that their readings can be equal to the maximum, i.e. the graduating marks and zero-point shift in absolute values can be characterized among themselves with little difference.

As a result of measurements and interpretation of the received data were revealed the gravitational signals in the variations of gravity, previous to strong earthquakes, the epicenters of which are in big distance (in the radius from one thousand till tens thousands km) from the registering station.

The statistic data show that the gravitational signals were registered in 90% of cases, on average 8-15 days before strong earthquakes.

Some most typical results of registration of the variations of gravity before strong earthquakes during 2004-2006 are shown in the graphs below. The analysis of these graphs shows that in most cases before the distant strong earthquakes is firstly observed decreasing, then – increasing of gravity. In overwhelming majority of cases is observed “vibration of the record” – relatively high-frequency oscillations of gravimeter readings with the frequency 0,1 – 0,4 Hz, which is stopped right away after the earthquake. Meanwhile, in some cases, before distant strong earthquakes the changes of anomalies of gravity have more complicated character. In the table is shown the catalogue of strong earthquakes taken place in 2004-2006, before which at “Binagadi” station were registered anomalous changes of gravity.

THE EARTHQUAKE IN TAIWAN WITH M 7 (15.10.2004)

A strong earthquake took place on 15 October in the shore of Taiwan. In the epicenter which was at the bottom of the ocean, more than one hundred kilometers to the South-East of the capital Taipei. The force of the tremors reached 7 according to Richter scale. According to available information 3000 people died during the earthquake.

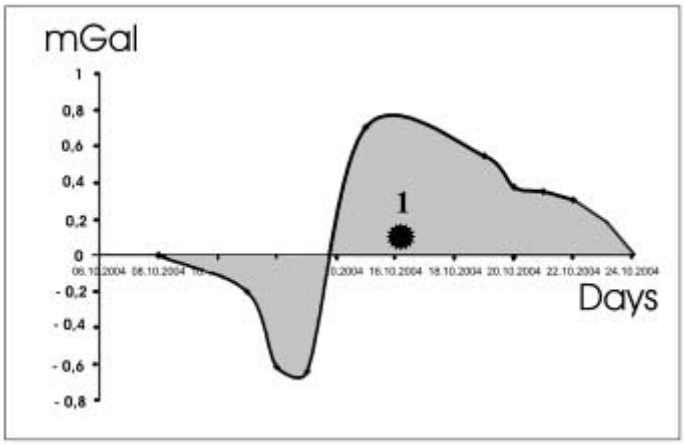

Fig.1 Variations of gravity before strong earthquakes in Taiwan (N 1).

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In Fig.1 is shown the graph of change of gravity before the earthquake with M 7 (N 1), which took place in Taiwan on 15.10.2004. So, the quasi-wave variations of gravity (QWV) were registered. The complete period of Δ_g quasi-wave variations is 15 days.

DISASTROUS EARTHQUAKE WITH M9 AND TSUNAMI IN INDONESIA (26.12.2004)

The disastrous earthquake of 26 December 2004 with magnitude 9 near North Sumatra, spawned the strongest tsunami has become the reason of loss of about 300 thousand people and went down in history of humanity as one of the most grandiose natural disastrous events. And the matter is not only in the monstrous number of victims of the earthquake and tsunami made from it (Fig.2). The matter is, first of all, in astonishing geological event, the scales of which are so big, that they influenced on planetary processes in the Earth.

This event is described in details in fundamental article of V.I. Starostenko and others (V.I.Starostenko and others, 2005). The disastrous earthquake on South-East Asia has changed the geophysical characteristic of the Earth. As it is said in the site Spaceflight Now, the scientists from NASA determined that earthquake tremors had influenced on the speed of rotation of the planet, had decreased the duration of days and a little changed a shape of the planet. Besides, as a result of the earthquakes the location of North geographical pole shifted. It shifted on 2,5 cm in the direction of 145 degrees of east longitude. The change of the speed of rotation of the planet aroused increasing of duration of days on 2,68 microsecond, and shift of masses brought to change of form of the planet. As a result of the earthquake the proportions of the planet have changed on one ten milliards, that is the Earth has become less flattened out and more compact.

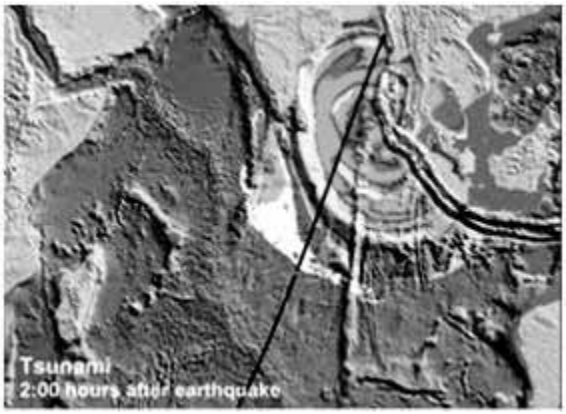

Fig.2. The scheme of spreading of tsunami from epicenter of catastrophic earthquake in Indonesia on 26 December 2004.

The image is from site www.wikipedia.org

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According to the data given in the work of V.I. Starostenko and others, the catastrophic earthquake of 26 December 2004 took place in the form of thrust-fault at the turn of Indo-Australian and Eurasian plates in the zone of North Sumatra. Approximately 2 minutes before the break realized the elastic deformation, which had been gathered in this center zone during hundreds of years as a result of continuing subduction (underthrust) of Indo-Australian plate under the Eurasian one. The zone of aftershocks on 26 December had the length of about 1300 km. Even if we suppose that only a part of aftershocks reflected the surface of the break of the main tremor, then, to the opinions of a number of researchers (2005) the geodesic observations and computer modelling allowed the scientists to come to the conclusion that the maximum underthrust during the given earthquake in the depth of 18 km, made approximately 20m. At that the bottom of the sea has moved considerably less: in vertical direction – approximately 5m, and in horizontal – 11m.

To our opinion, exactly from the point of view of planetary range of this event, the researching of the process of geodynamic preparation of this event reflected in global changes of gravity is the most interesting.

The analysis of records of changes Δ_g before and after Indonesian earthquake (N2) showed that in contrast to other strong earthquakes, the process of preparation, which appeared in the form of quasi-wave complete cycle of variations of gravity, has considerably longer period (Fig.3). So, decreasing of the value of gravity of relatively average magnitude has begun to be shown on 3 December 2004.

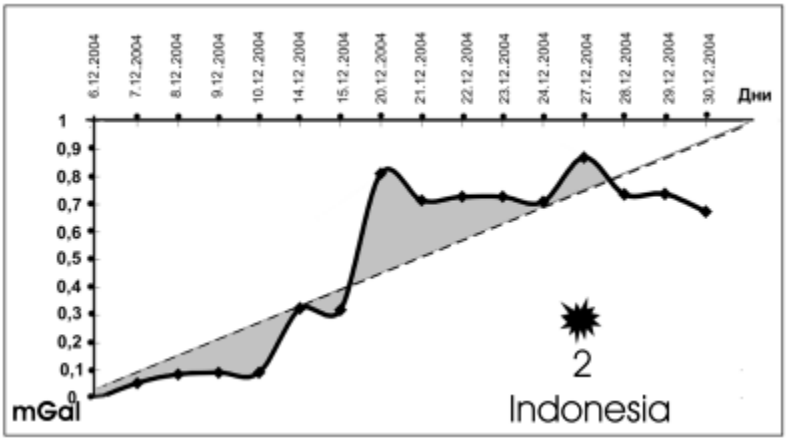

Fig.3. Variations of gravity before strong earthquakes,

which aroused the tsunami in Indonesia on 26.12.2004

Beginning from 10 December there is observed rather abrupt rise of the value of gravity, at that by 20 December the gravity has increased on 0,8 mGal, after what by 21 December a little decreased on 0,1 mGAl and remained unchangeable up to 24 December. On 24 December the value of gravity again becomes to increase, having reached its maximum on 26 December, jumping on 0,15 mGal during 1 day (Fig.3). After the earthquake the value Δ_g begins to decrease slowly, reaching the average value by 1 January 2005. So, a complete cycle of gravitational quasi-wave signal was 28 days during the Indonesian catastrophic earthquake on 26 December 2004. At that, the beginning of these changes was fixed 23 days before the main tremor. This period of time

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approximately in three increases the average period of time of beginning of appearances of gravitational precursor for other strong earthquakes. The maximum amplitude of QWV was 0,82 mGal. QWV was accompanied by "vibration of the record" of gravimeter readings. This fact once more approves the considerable difference of this remarkable geological event on all the planet scale from the rest strong earthquakes occurred during last 100 years.

THE DISASTROUS EARTHQUAKE IN PAKISTAN WITH M7,7 (08.10.2005)

The disastrous earthquake that took place on 8 October 2005 in Pakistan with magnitude 7,7 is referred by the specialists to the strongest and destroying earthquakes in this region during last 100 years. The first tremor with magnitude 7,7 took place at 8.50 a.m. on Saturday. According to the data of geological survey of the USA (USGS), the epicenter of the earthquake was in 100 km of North-East of Islamabad – in Pakistan's Kashmir, near the line of demarcation which divides India and Pakistan, at a depth of 10km. According to USGS, on Saturday and Sunday in Pakistan were fixed at least 45 tremors more; the strongest of them - with epicenter in 110 km to the North of Islamabad – reached magnitude 6,3 according to Richter scale. The cities Muzaffarabad, Bagh and Ravala-Kot and adjacent to them territories have suffered most of all. The serious destruction is observed in the regions Batagram, Bala-Kot, Mansehra, Abbottabad and Patan. According to available data, this earthquake has taken about 50 thousand human lives in Pakistan. In India mostly suffered the boundary cities Uri, Tangdar, Pounch and Srinagar. According to the data of Indian officials, about 2000 people died.

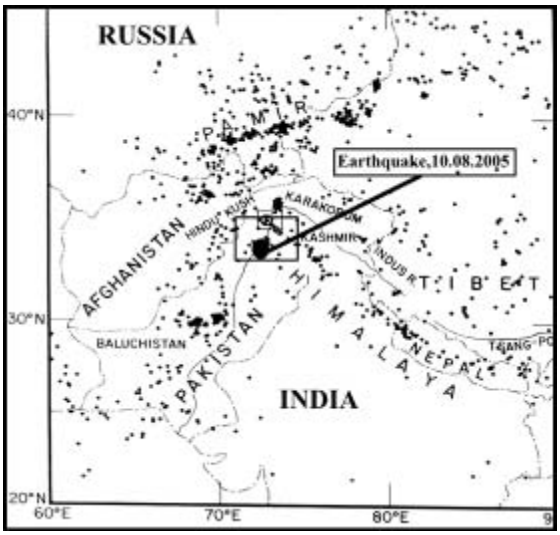

Fig.4. Scheme of location of epicentral zone of Pakistan earthquake

The analysis of the changes of Δ_g before, during and after Pakistan earthquake, shown in Fig. 4 is also of a big interest. In contrast to considerably more scaled earthquake in Indonesia on 26.12.04, relatively short period of time of Δ_g variations preceded the earthquake in Pakistan. Decreasing of values of Δ_g relative to average values began on 2 October, having reached the minimum, after what began increasing of values of Δ_g, which by the moment of earthquake on

08.10.05 (N 7) raised on 0,73 mGal. Finishing the cycle of quasi-wave changes of gravity was on 09.10.2005. The period of cycle was 7 days (Fig.5). QWV was accompanied by “vibration of the record” of gravimeter readings.

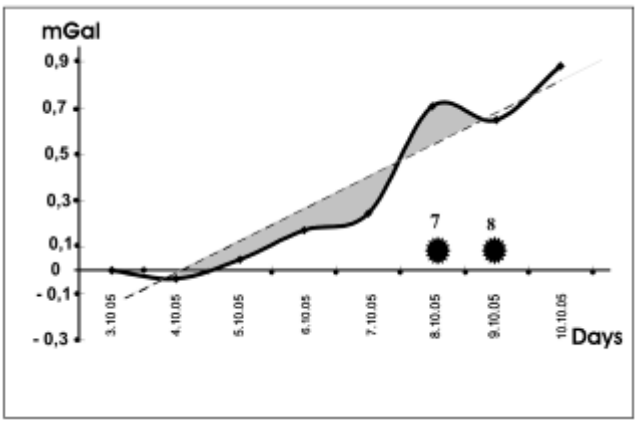

Fig.5. Variations of gravity before strong earthquake in Pakistan (N 7 and N 8)

In a day after the main tremor the value Δ_g decreased on 0,1 mGal, and at this moment occurred perceptible aftershock with magnitude 5,7 (N 8), after which the value Δ_g had increased on 0,2 mGal. Then the value Δ_g begins to decrease, reaching the average value by 14.10.05.

THE DISASTROUS EARTHQUAKE IN INDONESIA WITH M7,7 (27.01.2006)

On 27 January 200 in the region of Indonesia took place the earthquake with the magnitude 7,7 according to Richter scale (N 9). The tremors were fixed in the Banda Sea, to the East of one of the biggest Indonesian islands Sulavesi. Fortunately, this event hasn’t brought to serious consequences and victims because of considerable distance of epicenter of the earthquake from inhabited localities. At the same time, from the point of view of energy ingress, this event can be considered rather important. The pattern of change Δ_g before the earthquake and after it can also be evidence of it.

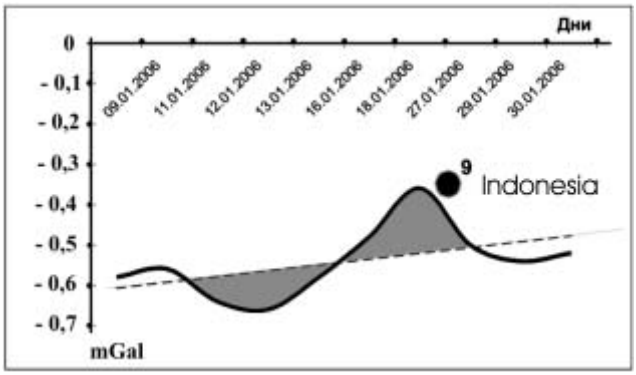

Fig. 6. Variations of gravity before strong earthquake in Indonesia (N 9)

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In Fig. 6 is shown the graph of changes of gravity in the process of preparation and after the earthquake in Indonesia on 27.01.2006. The process of decreasing of the values of gravity began on 10.01.2006, having reached the minimum on 12.01.2006, after what was observed its increasing on 0,32 mGal with the maximum on 25.01.2006. From 26.01.2006 begins the decreasing of Δ_g which comes back closely to the background value by 28.01.2006. So, a complete cycle of QWV is 18 days. As it is seen, the period of cycle is reasonably higher than the average period for strong earthquakes, but lower, than the period of QWV of the disastrous earthquake in Indonesia on 26.12.2004. The maximum amplitude of changes of Δ_g is 0,32 mGal. QWV was accompanied by "vibration of the record" of gravimeter readings.

EARTHQUAKE IN PHILIPPINES M 7,1 (05.02.2005)

On 05.02.2005 in Philippines in the region of the Mindanao Island took place a strong earthquake with the magnitude 7,1. The interpretation of graph of tideless variations of gravity before, during and after this event, given in Fig.8 is vary interesting. So, on 31 December of 2005 began decreasing of values Δ_g having reached the minimum on 03.02.2005.

By 04.02.2005 the value Δ_g increases on 0,96 mGal, after what is observed the abrupt decreasing of gravity on 1,2 mGal with minimum on 10.02.2005. so, the complete period of quasi-wave change Δ_g was 10 days.

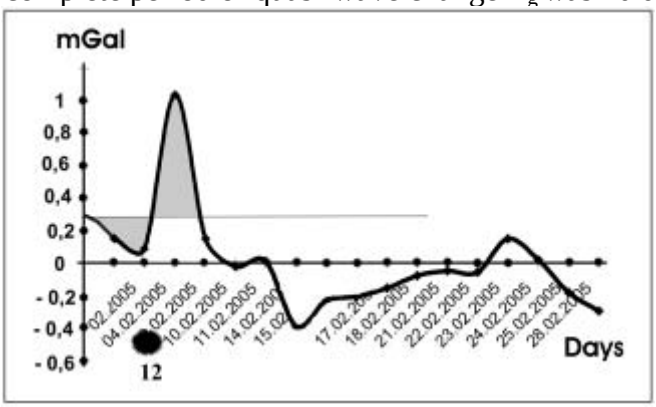

Fig. 7. Variations of gravity before strong earthquakes in Philippines (N 12).

As it is seen in Fig. 7 the amplitude of Δ_g variation was rather perceptible (1,2 mGal), what is the evidence of the range of geodynamic processes, accompanying this earthquake. QWV was accompanied by "vibration of the record" of gravimeter readings.

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EARTHQUAKES IN SOUTH IRAN ON 13..03.2005 (M 6) AND IN INDONESIA ON 28.03.2005 (M 8,7)

Two events, unequal on their energy significance, distinctly enough appeared in Δ_g variations, preceding and accompanying the earthquakes in South Iran (13.03.2005) with the magnitude 6 and in Indonesia (28.03.2005) with the magnitude 8,7.

Not describing in details the Iran earthquake we think it rather interesting to consider the events taken place during the strongest earthquake in Indonesia.

On 28 March 2005 in the Indian Ocean at about midnight the earthquake with the magnitude 8,7 according to Richter scale took place. The earthquake was felt in the distance of more than 700 km from epicenter. The tremors were felt by the inhabitants of Thailand, Malaysia and Singapore. The epicenter of the earthquake was at the bottom of the ocean not far from the Indonesian Island Sumatra. The tsunami with the height, which occurred as a result of the earthquake, fell in the Indonesian Island Simelue, at that the wharf of the main port of the island was partially destroyed, the wave of tsunami reached even the airport of the littoral city Sinabang. According to the evaluations of the officials, the death-roll as a result of the earthquake taken place on 28 March 2005 in the coast of Sumatra is more than 2 thousand people.

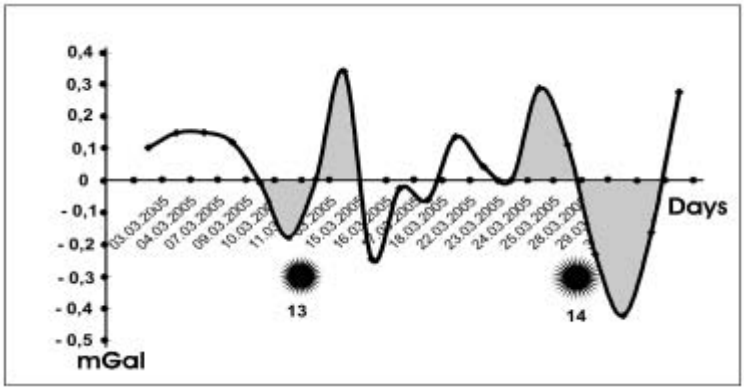

Fig. 8. Variations of gravity before strong earthquake in Iran (N 13) and in Indonesia (N 14)

In Fig. 8 is given the graph of Δ_g variations preceding and accompanying the earthquakes in South Iran (N 13) and in Indonesia (N 14).

First of all we'll consider the Iran earthquake. On 04 March 2005 begins the decreasing of values Δ_g which firstly reach their minimum between 10 and 11 March 2005 decreasing on 0,27 mGal. From 11 March begins decreasing of Δ_g and on 13 March takes place the earthquake in South Iran with the magnitude 6, at that the values of gravity continues to increase, reaching the maximum by 15 March, and the maximum amplitude of increasing Δ_g is considerable and is 0,56 mGal. After it there is observed the abrupt decreasing of the value Δ_g on 0,62 mGal with reaching the minimum 16.03.2005. A complete period of QWV covers the time from 09 till 15 March 2005 and it is 6 days.

During the following five days takes place the increasing of Δ_g against the background of fluctuations. To our opinion, the beginning of the process of preparation of Indonesian earthquake is reflected in the graph from 23 March, when Δ_g has a background value. Between 24 and 25 March Δ_g increases on 0,3 mGal, then

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it abruptly decreases on 0,72 mGal and in the process of this decreasing on 28.03.2005 takes place the strongest earthquake in Indonesia with the magnitude 8,7. At that Δ_g reaches its minimal value between 29 and 30 March 2005. A complete cycle of quasi-wave change in time Δ_g covers 23-31 March 2005 and is 9 days. QWV was accompanied by "vibration of the record" of gravimeter readings.

EARTHQUAKES IN INDONESIA ON 27.05.2006 (M6,3) AND ON 17.06.2006 (M7,7)

On 27 May in Indonesia in the region of Jokyakarta in the Island Java took place the strongest earthquake, the magnitude of which was 6,3 according to Richter scale. A death-roll as a result of the earthquake in the Island Java was 5115 people. About 20 thousand people were wounded, and 100 thousand people were left without a roof over their heads. After the main tremor followed hundreds of less strong ones. Almost whole region was without electricity and communication. In Bantul city were destroyed 80% of buildings. In Fig. 9is given the graph of Δ_g variations where is clearly observed the anomalous change of gravity in time before the main tremor (N 15). A form of graph of the change in time has a quasi-wave character with a full period of 12 days. The maximum amplitude of variations (from maximum till minimum) is 0,45 mGal. QWV is accompanied by "vibration of the record" of gravimeter readings.

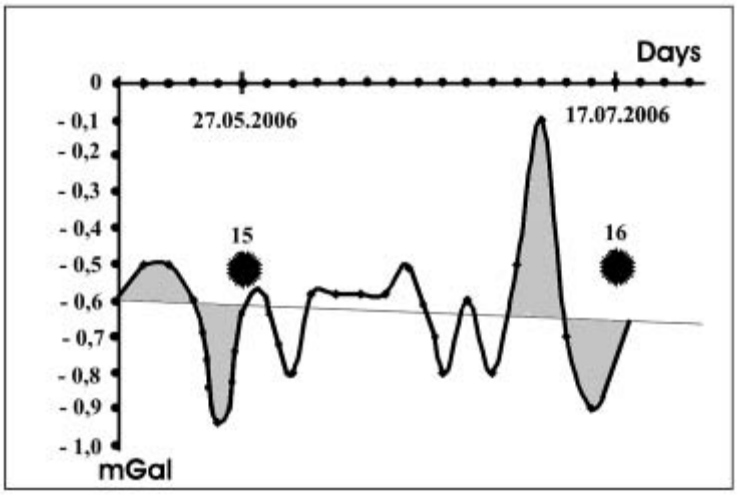

Fig. 9. Variations of gravity before strong

earthquakes in Indonesia (N 15 and N 16).

On 17 July 2006 in Indonesia took place the next strongest earthquake with the magnitude 7,7. Its epicenter was at the depth of 48 km in the Indian Ocean in 360km from Jakarta. Then more than 20 tremors followed. The earthquake spawned the tsunami with the height of more than 4 meters, which fell in the western coast of Indonesian Island Java. A main tremor of the element was in the resort town Pangandaran (the province Western Java) and in the region in 40 kilometers to the east of the Chilachap port.

Approximately in the 300km area at the coast of Java the tsunami destroyed and washed thousands of people into the ocean. Energy supply and telephone communications was broken. Jokyakarta also suffered because of the

earthquake and tsunami. As a result of the earthquake and tsunami about 1000 people died and 500 people were wounded.

In the graph appeared the pronounced anomaly of Δ_g variation, which considerably increases the anomaly during the earthquake on 27.05.2006. To our opinion it can be explained with a big magnitude of the earthquake on 17.07.2006. A form of anomaly Δ_g preceding the earthquake, also has a quasi-wave character with the period of 13 days. The maximal amplitude of Δ_g variation is 0,92 mGal. QWV was accompanied by "vibration of the record" of gravimeter readings.

Below are given the photos of the author near the destroyed chouses in Yogyakarta as a result of strong earthquakes and tsunami, occurred in Indonesia on 27.05.2006 and on 17.07.2006.

THE EARTHQUAKES IN JAPAN ON 10.10.2006 (M 6) AND IN THE KURILES ON 15.11.2006 (M 8,3)

On 10 October 2006 in the northern part of Japan took place the earthquake with magnitude 6 according to Richter scale. The epicenter of the earthquake was in the sea near the Fukusima city which is in 240km to the north-east from Tokyo.

The earthquake didn't cause the big destruction, but its preparation was accompanied by the pronounced anomaly of variation of gravity. The period of quasi-wave variation was 7 days. The maximal amplitude of changes of Δ_g was 0,8 mGal. QWV wasn't accompanied by "vibration of the records" of gravimeter readings. Fig.10.

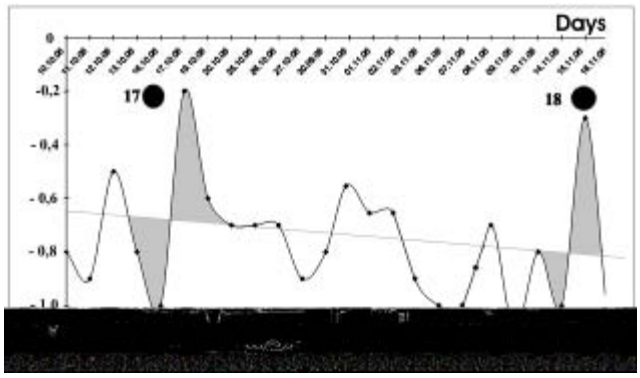

Fig.10. The graph of variations of gravity before the earthquakes in Japan (N17) and in the Kuriles (N18)

On 15 November 2006 in the Kuriles took place the strongest earthquake with the magnitude 8,3 according to Richter scale. The tremors were felt approximately in 390km to the east of the Iturup Island (the Kuriles Island).

The earthquake was preceded by the anomalous variation Δ_g which has the quasi-wave character with the period 5 days. The amplitude of variation was 0,72 mGal. QWV was accompanied by "vibration of the record" of gravimeter readings.

THE EARTHQUAKE IN TAIWAN ON 26.12.2006 (M7,4)

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On 26 December 2006 at 12:26 by Greenwich time near the south coast of the Island Taiwan took place the strong earthquake with M 7,4. The epicenter of the earthquake was near the south coast of the Island Taiwan in 90km to the south-east of the city Gaosyun.

According to the data of the National center of information about the earthquakes of Geological Survey NEIC the earthquake was felt on the whole island Taiwan and at the eastern coast of China. There were destruction and victims: under the heaps of the destroyed furniture factory died 2 people, more than 30 were wounded.

Fig. 11. The graph of variations of gravity before the earthquakes in Taiwan (N19).

In the Fig. 11 is shown the graph of quasi-wave variation of gravity before the earthquake in Taiwan. On 19 December began the decreasing of gravity which reached its minimum decreased by 21.12.2006 on 0,1 mGal, after what began its decreasing. Δ_g reached its maximum between 25 and 26 December, at that the general amplitude of decreasing of Δ_g was 1,2 mGal. On 26 December took place the earthquake.

It is remarkable that this graph could be called reference one for short-term prognosis of the earthquakes. QWV was accompanied by “vibration of the records” of gravimeter readings.

THE REGULARITIES OF APPEARANCE OF FAR-RANGE PRECURSORS OF THE EARTHQUAKES

The carried out researches of tideless variations of gravity allowed to reveal the quasi-wave anomalies of Δ_g variations and to make the conclusion about their connection with strong earthquakes. Meanwhile, the establishing of regularities among different parameters of quasi-wave variations and strong earthquakes is of interest. With this purpose was made the graph of dependence of the periods of QWV on the magnitudes of the earthquakes, accompanying QWV.

Fig. 12. The graph of the magnitude from the period of quasi-wave variation Δg.

In the graph (Fig. 12) is shown the straight-line trend which characterizes the dependence of periods of QWV on the magnitudes of the earthquakes. As it is seen from the graph, these two parameters have the directly proportional dependence, i.e. the higher the period of QWV the higher the magnitude of the earthquake.

It can be logically explained by the fact that the higher the energy of the earthquake the more time is needed for the process of accumulation and discharging of the stress in the interior of the Earth.

Another interesting aspect, to our opinion, is the possibility to determine the presence of dependence between the magnitude of the earthquake and amplitude of QWV. In Fig. 13 is shown the graph of dependence of magnitudes of the earthquakes on the amplitudes of QWV. As it is seen in the graph, this dependence is also described by the straight-line trend, which is the evidence of the fact that the magnitudes of the earthquakes is in directly proportional dependence on the amplitudes of QWV, i.e. the higher the amplitude of the ingress of QWV the higher the energy of the earthquakes. To our opinion, this conclusion is rather logical, because the amplitude of QWV can be the evidence of the scale of geodynamic process in the interior of the Earth.

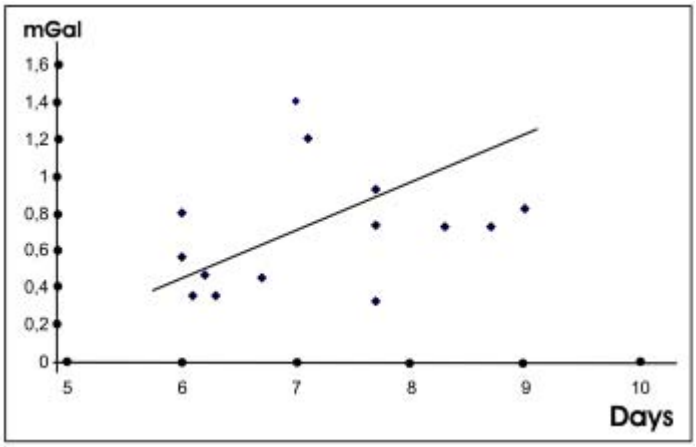

Fig. 13. The graph of dependence of the amplitude of quasi-wave variation of Δg on the magnitude of the earthquake.

The received results completely change the notions about the approaches to forecasting of the earthquake and about the scales of appearing of precursors of strong earthquakes in giant territories.

Starting from received results is becoming to be clear the reason of many unsuccessful attempts of forecasting of the earthquakes by means of registration of changes of gravity and, most likely, of a number of other precursors. The researchers registering the anomalies of the gravity in time referred them only to appearance of preparation of neighboring to the registering device of the center zones whereas actually these precursors reflected the preparation of the earthquakes the centers of which were in big distance from the station of observation. The opinion of M.Tadzimu is the most eloquent evidence about this mistake. He says that the short-period changes of the gravity till 0,2-0,3 mGal

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occur before and after the earthquake in consequence of monoaxial horizontal pressure of the masses of the crust near the epicentral zone (Tadzimu, 1970).

As a result of carried out researches we made the conclusion about the availability of two types of precursors of strong earthquakes:

- local precursors, the main reason of which is the tectonic processes located in the radius of hundreds of kilometers from the center zone of the preparing earthquake;
- far-ranging precursors of the earthquakes, the reason of which is the large-scale deep layers of the Earth.

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Table

№№	Name of district	Date and time	Magni - tude	Coordinates	Distance up to Baku Km/ Mile
1	TAIWAN REGION	2004/10/15 04:08	7	24.53°; 122.694°	
2	INDONESIA (TSUNAMI)	26.12.04 0:58	8,8	3.316°; 95.854°	6169,3 Km; 3833,43 Mile
3	HALMAHERA, INDONESIA	2005/08/19 15:48	5,5	2.646°; 128.143°	
4	NEAR EAST COAST OF HONSHU	2005/08/24 10:15	6,2	38.564°; 142.987°	
5	EASTERN GULF OF ADEN, INDINESIA	2005/08/26 18:16	6,2	14.417°; 52.365°	
6	OFF EAST COAST OF HONSHU, JAPAN	2005/08/30 18:10	5,7	38.495°; 143.151°	
7	PAKISTAN	08.10.05 3:50	7,7	34,43°; 73,54°	2182,33 Km; 1356,04 Mile
8	PAKISTAN	09.10.05 0:00	5,7	34,27°; 73,69°	2202,26 Km; 1368,42 Mile
9	BANDA SEA, INDONESIA	27.01.2006 16:58	7,7	-5.45°; 128.1°	16116.44 Km; 10014.29 Mile
10	NORTHERN SUMATERA, INDONESIA	09.01.2005 22:12	6,1	4.926°; 95.108°	5980.88 Km; 3716.35 Mile
11	NICOBAR ISLANDS, INDIA	24.01.2005 4:16	6,3	7,33°; 92.482°	5588.20 Km; 3472.34 Mile
12	MINDANAO, PHILIPPINE ISLANDS	05.02.2005 12:23	7,1	5.293°; 123.337°	8221.74 Km; 5108.75 Mile
13	SOUTHERN IRAN	13.03.2005 3:31	6	27.115°; 61.891°	1839.87 Km; 1143.24 Mile
14	NORTHERN SUMATERA, INDONESIA	28.03.2005 16:09	8,7	2.085°; 97.108°	6364.02 Km; 3954 Mile
15	JAVA, INDONESIA	27.05.2006 5:545	6,3	7.962° 110.458°	
16	SOUTH OF JAVA,INDONESIA	17.07.2006 08:19	7,7	-9.222°; 107.320°	
17	HAWAII REGION, HAWAII	15. 10. 2006г. 17:07	6,7	19.820° 156.027°	12793.53Km 79495.53Mile
18	KURIL ISLANDS	11.15.2006г. 11:14	8.3	46.616° 153.224°	7722.06 Km 4798.27 Mile
19	TAIWAN REGION	26.12.2006 12:26:21 (UTC)	7,4	21.825° 120.538°	

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It is becoming to be evident that the availability of two types of gravitational precursors of the earthquakes, on the one hand, complicates the interpretation of the received data of monitoring of gravity, and on the other hand, it allows to exclude the errors during short-term forecasting the earthquakes, when the far-ranging gravitational precursors of the earthquakes are taken as local ones. But the most important is that there appeared the possibility of registering the moment of origin of future seismic activation, most likely connected with the ingress of geodynamic activity in deep layers near the Earth core.

Being guided by the described above newest data of seismic tomography and the formed in definite degree the renewed model of the deep geodynamics of the Earth, we can surmise the next mechanism of appearance of far-ranging precursors of strong earthquakes. In the deep layers of the Earth presumably in the layer D with the definite quasi-periodic cyclicity, arises come energy splash, which have the short-tern character. This splash of energy must spawne the formation of the field of the high pressure, temperature and low density, injecting the plume which creates the additional impulse in convection current and in the mantle. In some period this impulse brings to acceleration of convection currents in asthenosphere what brings to activation of moving of definite lithospheric plates, depending on the fact in what part of the layer D is taking place the energy splash. There is no doubt that definite time passes from the moment of energetic impulse in the layer D before the beginning of seismic activation in the borders of lithospheric plates. Most likely, namely this period of time (8-20 days) has passed from the start time of registration of variations of gravity before strong earthquakes. And in this case can be two reasons of arising the registered anomalies of gravity: 1. Forming of giant fields of anomalous density, aroused by energy splash, in the layer D; 2. Radiation of tectonic waves in the zone of energy splash in the layer D. The nature of tectonic waves is different from seismic ones and they reflect not only the alternate interchange and moving from the emission source of the fields of increased and decreased density, but also a partial moving of substance of the mantle.

From physical point of view the observed anomalies can be explained more likely namely by registration of super-long tectonic waves, radiated in the layer D and alternately changing the density of the rocks during its moving, what, in its turn, registered by gravimeters in the form of variations of gravity. The tectonic waves cause the abrupt increasing of stress in center zones, where the stress have reached the critical values, what brings to the earthquake.

The registered in Scientific-Research Institute of prognosis and studying of the earthquakes the variations of gravity before strong earthquakes, the epicenters of which are in the distance of 4-7 kilometers from the registered station can shed the light on the spatio-temporal character of the process of rise of deep geodynamic activity. The main question during interpretation of gravitational anomalies before strong distant earthquakes is in the fact whether these anomalies are directly connected with preparation of center zone of the earthquake or reflect the zone of rise of geodynamic activity in the deep layers of mantle.

The calculations carried out by us show, that if the source of gravitational anomalies, registered before strong earthquakes in Pakistan, Indonesia and other earthquakes, 4-7 kilometers distant from “Binagadi” station, then in them should have been formed improbable giant fields of decreased density with a diameter of 100 kilometers. In this case near the center zones were registered the gravitational anomalies in hundreds of milligals, what actually aren’t observed. Consequently

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the source of gravitational anomaly is at the big depth and is distant from the center zone of the earthquake the same way as from the registered station.

So, we offered fundamentally new conception, explaining the observation of variations of gravity before distant strong earthquakes.

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