



## THE SOFTWARE FOR THE OPERATIVE FORECAST EARTHQUAKES ON THE SEISMOFLUIDOGEOLOGICAL FIELDS OF THE UNDERGROUND WATERS

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Studies confirmed the relevance seismic forecasting sharply increased seismic activity over the past 20 years. Earthquakes, among other types of natural disasters, take one of the first places in their devastating effects, the number of victims and material damage. They cannot be prevented, but to reduce the degree of seismic risk possible. You need to know the causes of earthquakes, study the processes associated with their preparation and implementation, as well as - to develop methods for predicting this terrible natural phenomena.

The territory of Azerbaijan and the adjacent waters of the Caspian Sea are seismically active regions of the Earth. Seismic forecasting study here were first launched in the RCSS ANAS and held for 35 years (1979-2014). They are presented year-round and geophysical seismicfluidogeodynamical (SFGD) works. SFGD direction carried seismicgeochemical (SGC) and seismichydrogeodynamical (SHGD) methods. Seismicgeochemical monitoring represented hydro, gas - and radio-geochemical methods. All work is divided into the following types of research: a) experimental - year - stationary and field monitoring SFGD; b) theoretical - in the short-term and operational seismic forecasting; c) the development and introduction of new mathematical and software daily data. The purpose of these studies-the rapid detection of "dangerous" focal zones of earthquakes in real time ("**on-line**"). Year-round monitoring objects are: a) groundwater (23 items) in 6 seismogenic zones, and b) sea water coast of the Caspian Sea in 3 regions of the Republic, and c) local land surface of the Earth. Region assess seismic conditions - the Caspian Sea, Azerbaijan and the territory of neighboring countries (Russia-Dagestan, Georgia, Armenia, Turkey and Iran). It also notes the possibility of preparing to implement not only strong but also tangible medium, weak tangible and seismic events.

As a result of year-round seismic forecasting SFGD research for 35 years (1979-2014) Produced a unique factual material. It is represented in the "Data Bank seismicfluidogeodynamical year (SFGD) monitoring fluid" in the seismogenic zones and marine waters of the Caspian Sea. When the correlation of these data with seismicity for the period 1986-2014 was found a short-term change in the concentration parameters in the fluid compositions in the preparation of both local ( $m_l \leq 4.0$ ) and global (planetary scale) earthquakes ( $m_b \geq 8.6$ ).

After a strong earthquake Baku Caspian (25.11.2000;  $m_l=6.0$ ;  $M_{pv}=6.4$ ;  $h=33$  km) made the first steps in the development, testing and implementation of technologies for rapid assessment of the seismic environment for SFGD fields of fluids in real time ("**FORECAST on-line EARTHQUAKES ON THE SEISMOGEOCHEMICAL FIELDS**"). However, in Azerbaijan year-round SFGD monitoring is carried out daily, but one time a day, that is discretely, and not in automatic mode. But received regions, seismicgeochemical stations, primary data daily, 12 hours a day are sent to the Department of "Geochemistry" (Baku). After that, the operational processing SFGD data for rapid

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assessment of the seismic environment, based on the Software ("**OPERATIVE FORECAST EARTHQUAKES ON THE SEISMOGEOCHEMICAL FIELDS**"). If SFGD automate monitoring, this software can be called "**FORECAST on-line EARTHQUAKES ON THE SEISMOGEOCHEMICAL FIELDS**".

This technology consists of mathematical and software designed for rapid methods (Keramova, 2004-2011), which are automated:

1. Rapid method of detection of anomalies (formula) for daily data processing (197 parameters) seismicgeochemical monitoring for rapid assessment of the seismic situation in the region.
2. Rapid method of calculating the magnitude range (formula) predicted earthquake.
3. Rapid methods for identifying the seismic source on the anomalies in the fields SFGD fluids. It allows you to set two parameters of the focal zone, preparing for implementation: a) "range" location (interval coordinates), b) the range of time that remained before the implementation predicted earthquake in the range 1÷16 days.
4. Empirically set to "range, that is interval time of forecast" a seismic event on the anomalies in geochemical fields of fluids. They appear only in the final stage of earthquake preparation for implementation. It is equal to 1÷16 days.

Technology "**FORECAST on-line EARTHQUAKES ON THE SEISMOGEOCHEMICAL FIELDS**" includes the following developed in the Department "Geochemistry" automated program (1998-2014):

1. "**Geoanaliz-1**"- base SFGD date in format DBASE - (1986-2013).
2. "**Geoanaliz-2**"- for processing the results of the chemical. water analysis and storage of data in format DBASE -(2001-2013).
3. "**IdentGraphEditor**" - construction SFGD "portraits" (identification graphics - IG) foci of earthquakes implemented parameters: location-time - (2006-2012).
4. "**SSD-UF**" and "**SSD-AF**" - conditional formatting data and for identifying AutoFilter SFGD anomalies based on the developed formulas - (2002).
5. "**IdentGraph on-line**" - daily preparation of IG "portraits" for rapid assessment of seismic situation in the Caspian Sea and Azerbaijan - (2009-2013).
6. "**IdentGraphCompare**" – comparison of specific "portrait" seismic source on the anomalies in the fields SFGD time mode "on-line" with the reference SFGD "portraits" - (2009).
7. "**AFATL**" - automatic detection of anomalies SFGD developed formulas - (2009)
8. "**IDENTIFIER**" - comparison of automatic "portrait" of the seismic source on the anomalies in SFGD fields in "on-line" with the reference "portraits"- (2012).
9. "**SEISMOGEOCHEMICAL - Fon**" - parameters for the calculation of backgrounds SFGD year-round monitoring - (2013).
10. "**ACCESS-SEISMOGEOCHEMICAL on-line**" - new base SFGD data platform "ACCESS" - (2013).
11. "**Map-SEISMOGEOCHEMICAL on-line**" - Operational comparison of earthquake parameters for real seismic situation and predicted - (2013).
12. "**FORECAST on-line EARTHQUAKES ON THE SEISMOGEOCHEMICAL FIELDS**" - for rapid assessment of the seismic environment for SFGD fields - (2014).

Also, set the following important conclusions: a) the preparation of earthquakes of various magnitudes, **anomalous perturbation field SFGD time manifestations and combinations of indicator elements for different seismic sources has an individual SFGD "portrait"**, b) reimplementation of earthquake in one and the same locus with similar seismic parameters (magnitude, depth), **it SFGD "portrait" is stable, that is, the standard for this earthquake**, c) within a specific tectonic fault, in different years, in the same focal zone, the final stage of earthquake preparation same band , formed anomalies identical parameters. Combinations thereof, are "standards" for specific focal zones within specific tectonic faults. On the basis of the established laws were first created: a) "Atlas SFGD "portraits" for seismic sources Anatolian-Iranian-Caucasus tectonic block" for all implemented strong and catastrophic earthquakes for the period 1997-2012 b) "Atlas of standards to identify seismic foci containing fluids SFGD fields of Azerbaijan". Confidence in the assessment of seismic situation in geochemical fields of fluids in real time - 70÷75%.

Fig. 1. is presented standard SFGD "portrait" of the Seismic centre of the Caspian Baku earthquake , which is located in the water's area of the South Caspian.

Baku - Southern Caspian sea earthquake  
 (Absheron-Pirsagat seismic zone)  
 (25.11.00; ml=6.0; Mpv=6.4; h=33 km)

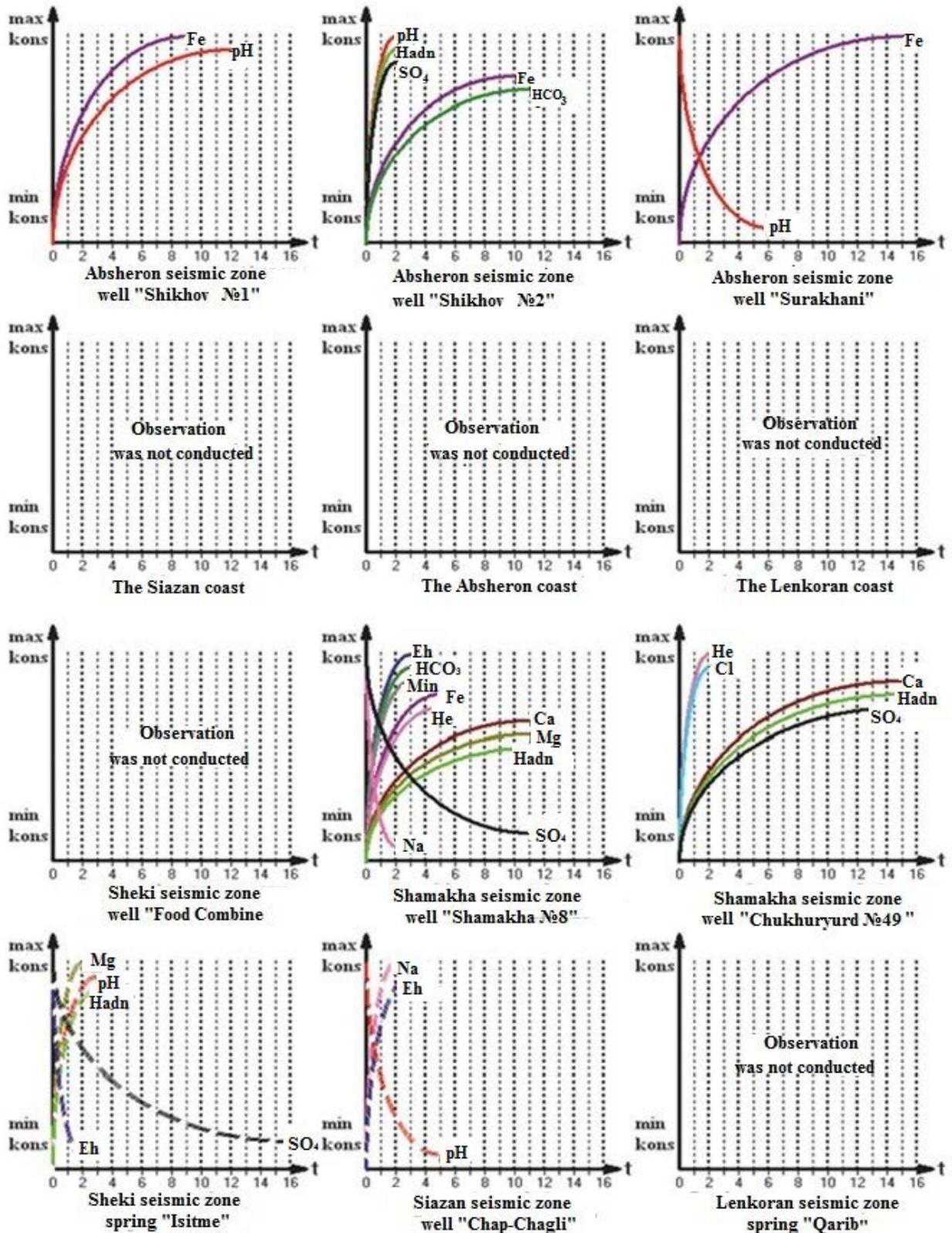


Fig. 1. Seismicgeochemical "portrait" of earthquake.