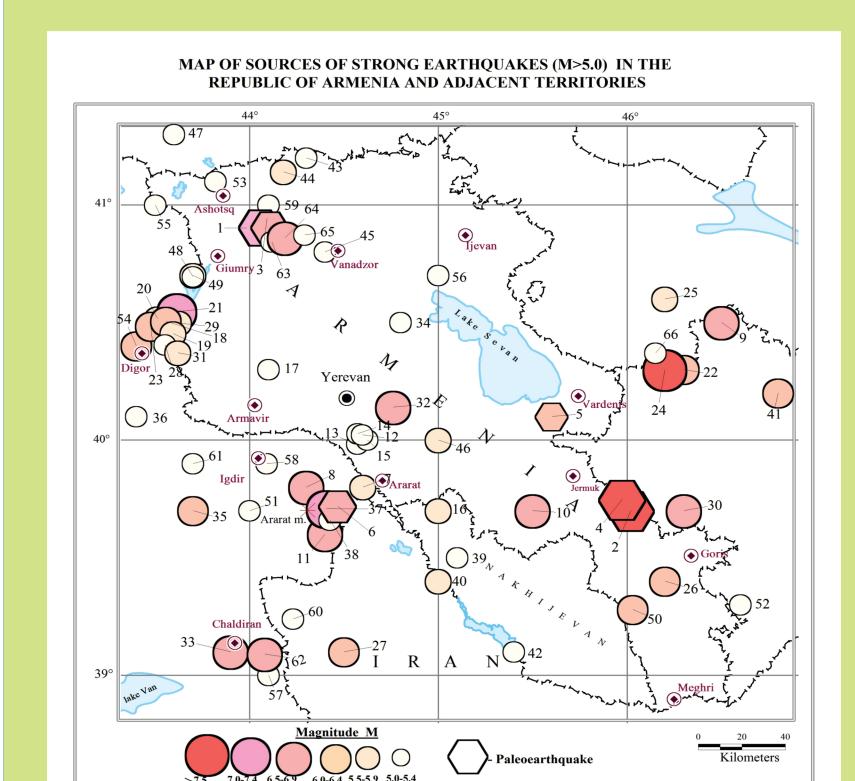


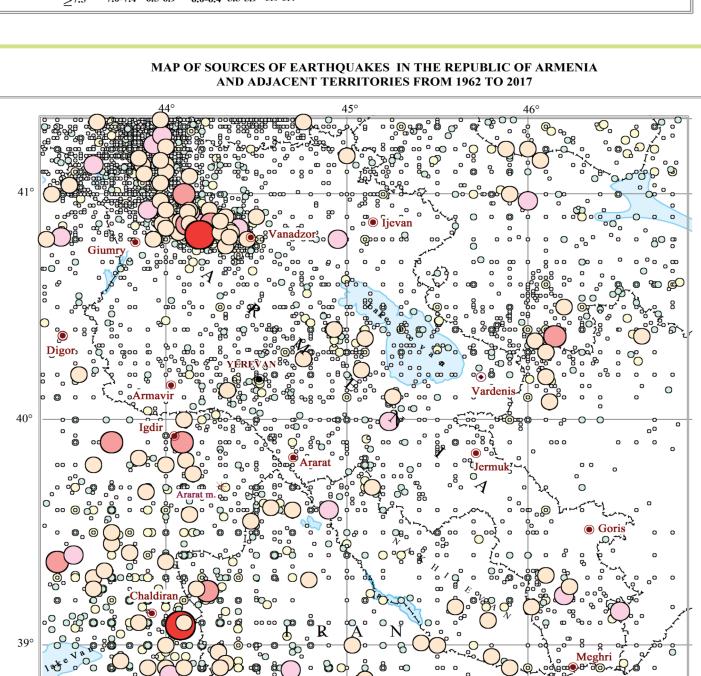
GEOPHYSICAL AND ENGINEERING-SEISMOLOGICAL RESEARCH IN ARMENIA MAIN DIRECTIONS, ACHIEVEMENTS AND PROSPECTS FOR DEVELOPMENT

Jon Karapetyan and Roza Karapetyan

ABSTRACT. This thesis presents the main directions of scientific research (Geophysics, Engineering Seismology, Predicting Earthquakes, Engineering Seismology, Predicting Earthquakes, Engineering Seismology, Strong Ground Motion Database, Analysis & Modeling, Seismic Hazard & Risk Assessment, Earthquake Engineering & Structural Dynamics, Making & Manufacturing of Geophysical Instruments), performed by scientific department of geophysical instrument Geophysics and Engineering Seismology after A. Nazarov NAS RA (IGES NAS RA). The main direction of the Earth's crust on the territory of the Republic of Armenia, the development of electrometric and nuclear geophysical study methods when exploring ore bodies on the flanks of metal deposits of the Earth's magnetic field and related geological and geophysical phenomena. Scientific studies carried out in the department of seismology and earthquake prediction are aimed at studying seismicity and accompanying strong earthquakes in the region. Scientific research carried out in the department of engineering seismology and earthquake engineering is the assessment of seismic resistance, considering the real effect of buildings and structures and the deformation features of the foundations. In the field of geophysical instrument engineering, a number of seismic sensors (accelerometer, velocimeter) and auxiliary equipment as recorders (loggers) have been designed at IGES NAS RA, providing wireless transmission of information to the data collection and processing center. On the basis of the developed equipment, instrumental observation systems (scientific networks) have been created in order to ensure the integrated safety of important objects. These systems can be converted to conduct seismic prognostic sites of large reservoirs, as well as important objects as nuclear power plants, bridges, overpasses, tunnels and technological pipelines of chemical and oil refineries. Also at IGES NAS RAwe have developed a complex of seismo-hydro-geochemical equipment for aquatic ecosystem monitoring. Herein we will present the technical characteristics of the above mentioned equipment and the possibility of its mass application in foreign countries. In the future, together with the Geophysical Center of the Russian Academy of Sciences, it is planned to create a magnetometric observational experimental-methodical seismic-prognostic base Gyulagarak IGES NAS RA. In the field geophysical instruments, various seismic sensors (an accelerometer, a velocimeter) and auxiliary equipment in the form of recorders (loggers) have been designed, which provide wireless information transfer to the data collecting and processing center. On the basis of these, instrumental earthquake observation systems have been developed to ensure the integrated security of critical facilities. These systems can be transformed to control global seismic monitoring of the territories, dams, also facilities of critical importance such as nuclear power plants. The report presents the technological pipelines for chemical and oil-processing plants. The report presents the technological pipelines for chemical and oil-processing plants. The report presents the technological pipelines for chemical and oil-processing plants. instruments and the possibilities of their wide application in different countries. Additionally, monitoring of seismicity of Armenian regions is implemented for the earthquake research.

SEISMOLOGICAL AND TECTONIC CONDITION OF THE TERRITORY OF ARMENIA





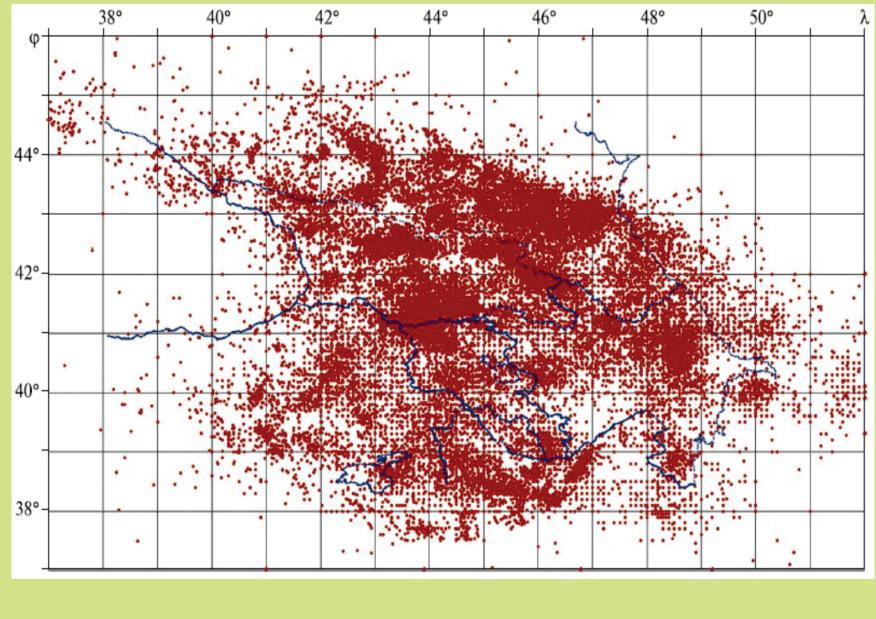


Fig.1. Earthquake epicenter distribution on the territory of Caucasus according to catalog for the period 1962-2011.

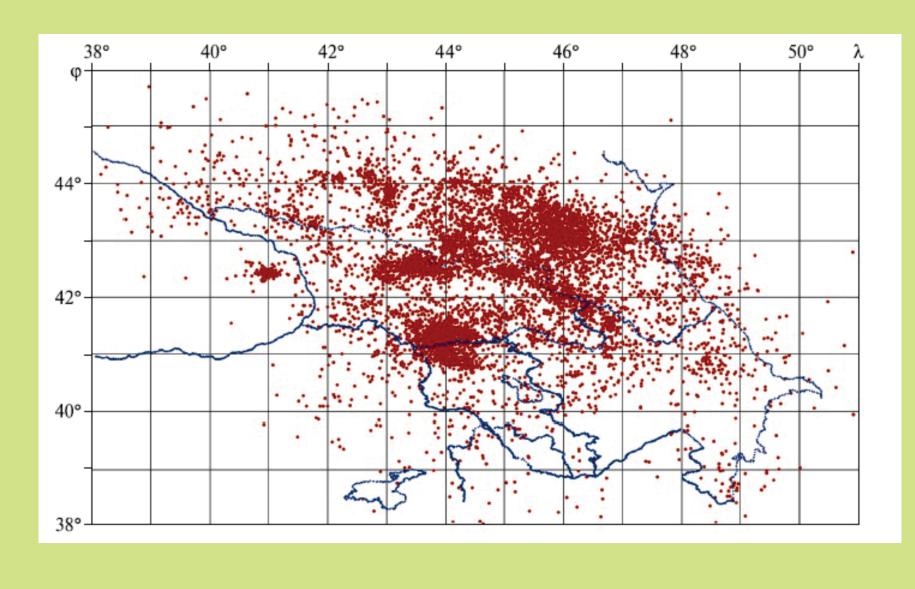


Fig.3. Earthquake epicenter distribution on the territory of Caucasus for 1971-2015, after recalculation...

Fig. 1 shows the map of earthquake epicenters on the territory of Caucasus for the period 1962-2011. Based on the data shown in fig. 1 it becomes obvious that the epicenters are distributed evenly in the territory of the region and are not related to tectonic structures if not considering exceptional cases. Moreover the initial data accuracy included in catalogs and bulletins of Caucasus earthquakes are not as reliable as to be used to determine hypocenters of earthquakes. In order to convince in above mentioned you should observe the distribution of points on Vadati graph i.e., time dependence of P-waves and false (S-P) wave run time.

Corresponding distribution of points on Vadati graph for the period 1971-2015 are shown in fig. 2. The analysis of fig.2 reveals, that the points on the graph are scattered which is due to low quality initial data.

Fig. 3 shows the results of recalculation of earthquakes happened in Caucasus for 1971-2015, for which depth determination errors do not exceed 5km. Overall 10150 are shown from 14400 registered by three and more stations and the data are included in bulletins of Caucasus. If we look properly it is obvious that the earthquake epicenters are localized and are not distributed evenly. Fig. 4 shows all Vadati graphs after correction of transverse wave arrival time.

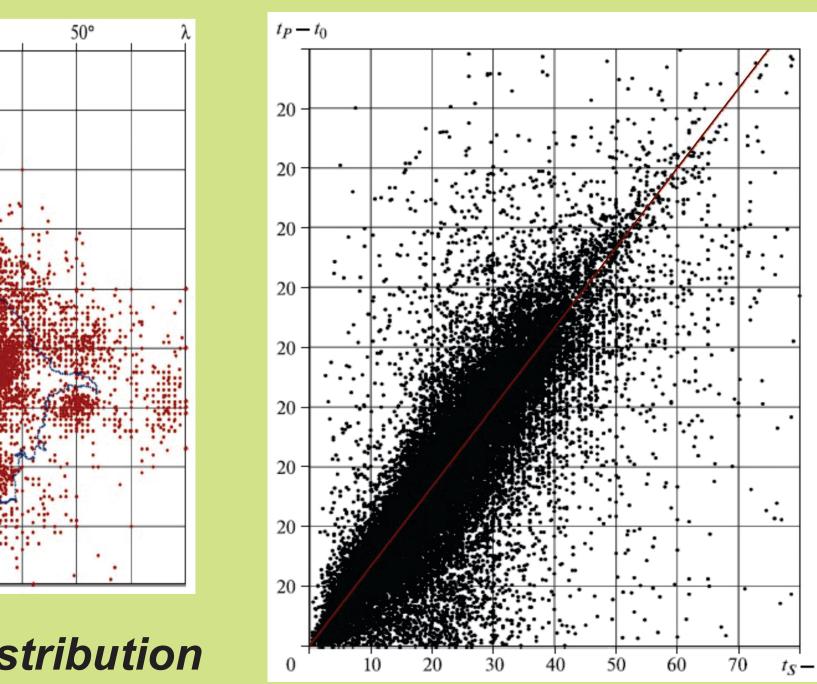


Fig.2.Plot of dependence of travel time of longitudinal waves $(t_p - t_n)$ on travel time of fictitious waves (tp-ts) for earthquakes in Caucasus for *1971–2015.*

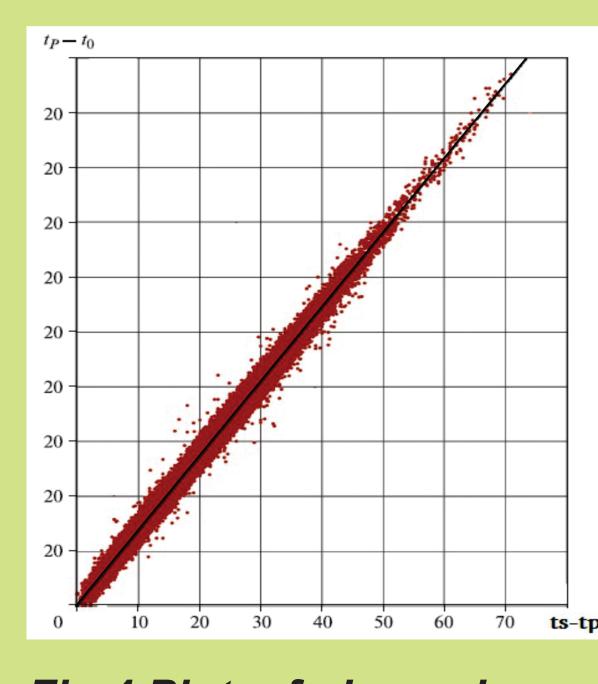
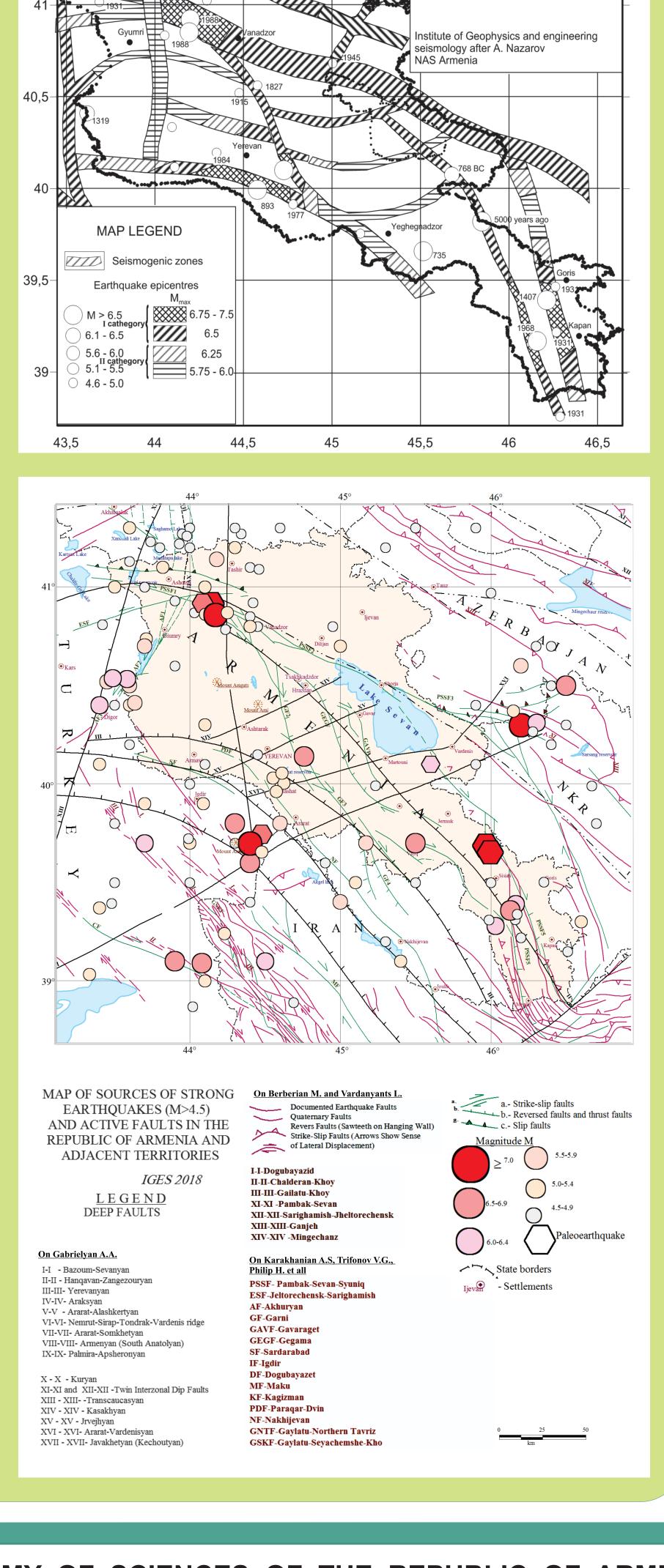
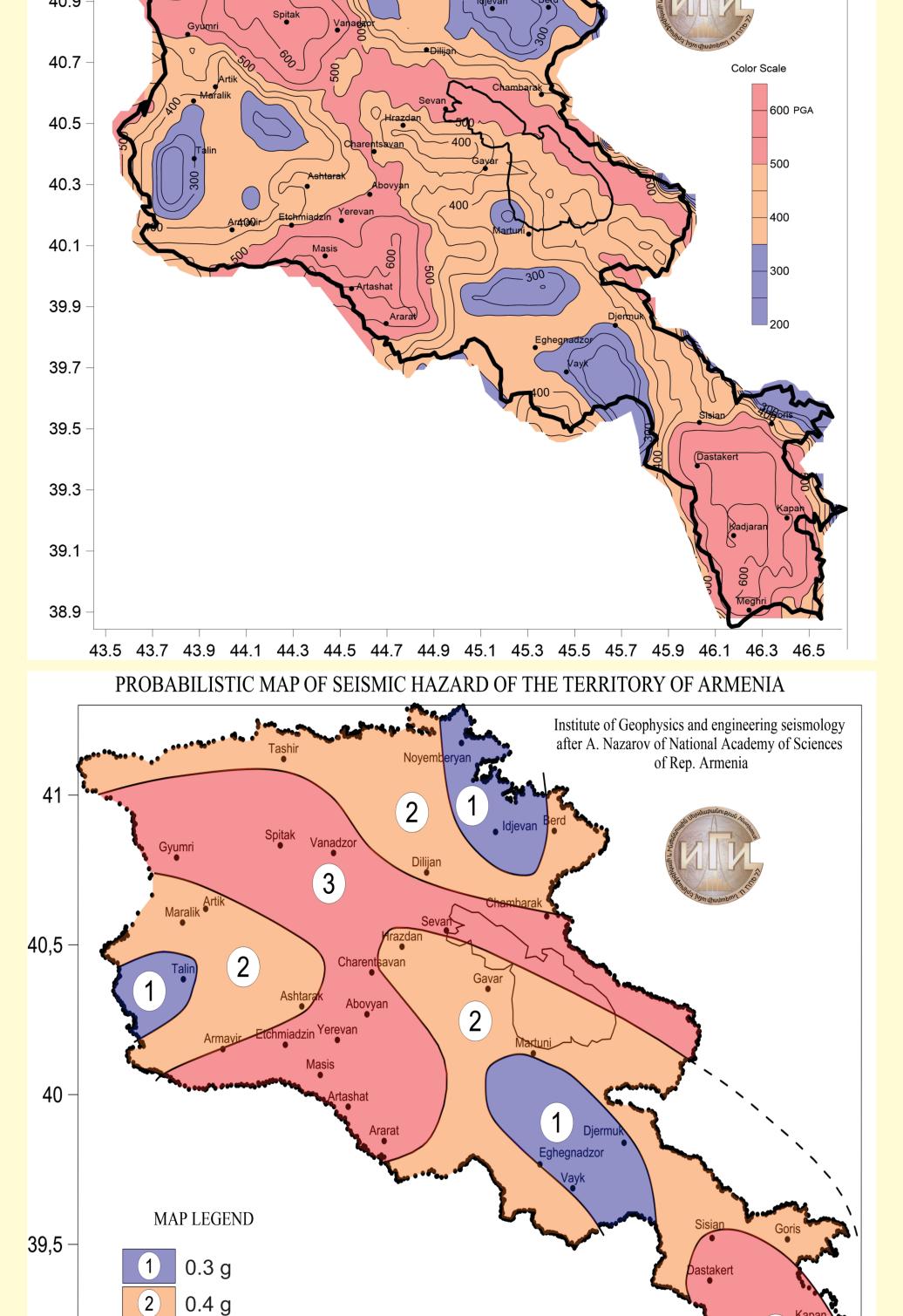


Fig.4.Plot of dependence of travel time of longitudinal waves $(t_P - t_0)$ on travel time of fictitious waves $(t_P - t_S)$ for earthquakes in Caucasus for 1971-2015, according to revised data from the



zones of the territory of Armenia

DETERMINISTIC AND PROBABILISTIC SEISMIC HAZARD MAPS OF THE TERRITORY OF ARMENIA



MAKING & MANUFACTURING OF GEOPHYSICAL SCIENTIFIC INSTRUMENTS















GLOBAL SEISMIC MONITORING OF THE TERRITORIES AND DAMS TO ENSURE SAFE OPERATIONAL PERIOD





E-Mail: iges@sci.am, jon_iges@mail.ru

www.iges.am













INTERNATIONAL COOPERATION OPPORTUNITIES

NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF ARMENIA INSTITUTE OF GEOPHYSICS AND ENGINEERING SEISMOLOGY AFTER A. NAZAROV

PGA for 475 years return

- Excellence in Research
- Geophysics
- Engineering Geophysics
- Seismology Predicting Earthquakes
- Environmental Geophysics Earth's Magnetic Field
- Engineering Seismology
- Strong Ground Motion Database
- Analysis & Modeling Seismic Hazard & Risk Assessment
 - Earthquake Engineering & Structural Dynamics Making & Manufacturing of Geophysical

- Year founded: 1961 Director: Jon K. Karapetyan
- Specialization: Geophysics, Engineering
- Manufacturing of Geophysical Instruments. Republic of Armenia, Gyumri, 3115, Str. V.Sargsyan 5

Seismology, Earthquake Engineering, Making &

- Tel: + 374 312 3 12 61 Mob: +374 94 79 85 80
- · Armenia according to its seismological, tectonic, geological conditions is an open air laboratory. We propose to set and solve divers problems in the field of geophysics.
 - . It is proposed to create joint seismic, Earth magnetic and electric field stations aimed at global monitoring.
 - . To establish collaborative laboratories in the field of Earth Sciences.