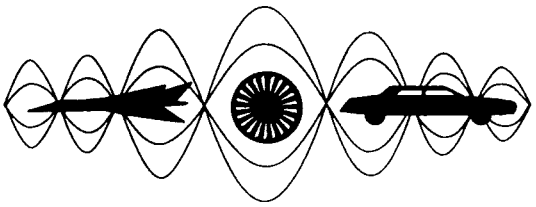

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INVESTIGATIONS OF MICROSEISMIC WIBRATIONS FROM SEISMOGENEOUS SOURSES AS A PRESAGE OF SEISMIC EVENTS

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Abstract

This work is devoted to survey of variations of amplitude-period character of microseisms in epicentral areas of expected seismic events, with the aim to solve the problem of short-term prediction of earthquakes.

Strong seismic events cause not only great material damage and human victims, but also the following tragic increase of different psychological and other diseases of population which has experienced the earthquake. From this point of view the problem of the short-term prognosis of the location and force of seismic events and the following measures minimizing the disastrous consequences of these events acquire special topicality.

This work is the first attempt to solve the above mentioned problem following the example of the Shirak basin for which at the given stage the focal zones situated to the north of Giumry in Ashotsk region are the most seismodangerous.

At the begining of 1995 in the area of intersection of the south shoots of Spitak fault (where the disastrous earthquake of 1988 took place) and Achourian seismogeneous fault (Fig. 1.) the activization of seismic processes took place as it was expected /1/. But at first the earthquakes were forecasted on a comparatively large territory. Non traditional (biolocation method) (G. Gazaryan, 1995) made possible the determination of more exact location of focal zones of expected earthquakes before some months of seismic events and the correct choice of the place for installation of the equipment to carry out the registrations.

After these events (at the time of investigations 20 earthquakes with the energetic class k=6-11.6 took place) the location of the above mentioned focal zones was confirmed. The earthquake focuses determined instrumentally were in zone $\varphi = 41° 00'$; $\lambda = 43° 58 \pm 5$km (according to data of the Northern Department of NSSD). The coordinates of the most intensive earthquake focus (9 June, 6.17) determined by means of macroseismic method, are as follows: $\varphi = 40° 57$, $\lambda = 43° 54$. The epicentral distance from the focal zone determined by means of instrumental method was in the limits of 16km (v.Karmrakar), 20km (v. Atsick and v. Maisian), but according to macroseismic observations it was equal to 9,6km and 13km

accordingly. The information about the settlements Vardakhpiur, Musaelian, Lernut and Torosghiugh won't be given, as even when enlarging the seismoregistrating chanel equal to 20000 the microseisms here have indeterminable low level, which is not observed on records. Though it should be taken into accout that observations in this settlements were carried out after intensive events, i.e. from June 24.

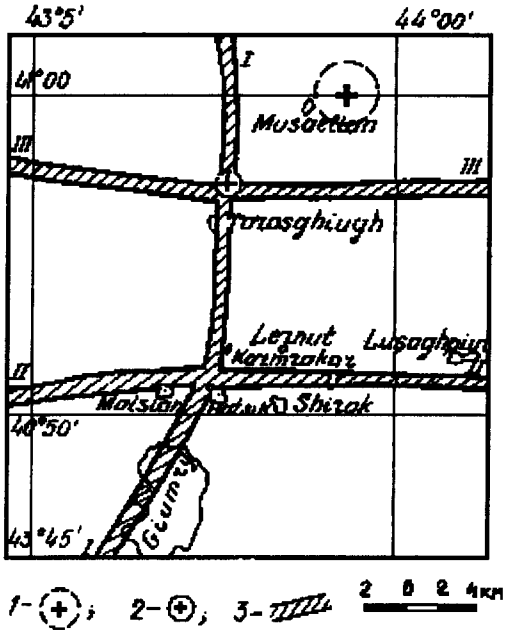

Fig.1 Location plan of the investigated region:
1.instrumental epicenter;
2.macroseismic epicenter;
3.seismogeneous faults by T.Babayan (1-1), E.Kharazyan (2-2), A. Hovhannesyan, F. Fidanyan, R.Gasparyan(3-3).

In the zone of indicated seismogeneous junction routine (daily) observations were carried out by means of the complex of geophysical methods (radiometrical, gravimetrical investigations, as well as observations of the change of high-frequancy microseism field). The investigations were carried out in two stages: September 1995 and June-July 1996.

The registration was carried out by the complex of seismoregistrating instruments: oscillograph H.041 with galvanometrical registration and by seismometrs CM-3 with working coils having high resistance .

Extention of the seismoregistrating chanel in the range of registered periods 0.05-0.3 sek was equal to 20000. The registration was carried out daily in order to avoid errors in the morning between 7.30 and 9.30 in the same places on concrete plates.

The graphs were made up showing that interesting results were obtained (Fig.2).

The amplitude level in Maisian, Hatsik and Karmrakar villages sometimes changed twice or thrice. The amplitude level anomal changes are especially obvious in Maisian and Hatsik villages, partially in Karmrakar. The values of predominant periods according to registrations obtained in all these settlements are equal and constant 0.1-0.12. During the whole time of observations before the most intensive earthquakes of June 9 (6.17 and 9.43, K=11,5) the strong increase of amplitude level is observed on the graphs. The above mentioned increase in Karmrakar was four times, in Maisian and Hatsik two times.

After these shocks the amplitude level decreased to one preceding the maximum increase.

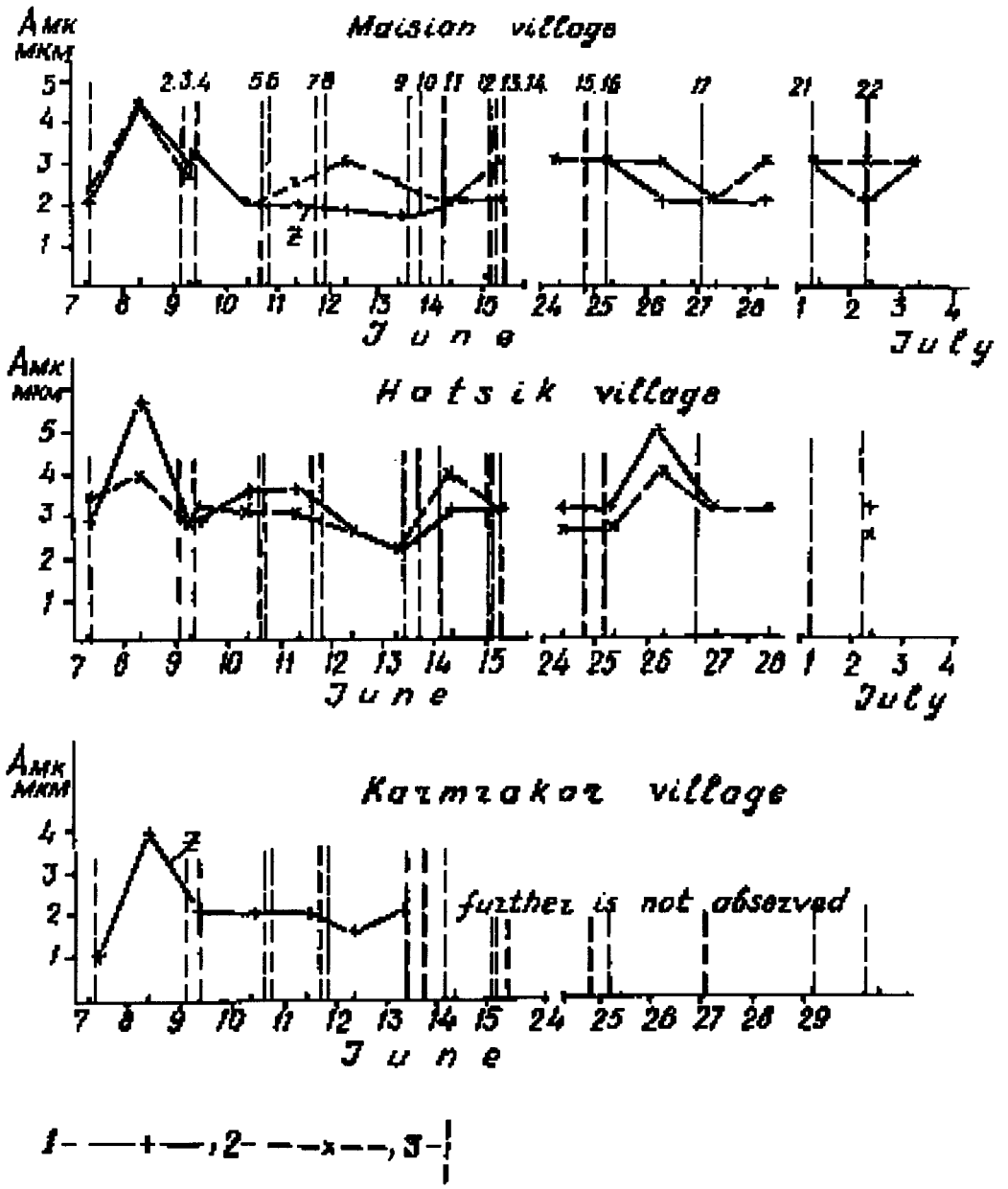

Fig.2 The graphs of changes of the microseism amplitude level
1. according to the vertical component of registrations;
2. according to the horizontal component (N-S);
3. seismic event with the corresponding number.

Though in Karmrakar the utmost increase was observed, the level remained constant decreasing to 2mkm and after June 13 it wasn't observed at all. In case of weak seismic events (k=8.5) the increase of microseism level up to earthquake is not observed, except for Hatsik village where (the general microseism level exceeds by 2.5-3mkm the one in other villages) increase of the amplitude level before the earthquakes on June 15 and 27 is observed with the decrease of the level after these earthquakes.

Obviously, this phenomenon during weak shocks is connected with the location of Hatsik village with respect to seismogeneous tectonic break or the junction of fault crosses, or the local zone.

It is also observed from the graphs that the increase of amplitude level of microseism vertical and horizontal components takes place in different ways, but after seismic events when the amplitude level becomes minimal, the values of this components are equal.

The result analysis of high-frequency microseism registrations led to the following conclusions: 1. some hours before the most intensive earthquakes during the whole period of the observations the anomal increase of microseism amplitude level occurred. After the events they decrease to phon level; 2. at the first stage of investigations it turned out, that besides the change of amplitudal level periods of oscillations of high frequency microseisms also changed. At the second stage of the work it occurred again the same, but only for amplitude levels, without the change of periods; 3. in case of weak seismic events the increase of microseism level up to earthquakes was not observed, except for Hatsik village where the above mentioned effect showed itself.

It is important to note that investigations included in the complex routine radiometrical observations of emanation variations showed that one of the occurred seismic events was displayed by sharp change of the structure of subsoil radon field (40 %) two hours before seismic shock, and within the hour after it the phon level was restored. High-exact gravimetrical observations carried out for the purpose of revealing of possible anomalies of gravimetrical field non-tidal changes allowed to conclude that investigated part of the earth's crust is in the concentrated state of strained field which brought to short-period (daily) pulsing anomal changes of gravitational field before and after seismic events (raising of local field before earthquakes and abatement after them) /2/.

As a final conclusion to these studies investigations of microseisms (and another noted methods) in source areas of expected seismic events make it possible to realize the short-term prediction of earthquakes.

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