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Use of microseismic vibrations for decision of scientific and applied problems

Felix Yudakhin (1) and Galina Antonovskaya (2)

(1) ARKHANGELSK SCIENTIFIC CENTRE UB RAS, Arkhangelsk, Russian Federation (arhsc@mail.ru, +78182215765),
(2) Institute of Ecological Problems in the North UB RAS, Arkhangelsk, Russian Federation (essm.ras@gmail.com)

One of ways of scientific knowledge is deepening of ideas by transition from macrolevel to microlevel. In seismology it's microseism's studying. Scientists began to study endogenous microseisms only in the end of XX century. Then one of few registered openings was made in geophysics - phenomenon of modulation high-frequency microseisms by deformation processes (Rykunov, 1978).
It's extremely important to reveal active geological structures on platform areas. For short period of time it's possible to record hundreds of microearthquakes giving most valuable information about geological environment structure and its activity.
Until recently microseismic vibrations were defined as hindrances complicating useful signals. In the laboratory of seismology of Institute of Ecological Problems in the North of Arkhangelsk Scientifical Centre of Ural Branch of Russian Academy of Sciences (IEPN ASC UB RAS) ways of use of these "hindrances" protected by two patents are offered for decision of various scientific and practical problems. Detection of deformation waves extending on continents from zones of spreading and frequently causing earthquakes is possible with microseismicity studying. This microseismic technique is based on three-component (Z, N-S, E-W) registration microseism and allocation of endogenous microimpulses by function calculations of component coherence. Estimations show that with energy we work with events of magnitude from M =-5 and above. These events are close to minimum by theoretical estimation. Method is focused on statistical analysis of weak events streams. Distributions of values of coherence function which are analogue of fundamental law of Gutenberg-Richter (the law of repeatability of earthquakes) used for this purpose. Microseismic signals keep within the diagram of earthquakes repeatability, in a low-energy part of this diagram.
All main parts of the given experimental method are devised in IEPN ASC UB RAS. For its testing good natural model has been found of block medium on Solovetsky Islands. It is a sea boulder dam (between B. Solovetsky's Island and B. Muksalma's Island). This area is uninhabited, i.e. anthropogenous influences and hindrances are minimal. Experiments with seismometric registration of response of block medium were conducted on a dam in two basic types of influences - 1) gradual sign-variable and 2) impact. We will stop on the first type of influence.
The dam is built in XIX century from moraine boulders in diameter more than 1m with sand-gravel-clay filling. Communications between blocks "took final shape" for time. Seismometric dot supervisions were made on crests of dams, three-component registration (vertical Z and horizontal: crossed X and along Y dams) was made. Frequencies of very weak events changed from 0,2-20 Hz to [U+F07E] 100 Hz.
Lateral loading was as gradual external influences on block medium, created at calm on a sea dam at lifting and descent of water of oceanic inflow (period of 12 hour). Length of the dam is 1,1 km, width is about 10 m, height is about 6-7 m, from them about 2m is constantly under water. The estimation of change of lateral loading at rising of water makes 0,1 bar. Microseism observation was within several hours by seismometers in a point located approximately in the middle of the dam. Functions of coherence records of different component have been calculated.
One more direction with use of seismic microfluctuations is researches of constructive buildings integrity that means to carry out not destroying control. These researches have been made on historical monuments of the Solovetsky monastery and other constructions.
From stated above follows that microseism use for solution of geological and construction problems opens big possibilities in geophysics. Studying of microfluctuations which concerned earlier to category of hindrances give large material for analysis. It is especially important in research of weak active platform's territories.