

Geophysics Dept.

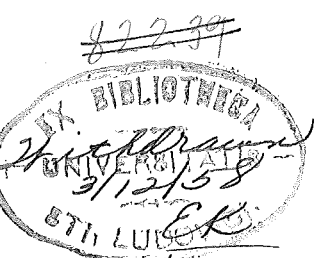
ON A STUDY OF MICROSEISMS RECORDED AT SITKA, ALASKA,
DURING THE PERIOD FROM JANUARY 1, 1929
TO DECEMBER 31, 1931, INCLUSIVE

by

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INTRODUCTION

As Gutenberg has said 1/, "Our most sensitive seismographs are never at rest. They show that

1/ Gutenberg, B. "Microseisms in North America",
Bull. Sels. Soc. Amer., XXI,
#1, 1931.

there are always small movements of the earth's crust which are called "microseisms."

We may segregate the types of microseisms according to the records obtained from the many kinds of seismographs in present use. This segregation would obviously be by period, appearing roughly as follows:

- A. Microseisms of very short period (less than two seconds.)
- B. Microseisms of medium period (between two and seven seconds.)
- C. Long period microseisms (greater than seven seconds.)

It is apparent, however, that even with this classification we do not obtain a complete picture of the phenomenon to be studied. There is probably a complete spectrum of frequencies of ground motion, and any given instrument will not show to advantage waves of period much greater or much less than the free period of the instrument. For instance, there are the very short period prospecting seismographs, with which may be recorded the extremely short period vibration of the ground which is present although the larger, longer period, seismographs of earthquake stations may show practically no ground motion. The prospecting seismographs must be set daily, so that their sensitivity will not be great enough to record this "static."

In the vicinity of heavy traffic we observe the short period irregular motion due to the passage of trains, busses, and trucks. This motion, however, is not propagated over continental distances, nor does it penetrate far into the upper layers. It is of period generally less than one second, and is therefore most easily shown on short period seismographs.

The next band of frequencies are seen to be those of period of from two to three to seven seconds. These are the microseisms most commonly registered, and it is the apparent predominance

of microseisms of this type which first led investigators to study them. The frequent observation of motion of this period may be partly due to the fact that the free period of many of the seismographs in present use lies in this range. The writer is led to suspect, however, that there is a predominance of motion of this range of periods with respect to frequencies immediately above and below, and that this is due to causes which will be outlined later in this paper.

The most outstanding type of microseism, as has been said before, is the motion of period between two and seven seconds. It is to this class that we will devote most of our attention during the course of this paper, although we shall also consider all other types and include them in the following classification in terms of probable causes.

PROPOSED NEW CLASSIFICATION OF OSCILLATIONS RECORDED BY SEISMOGRAPHS

CLASS I Produced by agents affecting only the instrument.

- A. Oscillation of air in the instrument room due to the turbulent motion of ventilating and eddy currents.
- B. Displacement (irregular) of the pendulum from movements of insects.

CLASS II Produced by agents affecting the immediate surroundings of the instrument.

- A. Oscillation of the pier with change of temperature.

B. Oscillation of the instrument housing and immediate vicinity with differential heating and cooling.

C. Effect of the wind on the instrument housing.

CLASS III Produced by agents actually causing ground motion.

Type I Short period local disturbances (less than two seconds).

- a. From waterfalls.
- b. From nearby machinery.
- c. From traffic and railroads.
- d. From volcanic eruptions.

Type II. Disturbances of period between two and seven seconds.

- a. From surf, either local or distant.
- b. From barometric disturbances.

Type III. Motion of period greater than seven seconds.

- a. From the effect of freezing in the upper layers.
- b. From wind friction on the ground surface.

Perhaps it will be well to consider briefly the work which has already been done by some of the outstanding writers on the subject of microseisms.