Determination of the explosion energy in some volcanoes according to barograms.

(With 3 text-figures)

With the development of volcanophysical methods, qualitative descriptions of volcanic phenomena begin to be in a greater degree substituted by their quantitative characteristic. For evaluating one of the most important parameters of explosive eruptions — of explosion energy — there exist several methods. Most convenient and, perhaps, the more precise one among them is a determination of the explosion air wave energy according to records of barographs.

The air wave energy is evaluated according to Taylor’s formula (5)

\[ E = \frac{2\pi \cdot RH \cdot \sin \varphi}{\rho_0 V} \int p^2_o \cdot dt \]  

where \( R \) is the globe’s radius (\( 2\pi R = 4 \times 10^9 \) cm); \( H \) — the height of the homogene atmosphere layer (\( 1.3 \times 10^8 \) cm); \( \rho_0 \) — air density at the earth’s surface (\( 1.3 \times 10^{-3} \) g/cm\(^3\)); \( V \) — sound speed (\( 3.2 \times 10^4 \) cm/sec); \( \varphi \) — distance from the explosion source in degrees; \( P \) — pressure; \( t \) — duration of vibration.

By substituting numerical signification of values entering into formula [1] by replacing in it \( P = A \sin \omega t \), where \( A \) is the alteration of amplitude in pressure (expressed in meteorological millibars) and by integrating, we reduce the Taylor’s formula to

\[ E(\text{avg}) = 1.25 \times 10^{20} \sin \varphi \frac{A^2 t}{2} \]  

Here \( A \) is the amplitude of each separate half-wave on the barogram, whereas \( t \) — its duration.
Formula [2] allows to determine the energy of air waves according to barograms in a sufficiently rapid and precise way.

Thus, according to the barograph’s record in Pulkovo (former Pavlovsk) (fig. 1), situated at a distance of about 9,800 km from the isle of Krakatau, the energy of the air wave of the Krakatau explosion on the 27 August 1883, is evaluated as $8.6 \times 10^{22}$ ergs. The same value was calculated by Pekers (3). Air wave energy of the Bezymianny volcano explosion (30 March 1956) in Kamchatka according to the