Kраткие сообщения


Резюме

К РЕШЕНИЮ ОБРАТНОЙ ГЕОДЕЗИЧЕСКОЙ ЗАДАЧИ ПОСРЕДСТВОМ ХОРДЫ

Josef Vykutil

Войенно-инженерная академия Антонина Запоточного, Брюно

Дается вывод формула для вычисления длины хорды, длины и азимутов нормальных сечений и длины геодезической линии эллипсоида. Применяются лишь тригонометрические функции данных величин и постоянные принятое значения эллипсоида, что является целесообразным при использовании вычислительных машин, особенно автоматов. Рабочие формулы рекомендуются в форме (8—11).

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MAGNITUDE CALIBRATING CURVES FOR NEAR EARTHQUAKES*)

Dedicated to Professor František Fiala on His 85th Birthday

Vít Kárník

Geophysical Institute, Czechosl. Acad. Sci., Praha**)

It is evident that the problem of magnitude calibrating functions is more complicated with short epicentral distances than with long ones. The origin of the magnitude scale was stimulated by the need of classifying of near Californian shocks, the definition being based on maximum recorded amplitudes measured on seismograms of the standard Wood-Anderson seismograph.

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**) Address: Boční II. Praha 4 - Spořilov.
The magnitude scale was then developed towards larger distances and based on true ground movement in the surface and body waves. Its use, however, was limited to distances greater than 20°. The increasing demand for studies on local seismicity led to the elaboration of different classification scales based on the amplitudes, or the energy of seismic waves. Some of them are not related to a common magnitude base. However, the calibrating amplitude-distance curves can be compared under certain assumptions.

Such a comparison may be helpful for a standardization of the magnitude determination. In Fig. 1 the following curves are plotted together:

1) \( b \)-values for Californian shocks converted to \( \log (B/T) \) using the known relation between \( T \) and \( J \); \( T = 0.2 - 0.8 \) sec [1, 2], \( S_g \) waves?
2) \( \log (B/T) \) calculated from tables 5 and 6 [3], California, \( S_g \) waves?
3) Strong motion data converted to \( \log B \), California, \( T = 1 - 4 \) sec [3], \( L \) waves?
4) Calibrating curves of the \( L_g(S_g) \) wave adopted for the \( M \) determination of European shocks, \( T \leq 3 \) sec (\( L_g \)) and \( T > 3 \) sec (\( L_R \)), compiled by Kärnik [4, 5].
5) Extrapolation of \( \sigma(A) = 1.66 \log A^2 + 3.3 = \log (B/T) \) used as a standard in some European countries and in the USSR for \( A > 20^\circ \), \( L_R \) waves, \( T \geq 6 \) sec [6].
6) Tsuboi’s formula for mulafor Japan, \( M = \log A - 1.73 \log d + 2.71 \), \( T = 4.5 \) sec ± [7], \( L \) waves?
7) Christoskov’s calibrating curve for the station Sofia, \( M < 6.5 \), \( T > 5 \) sec [8], \( L \) waves?
8, 9) Taner’s calibrating curves for Istanbul-Kandilli and for the John Carrol Univ. station, \( T = 10 \) sec [9, 10], \( L_R \) waves.
10) Rautian’s amplitude curve of \( S_g \) waves for Central Asia (calibrated under the assumption that \( K = 13 \) corresponds to \( M = 5 \)), \( T = 0.5 - 2.4 \) sec. (personal communication, 1965), \( S_g \) waves?
11) Transformed amplitude-distance curve from the paper of Bune et al., \( A_F - A_S \), \( T = 0.1 \) sec ± [11].
12) Aronovich’s curve for Crimea, \( S_g \)?, \( T = 0.2 - 2.0 \) sec [12].
13) Fedotov’s calibrating curves for the Kamchatka-Kurile Islands, \( S_g \)?, \( T = 1 \) sec ± [12].
14) Solovjev’s calibrating curves for the Kamchatka-Kurile Islands, \( S_g \)?, \( T = 1 \) sec ± [12].

The curves differ from region to region; there are, however, some common features, e.g. the trend of the curves and the interference or transition regions at \( A = 1^\circ - 2^\circ \) and \( A = 5^\circ - 6^\circ \), respectively. These regions correspond to the appearance of a “new” group which begins to prevail on the record. This phenomenon is probably due to a selective absorption in the latter case, the first case is mainly caused by strong reflected waves interfering with surface waves. The common shape of the curves can be explained fairly well by a superposition of the theoretical amplitude-distance curves of the form

\[
B(A, T) = B_0(A_0/A)^k \exp \left[ -k(A - A_0) \right],
\]

where, empirically,

\[
-\log k = 1.42 \log T + 1.78.
\]

For example, the theoretical curve for \( T = 1 \) sec is identical with the Gutenberg curves. It is well known that the period of the Airy phase, which dominates the train of surface waves, changes with distance and also depends on the structure of the crust. Superimposed wave groups in a wave train, where selective absorption exists, give rise to the emersion of new dominating groups with longer and longer periods. This mechanism can explain the way in which the value \( (A/T)_{max} \) decreases with distance. For Europe, two calibrating curves were drawn, one for \( T \leq 3 \) sec, the other for \( T > 3 \) sec [5], although a family of curves valid for different periods would suit best.

For short epicentral distances the use of surface waves \( (L_g \) or \( L_R \)) is more convenient because the body wave amplitudes strongly oscillate at \( A < 25^\circ \), and the accuracy of the \( m \)-determination