Geophysical Research Abstracts
Vol. 20, EGU2018-16225, 2018
EGU General Assembly 2018

Surface wavesscattering on the medium's relief

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It is shown how to improve the accuracy of earth's interior sounding methods that use surface acoustic waves using the results of a study of the scattering of these waves on the surface relief of the medium. A universal numerical model has been created in the Comsol Multiphysics 5.3 package. The amplitude and dispersion characteristics for various types of relief are obtained, including those corresponding to real geophysical objects (Elbrus volcano, Mauna Loa volcano). For these objects, the distortion of surface waves can reach 50%. The averaged coefficients of amplitude variation of different components of the surface acoustic wave, depending on the distance to the center of the relief feature and the ratio of the typical size of the relief to the wavelength, make it possible to refine the data obtained with the aid of amplitude earth's interior sounding methods, such as the Method of microseismic sounding. An analysis of the propagation times of surface acoustic waves between two fixed points on different sides of the relief feature showed that in many cases the effective velocity of propagation of surface acoustic waves exceeds the Rayleigh wave velocity in a homogeneous half-space. This result makes it possible to increase the accuracy of the dispersion methods of surface-wave tomography. It is shown that the relief has several times a stronger effect on the scattering of surface acoustic waves in the case of a liquid loading the medium.

The work is supported by a grant from the Russian Foundation for Basic Research 16-35-60109