Determination of regional earthquake parameters from surface wave records

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Abstract We consider in this paper the possibility of the source models construction for two regional earthquaes: in Akaba (June, 27, 2015, Mw=5.5) and in the Dead sea region (July, 4, 2018, Mw=4.8) by surface wave records analysis. Fundamental Love and Rayleigh modes recorded by seismic networks IRIS, GEOSCOPE and GEOFON were used for this purpose. At the first stage, at zero approximation we describe the source by moment tensor, considering the instantaneous point shear dislocation (double-couple) at a given depth. Four equivalent solutions were obtained from the amplitude spectra of surface waves. For an unambiguous choice of a solution, additional data were used, such as the signs of the first P-wave arrivals (for the Aqaba earthquake) or phase spectra (for an earthquake in the Dead Sea) were calculated for each of the four solutions. Based on the minimum values of the constructed joint residuals, a unique solution was chosen for each event. Then, considering the source flat, the following integral parameters were obtained: the duration of the process in the source, the lengths of the major and minor axes of the source, the average instant centroid velocity, the angle between the major axis of the source and the axis of strike, the angle between the direction of motion of the instant centroid and the axis of strike. The quality of the obtained solutions is estimated using the normalized residual function. This function characterizes the difference between the theoretical amplitude spectra and the observed ones. In the case of the earthquake in the Dead Sea, the resolution of this function for some parameters was so small that it was not possible to obtain a solution. Also, for the earthquakes under consideration, the ambiguity associated with a significant excess of the surface wavelengths over the depth of the shallow source was analyzed.

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