SPATIAL STATISTIC MODELS IN THE FORECASTING OF GROUND SEISMIC PARAMETERS DUE TO INDUCED SEISMICITY

Abstract

In this study are presented the results of a research which purpose was to improve the precision of forecasting of the maximum horizontal velocity and acceleration of ground seismic in the areas threatened with induced seismicity. In the proposed solution is presented a spatial model of seismic attenuation relationship based on the assumptions of the Joyner-Boor model. The statistical analyses verifying the models focused on the correctness of the estimation models with regard to meet this assumptions. The starting point to introduce the spatiality into the model is the fact that in the course of estimation of structural parameters of a model using the least squares method the spatial autocorrelation of residuals occurs. The spatial interactions were presented using a weight matrix and a construction based on a distance between units with cut-off point maximising the Moran I factor, the number of nearest neighbours maximising the Moran I factor and the reciprocal of the distance between the units.

On the basis of the results of the performed statistical tests it was stated that the correct model is a spatial error model (SEM). The calculations were prepared for the one of the most seismically threatened area in GZW (Upper Silesian Coal Basin). In the course of the research, it was found that the estimated spatial models of seismic attenuation relationship fit much better to empirical data than the classic model of seismic attenuation relationship by Joyner – Boor.

The proposed structure of the model considering the spatiality of this phenomenon can be a basis for further search of a matrix for spatial interactions. It seams justified to estimate the weight matrix with a structure based on the geophysical parameters of grounds in areas threatened by induced seismicity.