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Numerical Models of Earth Crust Deformation and Seismicity: Development of New Alternative Techniques and Their Application for Evaluation of Parameters of Future Earthquakes.

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The process of crust deformation is described by a set of dynamic objects, which propagate with different velocities inside crust, namely: (1) the planar fronts (waves) of deformation (tension and compression), and (2) spherical dislocations. The main goal of the modelling is to determine parameters of these dynamic objects on the basis of observed data, which reflect the crust deformation (Global Positioning System (GPS) network, Persistent Sea Water Level (PSWL) monitoring, seismic catalogues, etc). The parameters of the models are evaluated using two-steps procedure. First, the kinematic parameters (characteristics of propagation) are estimated by solution of inverse problem (nonlinear optimisation); second, the amplitude characteristics (elastic displacement) are evaluated by solution of linear inverse problem. The resulting 4D-models (geographic location, depth, time) allows us to extend the process of deformation in space and time.

In the frame or the proposed approach, every seismic event is considered as a singular point in the field of dynamic deformation, parameters of which are determined simultaneously by both the model of dynamic deformation and the dynamic model of seismic process. The 5D-model (geographic location, depth, time, magnitude) of seismic process, which describes the seismic process statistically, is created using only seismic catalogues. The 4D/5D-models are applied jointly for compilation of theoretical seismic catalogue for the nearest future (up to 50 years) that is used for purposes of seismic zonation and hazard assessment. The results of the models' application are

presented on examples of Taiwan and South-Eastern Europe. The modeled (theoretical) seismic catalogues are compared with observed seismicity.