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Mathematical models of the lithosphere behavior at the subduction zones during earthquakes

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Visco-elastic lithosphere model at the subduction zone was simplified for the case when moveable boundary of the lithospheric plate locates not far from the anchored area. Simple model was generalized to the arbitrary lithospheric plate length to derive more precise mathematical model for the description of the lithosphere kinematic behavior at the subduction zones during earthquakes.

Relationship between physical properties of the lithospheric plate and asthenosphere layer including size of the plate, mean layers density and thickness, and their elastic and viscous characteristics causes different styles of lithospheric plate behavior at the subduction zones. Models proposed allow prediction of the style of the lithosphere behavior if particular properties of lithospheric plates are known.

The mathematical model was specified for three types of possible lithosphere behavior scenarios. They include damped and aperiodic longitudinal vibrations of lithospheric plate, and high amplitude vibration of the plate accompanied by its breaking away from the ocean ridges.

Results obtained allow explanation of the observed lithospheric plates shifts and related events. Based on previous earthquakes observations at specific locations the mathematical models allow refining of lithospheric plate properties. They also can be used for the time prognosis for future earthquakes and to predict possible damage of constructions and buildings at the ground.