SPIN AND TWIST MOTIONS
IN A HOMOGENEOUS ELASTIC CONTINUUM
AND CROSS-BAND GEOMETRY OF FRACTURING

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A b s t r a c t

A uniform continuum with rotation motions of spin and twist type is presented; in this approach we supplement the ideal elasticity constitutive law, the strain-stress relation, by the rotation-asymmetric stress relation. In such a way, we can evade an influence of the Hook law, which, when used as the unique law in the ideal elasticity, rules out an existence of rotation waves. Thus, in the ideal elastic continuum the rotation vibrations can propagate and are not attenuated.

The asymmetric elastic rotation fields and their relation to asymmetric elastic stresses are proposed and discussed, under the condition that the total fields with the elastic and self parts remain symmetric or antisymmetric as required by the compatibility conditions. The tensor of incompatibility splits into the symmetric or antisymmetric parts.

The conservation and balance laws for spin and twist fields and the stress -related equations of motion for symmetric and antisymmetric parts of stresses are given. The relations obtained for elastic fields, expressed by difference of the total and self-fields, can be split into the self-parts prevailing on the fracture plane and the total parts describing seismic radiation field in a surrounding space.

The role of rotation processes in premonitory and rebound time domains is considered in estimating the most effective fracture patterns.

Key words: asymmetric stresses, spin and twist motions, equations of motion, rotation waves, fracture pattern.