

The Localization of Plastic Strain and Rock Fracture

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Localization of strain and fracturing in rocks is considered from the aspects of rigidly plastic and elastoplastic body models based on the Coulomb-Mohr and Huber-Mises-Shleicher criterions. A system of differential equations of plasticity and conditions of hyperbolicity were obtained. At the moment of failure, stress values and angles, at which it occurs, in plane strain and in plane stress were determined. The directions of localization and fracturing are identified with characteristics of system of equations for velocities. For hardening elastoplastic rocks, the localization is associated with loss of ellipticity and the first transition to hyperbolicity of system of equilibrium equations in terms of velocities. In employing this approach, theoretical and experimental results coincide for brittle solids.

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