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1 Rock fabric symmetry of low anisotropic rocks: implications for the spatial variability of mechanical properties

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Based on macroscopic appearance, most of the igneous rocks are considered to be isotropic in common testing procedures. The isotropy and homogeneity concepts are still popular in theoretical rock mechanics although hardly found when studying real rocks.

The rock fabric is spatially dependent property that can be expressed by its symmetry. It is composed of three principal components – spatial arrangement of rock-forming minerals' lattices (texture also called crystallographic preferred orientation – CPO), geometrical properties of rock-forming minerals (microstructure, shape preferred orientation – SPO – presents the best expressed example), and spatial orientation of voids.

Symmetries of apparently isotropic igneous rocks – granites – have been studied using multidirectional (3D) P-wave velocity laboratory measurement over a range of confining pressures. The measurements were conducted on spherical specimens prepared from natural rocks collected from several granite-producing areas in the Czech Republic. The rock mechanical tests (uniaxial compressive strength and measurements were performed in three principal directions of rock fabric as determined by ultrasonic measurements. The experimental data were compared to rock fabrics observed

in polarising microscope and to CPO and SPO in some cases. A classification of physical properties and their symmetry then followed based on the presence or absence of individual fabric parameters

Rock fabric models can be derived and generalized based on the knowledge of the individual rock fabric parameters. Fabric of studied granites shows low to medium anisotropy. Recorded orthorhombic fabrics are microcrack-dominated although shape preferred orientation of rock forming minerals contribute to overall mechanical anisotropy. Weak transversal anisotropy was found for granites containing magmatic foliation indicated by preferred orientation of mica.