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A km-scale "triaxial experiment" reveals the extreme mechanical weakness and anisotropy of mica-schists (Grandes Rousses Massif, France)

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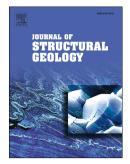
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- <sup>2</sup> mechanical weakness and anisotropy of mica-schists
- 3 (Grandes Rousses Massif, France)
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## 7 Abstract

8 The development of Andersonian faults is predicted, according to theory and experiments, for 9 brittle/frictional deformation occurring in a homogeneous medium. In contrast, in an anisotropic 10 medium it is possible to observe fault nucleation and propagation that is non-Andersonian in 11 geometry and kinematics. Here, we consider post-metamorphic brittle/frictional deformation in the 12 mechanically anisotropic mylonitic mica-schists of the Grandes Rousse Massif (France). The role of the mylonitic foliation (and of any other source of mechanical anisotropy) in brittle/frictional 13 14 deformation is a function of orientation and friction angle. According to the relative orientation of principal stress axes and foliation, a foliation characterized by a certain coefficient of friction will be 15 16 utilized or not for the nucleation and propagation of brittle/frictional fractures and faults. If the foliation is not utilized, the rock behaves as if it was isotropic and Andersonian geometry and 17 kinematics can be observed. If the foliation is utilized, the deviatoric stress magnitude is buffered 18 19 and Andersonian faults/fractures cannot develop. In a narrow transition regime, both Andersonian and non-Andersonian structures can be observed. We apply stress inversion and slip tendency 20 analysis to determine the critical angle for failure of the metamorphic foliation of the Grandes 21 22 Rousses schists, defined as the limit angle between the foliation and principal stress axes for which 23 the foliation was brittlely reactivated. This allows defining the ratio of the coefficient of internal 24 friction for failure along the mylonitic foliation to the isotropic coefficient of friction. Thus, the study 25 area can be seen as a km-scale triaxial experiment that allows measuring the degree of mechanical anisotropy of the mylonitic mica-schists. In this way, we infer a coefficient of friction  $\mu_{weak} = 0.14$ 26 27 for brittle-frictional failure of the foliation, or 20% of the isotropic coefficient of internal friction.

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