INVERSE MODELLING OF DEFORMED DUCTILE ROCKS

D. W. Schmid and Yu. Podladchikov Geologisches Institut, ETH, 8092 Zürich, Switzerland

Geological models and theories aim to explain today's geological picture of our surroundings. Unfortunately the present geometry is the result of the superposition of many complex processes, which can be explained by an infinite number of different stress and strain histories. Forward models help us to understand geological processes and interpret our field data. However, forward models cannot determine the exact path of deformation.We developed an inverse algorithm to "restore" finite strained rocks. We assume an initially undeformed set of "generic" rocks (a stack of layers of different thicknesses and randomly perturbed interfaces) which are subjected to a constant far-field stress regime of arbitrary orientation. We test our inverse algorithm by first using a forward model to generate synthetic data. According to the properties of the layers, we can show the transition from single layer buckling over disharmonic multilayer folding to localised shear zones across the layers. To verify our inverse model, we then apply it to the synthetic data. The inverse model varies the obliquity and magnitude of the far-field stress conditions and the rheological parameters until the assumed initial, undeformed rocks have been reconstructed. As a result, we can determine for which circumstances inverse modelling may be applied successfully to natural systems in which cases the rheology of the rocks and their stress and strain histories may be inferred.