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Introduction of the Stress Trajectories Element Method for Stress Analysis in Tectonic Plates

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Previously (EGU 2004-05) we reported a method for stress trajectory recovering from discrete data on stress orientations. The method has been developed for elastic regions; it uses continuous approximations of in-plane stresses based on linear combinations of holomorphic functions. The advantage of this approach over purely mathematical interpolating methods is in consistency between constitutive equations and obtained patterns of stress trajectories. Although the method provides reasonable results for stress field reconstruction it is also sensitive to data quality, which, in some cases, results in inaccurate stress patterns recovery at the periphery of the considered domain. In order to overcome this defect we propose a novel technique that is somewhat similar to the finite element analysis. However in contrast to FEM no hypothesis on material rheology is imposed and no interpolation laws are assumed for stresses and/or displacements distributions within the elements. Instead we assume piece-wise homogeneity of the stress trajectories (different stress orientations in different elements), which is consistent with all constitutive equations, at least for statically determined bodies. This essentially widens the class of rheological models of tectonic plates that can be considered in the framework of a uniform approach.

This approach is referred to as a variant of the stress trajectories element method (STEM) that is currently under development. Current study presents preliminary analysis of in-plane stresses for several regions of the earth's crust obtained by the STEM technique.

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