(In)finite element approach to modelling of viscoelastic relaxation of the Earth

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We present a new approach to the problem of the relaxation of a viscoelastic, 3-D, self-gravitating spherical Earth under external loads. Our method is based on the integral Lagrangian formulation. The Earth is approximated by a convex polyhedron and discretized using high quality tetrahedral mesh with optional local refinement in areas of interests. Piecewise linear and piecewise constant finite elements are respectively used in the parameterization of displacement, perturbation gravitational potential and stress tensor. In addition, infinite element method is used outside the Earth to solve the Laplace equation for perturbation potential on an unbounded domain. Direct time-integration scheme has been evolved by means of separating the elastic and non-elastic parts of the Cauchy incremental stress tensor. Benchmarks of the approach using homogeneous elastic and viscoelastic spheres and off-axis nested-spheres models will be presented.