Deformation theory for a 3-dimensional viscoelastic earth model-II

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This paper is concerned with a Maxwell earth with no initial stress from Maxwell's constitutive equation, the linearized equation of momentum conservation and Poisson's equation in the Laplace transform domain. In this domain, we obtain the same form as that of the elastic global deformation by reformulating the Maxwell's constitutive equation, and give the solution in the Laplace domain in a spherical symmetric earth model with theories on global elastic deformation. We employ the perturbed method to deal with the effect of lateral heterogeneities, and make a variation of linearized equation of momentum conservation. We develop it to obtain the relation between the solutions of the spherical symmetric earth model, the three-dimension earth model with lateral inhomogeneity, and the auxiliary solutions. Using the given surface boundary conditions to determine the auxiliary solutions, we obtain the perturbed solutions of lateral increment in the Laplace domain. Taking the inverse Laplace transforms of solutions of a spherical symmetric earth model and perturbed solutions, we obtain the solutions of deformation in a three-dimension viscoelastic earth model.And applying the above deformation theory, we compute the gravity changes in a 3-dimensional viscoelastic earth model.

Keywords: gravity, 3-dimensional viscoelastic earth