Eulerian mechanics of finitely-strained multipolar media

The visco-elasto-dynamic of deformable media at finite (also called large) strains formulated in the actual evolving configuration (i.e. the Eulerian approach) will be presented. For analytical reason and for modelling normal dispersion of elastic waves, a higher-order viscosity in a Kelvin-Voigt model (i.e. the concept of multipolar materials) is considered, which makes velocity Lipschitz in space and allows for a regular transport of mass density and deformation gradient and possibly of other (internal) variables as inelastic (plastic) strain, damage, porosity, diffusant content, or magnetization, etc. This allows for using a semi-Galerkin approximation to prove existence and certain regularity of weak solutions. Anisothermal extensions of such models are possible, too. The basic viscoelastic scenario primarily focused to solids is also consistent with viscoelastic fluids, which also allows for a monolithic formulation of a fluid-solid interaction (FSI) problem with no-slip interface and for modelling of various phase transitions.