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Discretization of an integro-differential equation modeling dynamic fractional order viscoelasticity

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We study a dynamic model for viscoelastic materials based on a constitutive equation of fractional order. This results in an integro-differential equation with a weakly singular convolution kernel. We discretize in the spatial variable by a standard Galerkin finite element method and in time by the discontinuous Galerkin method. We prove stability and regularity estimates which show how the convolution term introduces dissipation into the equation of motion. These are then used to prove a priori error estimates.

This is a cooperation with K. Adolfsson, M. Enelund, Department of Applied Mechanics, Chalmers University, and M. Racheva, Department of Mathematics, Technical University of Gabrovo.