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Time-fractional Gradient Flows for Nonconvex Energies in Hilbert Spaces and Applications to PDEs

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This talk is devoted to presenting an abstract theory on time-fractional gradient flows for nonconvex energy functionals in Hilbert spaces. Main results consist of local and global in time existence of (continuous) strong solutions to time-fractional evolution equations governed by the difference of two subdifferential operators in Hilbert spaces. To prove these results, fractional chain-rule formulae, a Lipschitz perturbation theory for convex gradient flows and Gronwall-type lemmas for nonlinear Volterra integral inequalities are developed. They also play a crucial role to cope with the lack of continuity (in time) of energies due to the subdiffusive nature of the issue. Moreover, the abstract theory is applied to the Cauchy-Dirichlet problem for some p-Laplace subdiffusion equations with blow-up terms complying with the so-called Sobolev (sub)critical growth condition by the aid of the nonlinear Calderón-Zygmund theory.This talks is based on a joint work with Yoshihito Nakajima (Tohoku University).