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On the convergance of the Galerkin method for equations with memory

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In my talk, I'll consider the following equations

$$\frac{\partial u(x,t)}{\partial t} + \mathcal{A}(x)u(x,t) + \int_0^t \mathcal{J}(x,t-s)u(x,s)\ ds = f(x,t) \tag{1}$$

and

$$D_0^\alpha u(x,t) + \mathcal{A}(x)u(x,t) = f(x,t). \tag{2}$$

Here $\mathcal{A}$ and $\mathcal{J}$ are second-order differential operators with respect to $x \in \Omega \subset \mathbb{R}^n$, with $\mathcal{A}$ being uniformly elliptic. By D_0^α we denote the Caputo fractional derivative of order $\alpha \in (0,1)$ with respect to t with lower bound 0.

Integro-differential and fractional differential equations of these types have been used to describe diffusion and heat conduction in hereditary systems. In my talk, I'll present the thoerems concerning the convergence of Galerkin's approximation in the case of nonsmooth right-hand side, namely when $f \in L_2([0,T], H_0^{-1}(\Omega))$ in (1) and $f \in L_p([0,T], H_0^{-1}(\Omega))$, with $p > 2/\alpha$, in (2).