

hp-Finite Elements for Fractional Diffusion

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In this talk we introduce and analyze a numerical scheme based on hp-finite elements to solve boundary value problems involving the spectral fractional Laplacian. The approach is based on a reformulation of the problem posed on a semi-infinite cylinder in one more spatial dimension. After a suitable truncation of this cylinder, the resulting problem is discretized with linear finite elements in the original domain and with hp-finite elements in the extended direction. The proposed approach yields a reduction of the computational complexity in terms of degrees of freedom and even has slightly improved convergence properties compared to the state-of-the-art discretization using linear finite elements for both the original domain and the extended direction. The performance of the method is illustrated by numerical experiments.

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