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Barcelona Analysis Seminar **2024–2025**

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Fractional Laplacians: A geometric approach and applications

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Diffusion processes beyond Brownian motion have recently attracted significant interest from different communities in mathematics, the physical and biological sciences. They are described by nonlocal operators with singular non-integrable kernels, such as fractional Laplacians. The fractional Laplacian is defined via an extension method, as a Dirichlet-to-Neumann operator for a degenerate elliptic differential problem in a half-space of one higher dimension. Detailed and sharp regularity results for associated problems in a bounded domain have been obtained by Gerd Grubb, for both local boundary conditions or exterior conditions. In this talk we motivate these problems, show how techniques from geometric microlocal analysis give an alternative approach and discuss its application to fractional inverse problems and to numerical analysis.