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CENTRO DE I&D EM MATEMÁTICA E APLICAÇÕES  
CENTER FOR R&D IN MATHEMATICS AND  
APPLICATIONS

# Gravitational Geometry and Dynamics Group Seminar

Wed. 8<sup>th</sup> March '23 Room 11.2.21 at 11h00

## Francisco Duque

IST and CENTRA

Zoom meeting ID 962 2413 8340

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## Gravitational Waves from Extreme-Mass-Ratio Systems in Astrophysical Environments

Gravitational waves carry unique information about the compact objects that generate them and the underlying gravitational theory describing them, which has allowed us to test General Relativity and the nature of black holes with unprecedented precision. In addition, they can also bear precious information about the astrophysical environments where binaries coalesce. Recent works have suggested that extreme-mass-ratio inspirals (EMRI) detected by the upcoming space-based LISA mission may put constraints on the properties of accretion disks and dark-matter structures present at galactic centers. Yet, the state-of-the-art has been employing unprecise models for the environmental effects that often rely on Newtonian approximations not valid for EMRIs. In this talk, we will develop the first generic, fully-relativistic formalism to study gravitational-wave emission by EMRIs in spherically-symmetric, non-vacuum black-hole spacetimes. Our methods naturally incorporate the effects of accretion, dynamical friction, and environmental feedback on the EMRI evolution. We will then apply it to different spacetimes describing dark-matter distributions surrounding black holes.

[https://videoconfcolibri.zoom.us/j/96224138340?](https://videoconfcolibri.zoom.us/j/96224138340?pwd=YkZUMGIlb0dqVjcxOVpXMTFVMTBXQT09)

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