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

universidade de aveiro

Gravitational Geometry and Dynamics Group Seminar

Wed., April 22, 2026, at 11h00.

Room: Sala 11.2.21 and **Teams ID:** 399 215 539 545 48

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Accretion beyond the black hole paradigm: a light from within the shadow

I will discuss the first 3D-general relativistic magnetohydrodynamic (GRMHD) simulation of sustained accretion onto a horizonless singularity in which matter falls onto the central object rather than being accumulated outside of it or expelled in outflows. We consider a Joshi-Malafarina-Narayan JMN-1 type spacetime, a well-motivated black hole mimicker arising from gravitational collapse with anisotropic pressure in general relativity, with a compactness parameter resulting in a null type central singularity. We find that the simulation reaches a sustained magnetically arrested disk state. For the parameters of the low-luminosity active galactic nucleus system M87* we find the accretion rate of (3-5) x 1e-6 MEdd, fully consistent with the estimates driven by the Kerr GRMHD, and in particular comparable with our reference Schwarzschild black hole simulation. Synthetic raytraced images at 230 GHz, computed through polarized general relativistic radiative transfer, are broadly consistent with the observations of M87* by the Event Horizon Telescope (EHT). We identified a key observational discriminant between a black hole and JMN-1, related to the presence of brightness in the images inside the "shadow" of JMN-1. This brightness is related to emission located very close to the central singularity, in the region that would be blocked by the event horizon in case of a black hole spacetime. Such a signature, while inaccessible to current EHT observations, falls within the projected imaging dynamic range of the near-future radio-interferometric instruments, offering a robust observational test of the black hole paradigm.

More about Gr@v at: gravitation.web.ua.pt

The Gr@v Seminars are supported in part by the FCT – Portuguese Foundation for Science and Technology, through projects 2022.04560.PTDC and 2024.05617.CERN and through CIDMA (https://ror.org/05pm2mw36), under the Portuguese Foundation for Science and Technology (FCT, https://ror.org/00snfqn58) Multi-Annual Financing Program for R&D Units, grants UID/04106/2025 (https://doi.org/10.54499/UID/04106/2025) and UID/PRR/04106/2025 (https://doi.org/10.54499/UID/PRR/04106/2025).

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