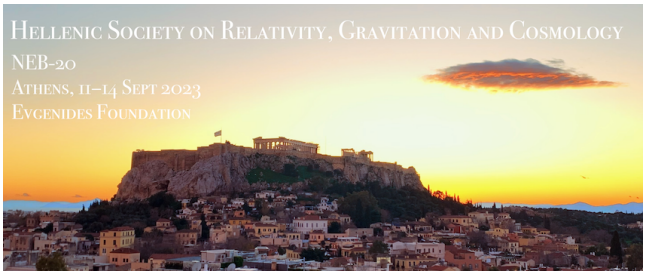

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Critical phenomena of a complex scalar field using pseudospectral methods

Monday, 11 September 2023 15:50 (20 minutes)

It has been thirty years since the breakthrough paper of M. Choptuik on critical phenomena in the gravitational collapse of a real massless scalar field in spherical symmetry. This celebrated paper led to a rich exploration of different extreme spacetimes in numerical relativity in the years following its publication. Those numerical studies persist in questioning the weak cosmic censorship conjecture, contributing to our understanding of spacetime singularities, as well as constructing new avenues for the mathematical relativity community. One would naively expect that the phenomena witnessed by Choptuik would generalize to full 3+1 dimensions. However, recent research has indicated that the universality of the critical solution breaks down already in axisymmetry, for instance, in the case of vacuum collapse of gravitational waves. In our work, we examine the gravitational collapse of a massless complex scalar field minimally coupled to GR, for the first time using a pseudospectral code (bamps), in spherical symmetry and beyond. We focus on that particular region in the phase space of initial data that captures deviations from spherical symmetry, following closely the relevant recent study of the real scalar field case for comparison. In this talk, I will show some results in spherical symmetry and departures from it, in an attempt to merge the gap in the literature regarding the genericity of the critical solution.

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