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Black hole mimickers

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We show that a spherically symmetric gravitational collapse of a star can result in a bounce if the equation of state behaves with sufficient rigidity just before the formation of an event horizon. The relativistic time dilation produced by the strong gravity makes the whole process to be undistinguishable from a black hole on timescales shorter than the Hubble time for a distant observer. We solve the Misner-Sharp equations for stellar collapse with a suitable equation of state that reduces to a polytropic at low densities and mimicks an effective cosmological constant during the collapse, finally inverting the direction of the velocity field of the fluid. We also present some preliminary results of numerical simulations of these objects. We conclude that evolving gravitational systems might mimick, in this way, most of the properties attributed to static black holes.

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