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Characterising spacetime during cosmological collapse

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We look into whether the spherical collapse model is a good approximation in a numerical relativity cosmological simulation and describe the spacetime's evolution during nonlinear collapse. In the simulation, we evolve a quasi-spherical structure, where fully nonlinear initial conditions are provided by perturbing the ΛCDM model with the comoving curvature perturbation, defined as a 3D sinusoidal. Then it is fully evolved with the Einstein Toolkit code. This is compared to the spherical collapse model, and the spacetime's evolution is described with both gravito-electromagnetism and the Petrov classification.

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