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Gregory-Laflamme instability and a wider class of hypercylindrical spacetime solutions

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Most hypercylindrical black string/brane spacetime backgrounds are unstable under small long wavelength perturbations along the string/brane directions. This is the so-called Gregory-Laflamme instability. After giving a brief review on the recent developments on this issue, I motivate why a wider class of hypercylindrical spacetime solutions is needed to be studied more. Such solutions in five-dimensional Einstein gravity characterized by mass density and tension and in four-dimensional theory with cosmological constant will be presented. Their geometrical properties are also discussed breifly. Interestingly, the solutions corresponding to most tension values contain naked curvature singularities. Considering physical collapsing processes from initial cylindrical matter distributions having arbitray tensions, it raises a question about why the regular solution is so special in the space of tension parameter. Some implications of our results are finally discussed.

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