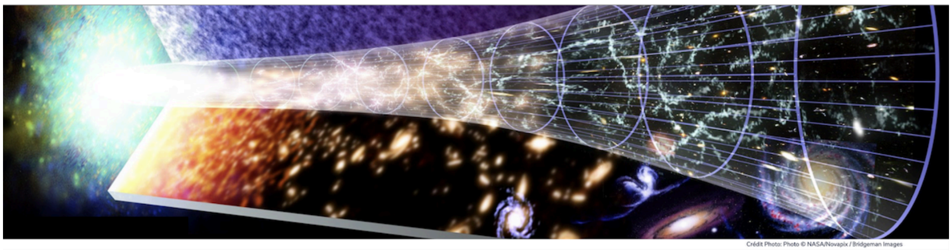
GDR CoPhy Episode 2



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Can the splashback radius be an observable boundary of galaxy clusters?

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The splashback radius was proposed as a physically motivated boundary of clusters as it sets the limit between the infalling and the orbitally dominated regions. However, galaxy clusters are complex objects connected to filaments of the cosmic web from which they accrete matter that disturbs them and modifies their morphology. In this context, estimating the splashback radius and the cluster boundary becomes challenging. We used a constrained hydrodynamical simulation of the Virgo cluster's replica embedded in its large-scale structure to investigate the impact of its local environment on the splashback radius estimate. We identify the splashback radius from 3D radial profiles of dark matter density, baryons density, and pressure in three regions representative of different dynamical states: accretion from spherical collapse, from filaments, and matter outflow. We also identify the splashback radius from 2D-projected radial profiles of observation-like quantities: mass surface density, emission measure, and Compton-y. We show that the splashback radius mainly depends on the dynamics in each region and the physical processes traced by the different probes. Consequently, caution is required when using the splashback radius as a boundary of clusters, particularly in the case of highly disturbed clusters like Virgo.

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