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## The Physics of Galaxy Cluster Outskirts

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The outskirts of galaxy clusters is one of the new frontiers at the crossroads of cosmology and astrophysics, promising to serve as a powerful laboratory for studying the cosmological growth of structure as well as rich astrophysics in the infall regions around the most massive dark matter halos. In this talk, I will discuss recent advances in our understanding of the physics of the virialization region in the outskirts of galaxy clusters based on a suite of cosmological simulations, including Omega500 and Illustris-TNG hydrodynamical simulations and the Uchuu-Universe Machine mock galaxy catalogs. Specifically, I will introduce (a) the puzzling offset between the locations of the splashback and the accretion shock radius and (b) how galaxies trace the locations of the splashback radius, with highlights on their possible physical origins and impact for modeling and interpreting large datasets from ongoing and future multi-wavelength (X-ray, SZ, and optical) cluster surveys.

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