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Survival of the prompt cusp population in Milky Way-like galaxies

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The current ΛCDM framework predicts the formation of density cusps in the centre of the first dark matter haloes, which would be able to survive until $z = 0$. More specifically, we could find a large number of these prompt cusps with Earth-like masses, which can populate the Milky Way. However, stellar encounters and/or tidal forces might destroy or deplete these structures. In this project, we shed light to the resilience of individual prompt cusps within Milky Way-like galaxies through the Halo Expansion Technique (HEX), which computes the evolution of a subhalo inside the field host halo potential, that resembles a host in a cosmological simulation such as Aquarius (for the DMO case) or Auriga (for the hydrodynamical case). In contrast, the subhalo would be resolved with a large number of particles, and would be orbiting its host for several dynamical times, from its accretion until the present day. We are also able to compare the orbits of these individually simulated subhaloes with their corresponding counterparts in the respective parent simulations, and study the evolution of the density profiles with time. The existence of these prompt cusps at distances close enough to the Earth would be very useful for gamma-ray DM searches, since their annihilation signal would be larger with respect to an NFW subhalo.

Primary author: AGUIRRE-SANTAELLA, Alejandra (Institute for Computational Cosmology, Durham University)

Co-authors: Prof. JENKINS, Adrian; Prof. FRENK, Carlos; Dr BOSE, Sownak

Presenter: AGUIRRE-SANTAELLA, Alejandra (Institute for Computational Cosmology, Durham University)

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