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Dark matter self annihilation in cosmological simulations

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The standard model for the evolution of the universe is the Lambda cold dark matter (Λ-CDM) model. Its widespread acceptance is due to its simplicity and agreement with a whole host of different astronomical observations. However much is still unknown about the Dark Sector. While Λ-CDM successfully predicts the large scale properties of the universe, there are some discrepancies on the smaller scale, such as a larger than expected number of dwarf galaxies orbiting their parent galaxies and an over-abundance of dark matter in the cores of galaxies. While some have proposed these anomalies can be explained by baryonic physics or observational errors, there is still room for explanations lying within the Dark Sector.

In this presentation, I will show n-body simulations (based on Gadget 2) of simple model halos with gas components in which dark matter undergoes WIMP-like self-annihilation. This annihilation causes a mass loss of the dark matter components and the corresponding energy released by these interactions feed into the surrounding gas particles, affecting the mass distribution these of these halos. By developing this simple model and implementing it into sophisticated cosmological simulations, we will determine how these interactions imprint indirect clues onto the large and small scale galactic structure as to the identity and effect of dark matter on the universe.

Summary

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