

Gravitational thermodynamics and modified dark matter

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Modified dark matter (MDM) is a phenomenological model of dark matter, inspired by quantum gravity. We review its construction based on gravitational thermodynamics / entropic gravity arguments. For an accelerating Universe with positive cosmological constant (Λ) such as ours, such considerations lead to the emergence of a critical acceleration parameter related to Λ . We show how modified Newtonian dynamics (MOND) is a phenomenological manifestation of MDM which, we further demonstrate, passes observational tests at both the galactic and cluster scales. Guided by our understanding of quantum gravity, we speculate on the extended nature of the quanta of MDM (obeying infinite statistics, aka quantum Boltzmann statistics) which appears to connect dark matter to such global aspects of spacetime as Λ and the Hubble parameter, and to lead to possible novel particle phenomenology for their interactions, which may explain why, so far, dark matter detection experiments have failed to definitively detect dark matter.