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Alleviating both H0 and σ8 tensions through Tsallis entropy

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We investigate the cosmological applications of Tsallis entropy and we analyze them in the light of both H0 and σ8 tensions. We obtain the modified Friedmann equations, which contain new extra terms that constitute an effective dark energy sector depending on the new Tsallis exponent δ, that quantifies the departure from standard entropy. For particular δ choices we investigate the effect of the additional terms on the expansion rate of the universe, which appears to be negligible at high redshifts, however at low redshifts the Hubble parameter acquires increased values in a controlled way. The mechanism behind this behavior is the fact that the effective dark-energy equation-of-state parameter exhibits phantom behavior, which implies faster expansion, which is one of the sufficient conditions that are capable of alleviating the H0 tension. Additionally, for the same parameter choice we obtain an increased friction term and an effective Newton's constant smaller than the usual one, and thus the σ8 tension is also solved.

Presenter: Dr PETRONIKOLOU, Maria (National Observatory of Athens, NTUA)