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Cosmology in f(Q) Gravity through Unified Dynamical System Analysis.

Motivated by the effectiveness of f(Q) gravity models in fitting observational data at both background and perturbation levels, our study employs a comprehensive dynamical system analysis to independently validate these findings. We focus on two well-studied f(Q) models, specifically the power-law and exponential variants. Our analysis reveals a matter-dominated saddle point in both cases, accurately exhibiting the expected matter perturbation growth rate. Subsequently, we observe a stable dark-energy-dominated accelerated universe, maintaining constant matter perturbations. Additionally, an examination of $f\sigma_8$ behavior demonstrates successful alignment with observational data, resembling the Λ CDM scenario, although the exponential model lacks this as a specific limit. This independent dynamical systems approach corroborates previous observational results, solidifying the potential of f(Q) gravity as a promising alternative to the Λ CDM concordance model.

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