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Cosmic antifriction and accelerated expansion

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Abstract

We explain an accelerated expansion of the present Universe, suggested from observations of supernovae of type Ia at high redshift, by introducing an antifrictional force that is self-consistently exerted on the particles of the cosmic substratum. Cosmic antifriction, which is intimately related to "particle production," is shown to give rise to an effective negative pressure of the cosmic medium. While other explanations for an accelerated expansion (cosmological constant, quintessence) introduce a component of dark energy in addition to "standard" cold dark matter (CDM) we resort to a phenomenological one-component model of CDM with internal self-interactions. We demonstrate how the dynamics of the cold dark matter model with a cosmological constant may be recovered as a special case of cosmic antifriction. We discuss the connection with two-component models and obtain an attractor behavior for the ratio of the energy densities of both components which provides a possible phenomenological solution to the coincidence problem. © 2001 The American Physical Society.

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