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Multi-field TDiff theories: the mixed regime case

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Abstract

We study theories breaking diffeomorphism (Diff) invariance down to the subgroup of transverse diffeomorphisms (TDiff), consisting of multiple scalar fields in a cosmological background. In particular, we focus on models involving a shift-symmetric field dominated by its kinetic term and a field dominated by its potential, coupled to gravity through power-law functions of the metric determinant. The Diff symmetry breaking results in the individual energy-momentum tensors not being conserved, although the total conservation-law is satisfied. Consequently, an energy exchange takes place between the fields, acting as an effective interaction between them. With this in mind, we consider the covariantized approach to describe the theory in a Diff invariant way but with an additional field, and discuss the phenomenological consequences of these models when it comes to the study of the dark sector.

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