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Reconstruction the scalar-torsion gravity version from the frame of exact cosmological solutions

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Cosmological models based on scalar-torsion gravity with non-minimal coupling between the scalar field and torsion are considered. These models were obtained as a consequence of the generalized exact solutions of cosmological dynamic equations for an arbitrary Hubble parameter and an arbitrary scalar field evolution.

An inflation models classification according to the expansion order of the tensor-to-scalar ratio dependence on spectral index of the scalar perturbations $r = r(1 - n_S)$ was also proposed. On the basis of this classification, the method for constructing inflationary models based on scalar-torsion gravity verified by observational constraints was considered, implying a linear dependence $r \sim (1 - n_S)$ for arbitrary model's parameters. For the gravity theory under consideration the type of scalar field potential or other background parameters doesn't affect the possibility of verifying the inflationary models.

Also, proposed inflationary models can predict different types of tensor perturbation spectrum (red, blue or flat) depending on the tensor-to-scalar ratio value and how close the early universe cosmological dynamics is to the purely exponential (de Sitter) expansion regime. The proposed type of the scalar-torsion gravity implying the wide class of verified cosmological models with arbitrary parameters is of interest for the further deviations research in the relict gravitational waves spectrum and in the compact astrophysical objects evolution from teleparallel equivalent of general relativity or from the other modified gravity theories.

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