SAIP 2018
South African Institute of Physics Conference
25 - 29 JUNE 2018 • UNIVERSITY OF THE FREE STATE • BLOEMFONTEIN • SOUTH AFRICA

Contribution ID: **251** Type: **Oral Presentation**

Shear-free Dust Cosmological Models in Gravitational Scalar-Tensor Theories

Wednesday, 27 June 2018 12:40 (20 minutes)

Theoretical physics in general and cosmology in particular have faced some challenges due to the recent observations in cosmology and astronomy, such as the discovery of the accelerated cosmic expansion and the existence of dark matter and dark energy. Einstein's theory of General Relativity (GR) together with the standard model of cosmology fall short of giving any explanations for these
problems. Higher-order gravitational theories such as f(R) and scalar-tensor theories of gravity have been suggested to provide an answer to these shortcomings. In this work, we investigate the cosmological implications of such theories such as the background expansion history as well as the evolution of cosmological density perturbations. We present the equivalence between f(R) and
scalar-tensor theories of gravity. Although GR is a generalization of Newtonian gravity in the presence of strong gravitational fields, there is no properly defined Newtonian limit of GR on cosmological scales.
Recently, general relativistic quasi-Newtonian cosmologies have been studied in the context of large-scale structure formation and nonlinear gravitational collapse in the late-time universe. This despite the general covariant inconsistency of these cosmological models except in some special cases such as the spatially homogeneous and isotropic, spherically symmetric, expanding FLRW spacetimes. f(R) models have been shown to exhibit more shared properties with Newtonian gravitation than
does GR. We investigate the existence and integrability conditions of quasi-Newtonian cosmological spacetimes of classes of shear-free cosmological dust models with irrotational fluid flows in the context of scalar-tensor theories of gravity. We also derive the covariant density and velocity propagation equations of such models and analyse the corresponding solutions to these perturbation equations.

Please confirm that you
have carefully read the
abstract submission instructions
under the menu item
"Call for Abstracts"
(Yes / No)

yes

Consideration for
student awards
Choose one option
from those below.
N/A
Hons
MSc
PhD

PhD

Supervisor details
If not a student, type N/A.
Student abstract submision
requires supervisor permission:
please give their name,
 institution and email address.

Amare Abebe
North-West University
amare.abbebe@gmail.com

Primary author: Ms ABDULRAHMAN, Heba (North-West University)

Presenter: Ms ABDULRAHMAN, Heba (North-West University)

Session Classification: Astrophysics

Track Classification: Track D1 - Astrophysics