Семинар по гравитации и космологии им. А.Л. Зельманова

со-председатели:
академик РАН Старобинский А.А. и д.ф.-м.н. Сажина О.С.

No.360

11 октября 2023 г.

17:00

Государственный астрономический институт им. П.К. Штернберга
Московского Государственного Университета им. М.В. Ломоносова
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ЗАСЕДАНИЕ В ДИСТАНЦИОННОМ РЕЖИМЕ

Ссылка на подключение к Семинару указана рассылке и доступна без предварительной регистрации (необходимо ввести свое имя и нажать кнопку «Присоединиться»). В случае проблем с подключением обращайтесь по адресу: cosmologia@yandex.ru (Сажина О.С.)

Ссылка на подключение к Семинару 11 октября 2023 г. 17:00:
https://bbb.sai.msu.ru/b/7h3-4gg-gcp

Название: **Cosmological models with arbitrary spatial curvature in the theory of gravity with non-minimal derivative coupling**

Автор(ы): С.В. Сушков (Казанский федеральный университет)

Аннотация: We investigate isotropic and homogeneous cosmological scenarios in the scalar-tensor theory of gravity with non-minimal derivative coupling of a scalar field to the curvature given by the term $\zeta/H_0^2 \cdot G^{\mu\nu}\nabla_{\mu\varphi}\nabla_{\nu\varphi}$ in the Lagrangian. In general, a cosmological model is determined by six dimensionless parameters: the coupling parameter ζ (ζ), and density parameters Ω_0 (cosmological constant), Ω_2 (spatial curvature term), Ω_3 (non-relativistic matter), Ω_4 (radiation), Ω_6 (scalar field term), and the Universe evolution is described by the modified Friedmann equation. In the case $\zeta = 0$ (no non-minimal derivative coupling) and $\Omega_6 = 0$ (no scalar field) one has the standard ΛCDM-model, while if $\Omega_6 \neq 0$ we have the ΛCDM-model with an ordinary scalar field. As is well-known, this model has an initial singularity, the same for all k ($k = 0, \pm 1$), while its global behavior depends on k. The Universe expands eternally if $k = 0$ (zero spatial curvature) or $k = -1$ (negative spatial curvature), while in case $k = +1$ (positive spatial curvature) the Universe expansion is changed to contraction, which is ended by a final singularity. The situation is crucially changed when the scalar field possesses non-minimal derivative coupling to the curvature, i.e. when $\zeta \neq 0$. Now, depending on model parameters,

(i) There are three qualitatively different initial state of the Universe: an **eternal kinetic inflation**, an **initial singularity**, and a **bounce**; the bounce is possible for **all** types of spatial geometry of the homogeneous universe;

(ii) For **all** types of spatial geometry, the Universe goes inevitably through the **primary quasi-de Sitter** (inflationary) epoch when $a \propto exp(h_{dS}) \cdot H_0 t$ with the de Sitter parameter ${h_{dS}}^2 = \frac{1}{9\zeta} - \frac{8\zeta\Omega_2^3}{27\Omega_6}$. The mechanism of primary or **kinetic** inflation is provided by non-minimal derivative coupling and needs no fine-tuned potential;

(iii) There are **cyclic** scenarios of the Universe evolution with the non-singular bounce at a minimal value of the scale factor, and a turning point at the maximal one;

(iv) There is a natural mechanism providing a **change** of cosmological epochs.

Zelmanov Memorial Seminar on Gravitation and Cosmology
co-chairmen:
Starobinsky A.A., Sazhina O.S. (cosmologia@yandex.ru; все желающие получать регулярную рассылку Семинара, пожалуйста, присылайте контактные электронные адреса.)
Sternberg Astronomical Institute, Universitetskii pr. 13; 17:00