Cosmological Models with Fluids, Scalar Fields and Forms in Diverse Dimensions.

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The discovery of *accelerated* expansion of the Universe and the fact that flat Friedmann model with the cosmological constant or quintessence now fits best the set of observational data, created problems of dark matter and dark energy. This is a real revolution in modern physics as we do not know now what really the *dark matter* (0.20 of 0.30) and what the *dark energy* (0.70) of the total energy are. Even attempts to explain it via the cosmological constant or quintessence seem to change one puzzle with another one as necessary vacuum properties or exotic scalar fields with or without strange potentials are still waiting to find their place in rigorous theories, not speaking about their real experimental confirmation. In the lectures I describe our different attempts to solve some basic problems of modern cosmology using exact solutions with different matter sources in diverse dimensions.

In [1] we showed that the cosmic acceleration and coincidence problems may be solved by using an x-fluid as a quintessence and a viscous fluid as a normal matter. We adopted the "second equations of state" in the form of some special metric dependence of the bulk and shear viscosity coefficients. These "second equations of state" generalize the so called "linear dissipative regime" in FRW world model. We studied D-dimensional homogeneous anisotropic cosmology, which allows to describe the dynamical compactification of the extra dimensions (see our paper [2] on viscous cosmology).

Other 2-component models in many dimensions also having the acceleration were found: with the cosmological constant in [3], with a perfect fluid in [4], with 2 non-Ricci-flat spaces [5], with p-branes and static internal spaces in [6], with scalar fields having exponential potentials in [7] and in four dimensions with a perfect fluid and a scalar field with the exponential potentials in [8,9], using methods, developed in our multidimensional approach.

With the same aim the D-dimensional cosmological model describing the evolution of a multicomponent perfect fluid with variable barotropic parameters in n Ricci-flat spaces was investigated [10]. The equations of motion are integrated for the case, when each component possesses an isotropic pressure with respect to the all spaces. The exact solutions are presented in the Kasner-like form. Some examples are given. The first example is 4-dimensional model with the Kasner-like behavior near the initial singularity and an isotropic accelerated expansion at late times. The other example is $(4+d)$-dimensional model describing a contraction of the internal space accompanied by the expansion of the external space at early times. Some other models are discussed also.

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