

General Relativity and Quantum Cosmology

Expanding perfect fluid generalizations of the C-metric

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(Submitted on 28 Jan 2010)

We reexamine Petrov type D gravitational fields generated by a perfect fluid with spatially homogeneous energy density and in which the flow lines form a timelike non-shearing and non-rotating congruence. It is shown that the anisotropic such spacetimes, which comprise the vacuum C-metric as a limit case, can have *non-zero* expansion, contrary to the conclusion in the original investigation by Barnes (Gen. Rel. Grav. 4, 105 (1973)). This class consists of cosmological models with generically one and at most two Killing vectors. We construct their line element and discuss some important properties. The methods used in this investigation incite to deduce testable criteria regarding shearfree normality and staticity of Petrov type D spacetimes in general, which we add in an appendix.

Comments: 13 pages

Subjects: **General Relativity and Quantum Cosmology (gr-qc)**Cite as: **arXiv:1001.5263v1 [gr-qc]**

Submission history

From: Lode Wylleman [[view email](#)]

[v1] Thu, 28 Jan 2010 20:54:53 GMT (32kb)

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