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Effect of peculiar velocities on the gravitational potential in cosmological models with perfect fluids. (English) Zbl 1473.83087

Phys. Lett., B 809, Article ID 135761, 6 p. (2020).

Summary: We consider a universe filled with perfect fluid with the constant equation of state parameter ω. In the theory of scalar perturbations, we study the effect of peculiar velocities on the gravitational potential. For radiation with $\omega = 1/3$, we obtain the expression for the gravitational potential in the integral form. Numerical calculation clearly demonstrates the modulation of the gravitational potential by acoustic oscillations due to the presence of peculiar velocities. We also show that peculiar velocities affect the gravitational potential in the case of the frustrated network of cosmic strings with $\omega = -1/3$.

MSC:

83F05 Relativistic cosmology
83C55 Macroscopic interaction of the gravitational field with matter (hydrodynamics, etc.)
76E20 Stability and instability of geophysical and astrophysical flows
76Q05 Hydro- and aero-acoustics

Keywords:

cosmology; scalar perturbations; peculiar velocities; gravitational potential; cosmic strings

Software:

Equator

Full Text: DOI arXiv

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