Schuecker, P.; **Böhringer, H.**; **Arzner, K.**; **Reiprich, T. H.**

Cosmic mass functions from Gaussian stochastic diffusion processes. (English) Zbl 1066.85006

Astron. Astrophys. 370, No. 3, 715-728 (2001).

For the derivation in modern cosmology of the Press–Schechter formula of the cosmic mass function, the excursion set formalism assumes that at a fixed spatial location the change of the density contrast successively smoothed with a decreasing filter scale can be described as a sample path of a stochastic diffusion process [*J.A. Peacock*, Cosmological physics. (Cambridge University Press, Cambridgep) (1999; Zbl 0952.83002)].

The paper under review is concerned with the development of techniques to derive cosmic mass and filter functions for given stochastic diffusion processes and Gaussian random fields of the mass density contrast by solving the Kolmogorov forward and backward equations including non–vanishing drift terms. For practical reasons the analysis is concentrated on order 0 and order 1 processes. Whereas processes of order 0 are characterized by drift coefficients which are independent of the filtered density contrast, processes of order 1 admit a linear dependence on the filtered density contrast. The cross–correlation between two mass scales gets important especially for small masses. It is shown that in stochastic diffusion processes of order 1, although derived within the framework of Markov processes, realistic non–zero covariances appear in a natural way without sampling along the diffusion history. In addition, the filter functions associated with the diffusion processes are derived. Whereas for all processes of order 0 the filter function is the sharp filter, processes of order 1 are associated with exponential filters. The effects of the exponential filters on the mass function are in the low–mass range where an excess over the standard Press–Schechter expectation of cosmic mass has been established.

In conclusion, the reasoning of the paper under review leads to more realistic non–sharp filter profiles and to cross–correlations between different mass resolution scales of cosmological physics which are expected to have important implications on various progenitor statistics and biasing schemes.

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MSC:

85A35 Statistical astronomy
85A40 Astrophysical cosmology

Full Text: DOI