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Evolution of a One-dimensional, Two Component, Universe YUI SHIOZAWA, BRUCE MILLER, Texas Christian Univ, JEAN-LOUIS ROUET, Universite d'Orleans — While the universe we observe today exhibits local filament-like structures, with stellar clusters and large voids between them, the primordial universe is believed to have been nearly homogeneous with slight variations in matter density. To understand how the observed hierarchical structure was formed, researchers have developed a one-dimensional analogue of the universe that can simulate the evolution of a large number of matter particles. Investigations to date demonstrate that this model reveals structure formation that shares essential features with the three-dimensional observations. In the present work, we have expanded on this concept to include two species of matter, specifically dark matter and luminous matter. In our simulation, luminous matter is treated in a way that loses energy in interaction with itself. The results of the simulations clearly show the formation of a Cantor set like multifractal pattern over time in configuration space as well as in phase space. In contrast with most earlier studies, mass-oriented methods for computing the multifractal dimensions were performed on various subsets of the matter distribution in order to understand the bottom-up structure formation.

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