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Cosmology in One Dimension: Fractal Dimensions from Mass Oriented Partitions BRUCE MILLER, Texas Christian University, JEAN-LOUIS ROUET, Universite d'Orleans, YUI SHIOZAWA, Texas Christian University — The distribution of visible matter in the universe has its origin in the weak fluctuations of density that existed at the epoch of recombination. The hierarchical distribution of the present universe, with its galaxies, clusters and super-clusters of galaxies indicates the absence of a natural length scale. Numerical simulations of a one-dimensional system permit us to precisely follow the evolution starting with an initial perturbation in the Hubble flow. The limitation to one dimension removes the necessity to make approximations in calculating the gravitational field and the system dynamics. It is then possible to accurately follow the trajectories of particles for a long time. The simulations show the emergence of a self-similar hierarchical structure in both the phase space and the configuration space and invites the implementation of a multifractal analysis. Here we apply four different methods for computing generalized fractal dimensions D_q of the distribution of particles in configuration space. We first employ the conventional methods based on partitions of equal size and then less familiar methods based on partitions of equal mass. We show that the latter are superior for computing generalized dimensions for indices $q < -1$ which characterize regions of low density.

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