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国台学术报告 NAOC COLLOQUIUM

2021 年 第 8 次 / No. 8 2021

Time: Wednesday 2:30 PM, Jun.9th Location: A601, NAOC

A universal model for evolution of dark matter halos

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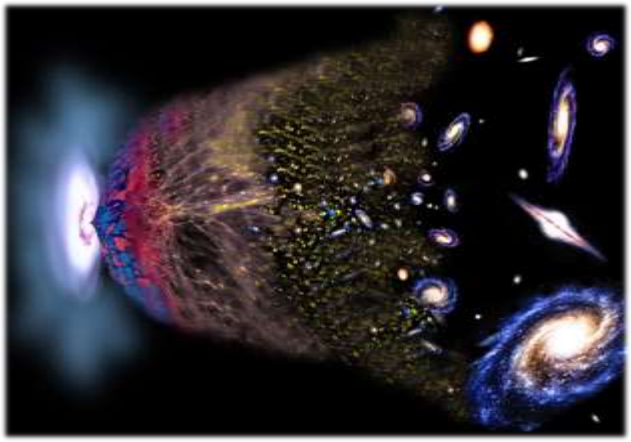
Dr. Donghai Zhao is a researcher at the Shanghai Astronomical Observatory of the Chinese Academy of Sciences and got support from the National Science Fund for Excellent Young Scholars in 2012. He received his B.S. in Geology in 1996, joined the first Sino-German Max-Plank Partner Group in 1999 and received his Ph.D. in Astrophysics in 2002. He has been working at the Shanghai Astronomical Observatory since then. He has worked mainly on the formation and evolution of the large-scale structure of the Universe. His research results have been extensively included in two international textbooks Galactic Dynamics and Galaxy Formation and Evolution.

Abstract



Dark matter halos are the elementary units of the large-scale structure of the Universe and host galaxy formation. However, their formation and evolution are highly nonlinear gravitational processes, and the analytical theory of structure formation and evolution can only give an approximate image, while the numerical simulation studies have the defects of limited applicability, non-transferability and physical ambiguity, and suffer from numerical effects. By presenting the results of numerical simulations into the parameter space adopted by the analytical theory, a new approach was proposed by Donghai Zhao et al. in 2009, to obtain a universal model for halo mass growth and its internal structure evolution. I will show in this report this model applies precisely to any dark halo mass, to any period in the history of the Universe, to a wide variety of cosmological models and to not only cold but also warm and hot dark matter models, and thus are unquestionably applicable to our real universe. Following this approach, our research group has recently proposed a unified model of dark matter halo merger rate and a unified model of dark matter halo merger orbit, both of which are again accurate and universal, while physically clear. I'll show also our new results on the anisotropy of velocity dispersion of smooth matter inside dark matter halos.