PLASMA WAVES AROUND THE CENTRAL BLACK HOLE IN AN ACTIVE GALACTIC NUCLEUS

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An axisymmetric, stationary electrodynamic model of the central engine in an active galactic nucleus has been well formulated by Macdonald and Thorne. The relativistic region around the central black hole is filled by plasma in this model. The propagation of the plasma waves which are parallel to the magnetic lines will be discussed in this presentation. The goal of this analyses will be to estimte the resonance, cut-off frequencies and to investigate the possibility of a significant energy transport.

Cosmological Hydrodynamic Code Based on the Total Variation Diminishing Schen

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We describe an explicit second order finite difference code based on a total variation diminishing scheme for self-gravitating cosmological hydrodynamic systems. The code has been developed to follow correctly the adiabatic changes of extremely supersonic preshock flows with a Mach number larger than 100 as well as very strong shocks. In highly supersonic regions, we utilize an entropy-like variable switching to a more conventional total energy variable near to and interior to shocks. The self-gravity has been included in such a way that the numerical errors in calculating the gravitational force term do not induce the leakage of the gravitational energy into the thermal energy of the gas. Also, the gravitational force term has been corrected to take account of the mass diffusion around the shocks so the total energy can be conserved. Tests for the accuracy and performance of the code without gravity have proven that it can accurately handle supersonic flows with a Mach number larger than 10^4. In calculations of the formation of an one dimensional Zel'dovich pancake, an energy accuracy of 1% is obtained for 32 cells per unit wavelength and the accuracy reaches 0.01% as the number of cells approaching 1024. To further test the code with gravity, three dimensional simulations of a purely baryonic universe but with the initial cold dark matter power-spectrum have been performed. The results have shown that shocks are well resolved and separete cleanly the hot, dense, collapsed peaks from the cold, low density, expanding voids. The thermal energy in low density regions can be orders of magnitude lower using this scheme than in some others due to very careful attention given to entropy in high Mach number regions.

Various numerical experiments have proven that the code can handle the expanding low density regions very well as well an conserve the total energy very accurately.

KINEMATIC EVOLUTION OF THE UNIVERSE WITH DARK MATTER

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We performed kinematic tests of the universe with dark matter such as relativistic particles, nonrelativistic particles, and cosmological constant. They were introduced to solve discrepancies between inflation theories ($\Omega_0 = 1$) and observations ($\Omega_0 = 0.2 \pm 0.1$) with respect to the density parameter Ω_0. It is found that the cosmological constant has great influence on kinematics of the universe. If we assume time variable (decreasing) 'cosmological constant', it is shown positive role for the growth of the density fluctuation.

HYBRID GALAXY FORMATION

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A simple approximate form of the present δ-spectrum for the hybrid (HDM + CDM) scenario is used to compute r.m.s. fluctuations in the mass ($\delta M/M$), the peculiar velocity V_p and the background temperature ($\delta T/T$). The results show no significant changes as compared with those of single component scenario, which seems to support the currently favored CDM dominated galaxy formation.

우주상수가 0이 아닌 우주에서의 중력렌즈의 통계적 성질

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지금까지 발견된 중력렌즈계 중에서 렌즈와 광원의 적색이동값이 알려져 있는 3C324, Q0142-100, Q2237+030을 이용하여 0 이 아닌 우주상수를 포함하는 네가지 경우의 평평한 우주론적 모델에 대하여 상의 분리각 분포를 계산하였다. 렌즈의 모델로는 singular isothermal sphere를 사용하였고, 균질하고 등방적인 Friedmann-Lemiatre-Robertson-Walker우주를 가정하였다. 이 모델들에서 렌즈의 광원의 적색편이가 고정된 경우, Schechter luminosity function을 따르는 렌즈은하(lensing galaxies)들에 의해 여러 개의 상이 생길 때 이들 상의 분리각의