unmagnetized case. The effects of the magnetic field appear more strongly on small scale. As the strength of the equilibrium magnetic field increases the growth rates decreases, and the maximum instability occurs at lower value of m due to the increasing magnetic pressure. With the inclusion of the magnetic field, the effects of the ionization fraction and friction on the grows rates also appear to be important for high m modes. Increasing the ionization fraction or the friction suppresses instability, but only slightly changes the maximally unstable azimuthal scales. The enhanced growth rates due to a dust component for which thermal pressure is negligible are somewhat reduced by the inclusion of a magnetic field. The effects of different boundary conditions (reflecting and transmitting) on the growth rates are also shown.

The structure and Stability of Two-Temperature Accretion Disk

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The structure and stability of the gas pressure dominated, thin accretion disk, cooled by Comptonization of the central soft photons is studied. Steady-state solutions have two branches: High-temperature (HT) solutions have very different ion and electron temperatures and correspond to the classic solutions of Shapiro, Lightman, and Eardley. Low-temperature (LT) solutions have same ion and electron temperature, which is very close to the Compton temperature of soft photons.

The linear analysis, allowing for the surface density perturbations and dynamics in the vertical direction, shows that LT disk is stable while HT disk is not. LT disk is stable because ions and electrons are locked to the Compton temperature of the soft photons. HT disk generally has 4 local modes: (1) Heating mode grows in thermal time scale, (5/3)(α ω)-1, where ω is Keplerian frequency. (2) Cooling mode decays in Compton time scale, (2/5)(Te/Ti)(αω)-1 << (αω)-1. (3) Lightman-Eardley mode decays in viscous time scale, (8/11)(?/Ho)2(αω)-1, where ? is the wavelength of the perturbation and Ho is the disk height. (4) Vertical oscillatory modes oscillate in Keplerian time scale, (3/8)1/2ω-1 with the growth rate (Ho/?)2. Including dynalics in the vertical direction does not change the stability behavior in general, adding only the oscillatory modes which gradually grow as Ho/? increases.

Non-linear behavior of the disk is followed by numerical integration. Cooling function covering both effectively optically thin and thick cases is used. Only the ion temperature perturbation is important and the disk either expands or collapses vertically, depending on the sign of the perturbation. When expanding, the ion temperature becomes very high while the electron temperature very low, resulting in runaway behavior due to the decreased Coulomb coupling, especially so if the ion velocity effect is considered. When

collapsing, the disk approaches LT solutions and stabilizes at Compton temperature.

An Upper Limit to the Electrodynamic Power Output From an Accretion Disk around a Black Hole

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We examine the electrodynamic power output from an accretion disk surrounding a Kerr black hole. We derive an upper limit for the total power. We find that this limit is only moderately sensitive to most of the relativistic correction factors. In fact, this limit is less sensitive to the change in the black hole spin than one would expect from the change in the inner radius of the accretion disk. The disk around a rapidly rotating black hole will produce more nonthermal radiation than a similar disk around a slowly rotating black hole of identical mass, but the difference is only a factor of ~ 1.7.

Globular Clusters in Dwarf Galaxies and the Formation of Nucleated Dwarf Galaxies

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We try to examine dynamical reasons which could lead formation of nucleated dwarfs and non-nucleated dwarfs. We focus on the fact that many dwarf spheroidals have globular clusters. Despite that dynamical friction is important and effective for globular clusters' orbital decay in dwarf spheroidal galaxy, the outcome of dynamical evolution may depend on the differences between the internal velocity dispersion of the clusters and that of the host galaxies. As the clusters sink to the center of a host galaxy, they eventually interact with each other. The recoil velocity of cluster-cluster scattering may be comparable to the internal velocity dispersion of the clusters. If the recoil velocity is large compared with the velocity dispersion of the host galaxy, the clusters may be slingshot out of the core as in the case of Fornax. If the recoil velocity velocity is small compared with the velocity dispersion of the host galaxy, the cluster remains in the center of the host galaxy. Repeated encounters provide opportunities for the clusters to eventually coagulated. In order to study this dynamical process, we adopt a restricted N-body numerical scheme based on Aarseth's NBODY1 scheme. Although we adopt a point mass potential for the field stars, the gravitational potential parameter. Out preliminaryresults suggest that