Talk at Splinter Meeting

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Self-Similar Evolution of Self-Gravitating Black Hole Accretion Disks

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We present a new dynamical model for geometrically, thin axisymmetric accretion disks. The model accounts for black hole growth self-consistently allowing for a time-dependent central point mass. It incorporates the effects of self-gravity using the monopole approximation for the disk's gravitational potential. Since both effects are considered in a dynamical way, the model allows to examine the impact of a varying gravitational potential on the accretion process. The proposed non-linear advection-diffusion equation admits self-similar solutions depending on a single non-dimensional parameter which is linked to the initial mass distribution. It is shown that fully self-gravitating disks yield higher accretion rates and therefore evolve faster than almost Keplerian disks. So far, we have focused on four different viscosity prescriptions which all yield qualitatively similar results. However, we found that the standard Shakura-Sunyaev α-viscosity is very inefficient in comparison with other viscosity models and may hardly explain supermassive black hole formation in the early universe.