tangential orbits, is searched with a new technique and very conspicuous inhomogeneities are found in the Coma cluster of galaxies. Nonparametic statistical tests indicate that the inhomogeneities are real at a 99% level of confidence. Even in the central regions (the annular zone of 7′ ~30′ from the center), zones that are dominated by radial orbits are clearly distinguishable from that of the tangential orbits, and defining the cluster 'equator' as the direction defined by Coma-A1367 supercluster, tangential orbits dominate the 'polar' zones. Galaxies located in 30′ ~100′ from the center also show significant inhomogeneity in that the polar zones are mostly radial and the velocities in the rest of zones are more or less homogeneous in distribution. These indicate that the orbits of Coma galaxies in global are exceedingly more radial, implying that there are significant infalls and is likely to be interpreted that Coma has gone through some sort of an earlier virialization particularly toward the equator.

Incorporating the velocity inhomogeneity into mass estimators, the most appropriate mass is inferred from tangential orbits, and this is turned out to be 0.4×10^{15} $h^{-1}M_{\odot}$ ($R\leq0.6$ h^{-1}Mpc), and 1.0×10^{15} $h^{-1}M_{\odot}$ ($R\leq2.1$ h^{-1}Mpc), and the corresponding mass to blue light ratio on the average is ~300h. These estimates are consistent with Merritt (1987) and Hughes (1989) and the M/L_B is seemed to favour the mass-follows-light models than the uniform spread of dark matter throughout the cluster.

Numerical Approach to Tidal Disruption of a Star by a Massive Black Hole I: Basic Scheme and Preliminary Results

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Tidal disruption of a star by a massive black hole is a well known phenomenon, but the evolution of the debris has not been well understood because of the complicated nature of hydrodynamical process. We have developed a computer program based on the Smoothed Particle Hydrodynamics (SPH) to investigate the dynamical evolution of the stellar debris. General relativistic precession is included using post-Newtonian approximation in order to minimize the complexity while no relativistic correction is made for hydrodynamic equations. No cooling is included except the thermal diffusion which effectively has the cooling effect in the region where temperature is much higher than surroundings. We found that about 50% of the material is unbound immediately after the disruption. The remaining particles move along the bound orbit with wide range of eccentricity. Because of large amounts of relativistic precession per orbit, the incoming stream of gas with longer periods intersects with outgoing stream of gas with shorter periods, resulting strong shocks. The gas particles gain large amount of random kinetic energy so that some fraction of shocked particles again becomes unbound. The preliminary results indicate that only a very small fraction of stellar mass eventually forms a outcome of stellar disruption largely depends on the fractional mass of circularized orbit as pointed out by Cannizzo, Lee, and Goodman

(1991).

Multiphase Interstellar Matter in Early Type Galaxies

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In order to understand the relationship between different phases of interstellar matter and their roles in fueling radio continuum sources and star formation, we have compared observational data from a wide range of wavelengths. About 30% of early type galaxies in our sample follow a relation between non-thermal radio continuum and infrared emission which is likely due to star formation as in spiral galaxies. About half of the galaxies have excess radio emission over the relationship and these galaxies also tend to contain large amount of X-ray emitting hot gas, indicating that the presence of hot gas is important for the fueling of nuclear radio sources.

A Surface Photometry of NGC4419

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We have conducted a surface photometry of barred spiral galaxy NGC4419, by making use of 6 Kiso plates in U,B,V,R-band. We have used the IRAF/SPIRAL for the reduction of the observational data. In order to make a quantitative analysis, we have decomposed the observed luminosity profile into bulge a component following $r^{1/4}$-law and an exponential disk. The fitting was found to be rather poor, especially near the boundary between bulge and disk. The inclination may be partly responsible for such poor fitting, but we believe that the disk of this galaxy does not follow exponential law at small radii. The disk of this galaxy may be an example of Freedman's type II disk. The b-v color does not show any significant variation over the radius while v-r color tends to be larger near the center. The effect of atmospheric and instrumental point spread function on observed luminosity distributions is also discussed.

Structure of the Blue Compact Galaxy ESO 338-IG04

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CCD images and PCA spectra of the blue compact galaxy ESO 338-IG04 were obtained. 3 color contour images (V, R and I) show the similar smooth distribution with a single concentration. PCA spectra show the similarity to the emission spectrum of highly excited H II region.