derived from the magnitude of the instability-generated torques as a function of the cooling rates. It is confirmed that uncooled disks heat to the point of stability and cease to provide progenitor studies. With instationarily unstable cooled disks also heat up, the instability is never entirely removed; they evolve through the continued action of density waves. Thus it is demonstrated that the rate of evolution of gravitationally unstable disks is controlled by the rate at which thermal energy can escape the disk, just as in the case of convectively unstable disks and Hayashi track stars.

14.08

Magnetic Braking, Ambipolar Diffusion, and the Formation of Cloud Cores and Protostars
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We follow the formation and contraction of fragments (or cores) in isothermal, rotating, magnetic molecular clouds to a central density enhancement of $10^6$ (e.g. from $10^2$ cm$^{-3}$ to $10^4$ cm$^{-3}$). Initial states are exact equilibria with magnetic, centrifugal, and thermal-pressure forces balancing self-gravity. The evolution of a typical cloud away from equilibrium is due to magnetic braking (the transport of angular momentum by torsional Alfven waves) and ambipolar diffusion (the relative drift between plasma and neutrals). A core forms and evolves quasi-statically, with ambipolar diffusion increasing its mass-to-flux ratio and magnetic braking keeping the whole cloud near corotation with the galactic background. The core enters a dynamic collapse phase after the mass-to-flux ratio becomes supercritical. During this phase, the evolution of the core is characterized by trapping of magnetic flux and angular momentum. We find that the angular momentum problem of star formation is essentially resolved by magnetic braking during the quasi-static phase. The specific angular momentum in the supercritical core at the end of the run is comparable to that of observed wide binaries. The interplay of magnetic braking and ambipolar diffusion determines the final mass and angular momentum in the collapsing core.

15.02

Turbulent Mixing Layers in Cluster Cooling Flows
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We propose that turbulent mixing layers between hot intracluster gas and cold gas in cluster cooling flows may be the source of the ionizing radiation required to explain the observed optical emission. Such turbulence might be driven by the relative velocity between hot gas and cooling condensates or cold gas accreted in mergers. Intermediate temperature gas at $T \approx 10^7$ K produced by the turbulent mixing radiates strongly in the EUV and only weakly in X-rays. We calculate the spectrum from a mixing layer following the non-equilibrium ionization and the photoionization of the mixed gas as it cools. We find the spectrum to be significantly softer than that used by Crawford & Fabian (1992, MNRAS) even when absorption is included. Thus, the mixing layer radiation alone is unable to produce the high [N II] 6584/6548 ratio observed in class I nebulae. Including the emission from the X-ray producing hot gas ($T \approx 10^7$ K) produces the necessary hardening of the spectrum and allows the optical line ratios to be matched.

15.03

Reducing the Thermal Stability of a Radiating Plasma: The Effects of Nonlocal Thermal Conduction
E. Chun, R. Rosner (U. Chicago)

We report on the linear stability of an optically thin uniform radiating plasma subject to nonlocal heat transport. Our analysis indicates that nonlocal heat transport acts to reduce the stabilizing influence of thermal conduction, and that there are critical values for the electron mean free path such that the plasma is always unstable. Our results are directly relevant to the problem of thermal condensations in the halos of clusters of galaxies.

15.04

Optical and Radio Properties of Dominant Galaxies in Cluster Cooling Flows
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We present CCD color imagery of dominant cluster galaxies centered in large cluster cooling flows (cD's). Earlier photometry through synthetic elliptical apertures has shown that these objects have blue central colors and radial color profiles which redden with radius, opposite to those in normal E's. Using color maps and difference images formed by modeling and subtracting the background galaxy, we find bright lobes of blue continuum light projected along the radio source structures which are perpendicular to the central dust lanes of the cD's in A1795 and A2597. It appears that interactions between their radio jets and the ambient medium may have induced star formation, or that the blue lobes are scattered radiation from an anisotropically emitting active nucleus. These objects, which reside at $z < 0.1$, may be the scaled-down analogs of aligned high redshift radio galaxies.

Difference images of NGC 1275 show extinction attributable to dust in a flattened distribution that is aligned with its atomic and molecular gas. This morphology suggests that most of the dust is associated with NGC 1275 itself, rather than the high velocity system (HVS). The central dust structure within 7 kpc ($v_\text{HVS} \approx 50$ km/s) of the active nucleus, appears to be coplanar with the young blue star clusters recently detected with the HST. The bright, 20cm radio continuum structure is oriented roughly perpendicular to the central dust feature, similar to A1795, A2597 and other prominent radio galaxies. The blue clusters associated with NGC 1275 at larger radii are distributed along the cold gas axis to the north-east, whereas, those associated with the HVS are roughly perpendicular to this axis along the north-west radio lobe. Contrary to earlier studies, we find significant blue continuum from the HVS. The central region within 15 kpc radius appears to be embedded in a diffuse halo of blue light, similar to that found in A1795 and perhaps in A2597. While NGC 1275 may have many unusual properties, its basic structure may be that of a relatively normal elliptical radio galaxy.