N94-31122

OBSERVATIONS OF ACCRETION AND ANGULAR MOMENTUM REGULATION IN YOUNG CIRCUM-STELLAR DISKS AND THE IMPLICATIONS FOR PLANETARY FORMATION. P. Hartigan, University of Massachusetts, Amherst MA 01003, USA.

Accretion disks around young stars produce excess infrared continuum associated with the disk, and excess optical and ultraviolet continua associated with the boundary layer or "hot spot" as material falls from the disk onto the stellar photosphere. When we subtract the excess continuum and photospheric contributions to the total spectrum, we can obtain high-quality emission line profiles of the Balmer lines as well as permitted lines from other elements. These emission lines often exhibit redshifted absorption, indicative of infalling material. Remarkably, objects with large accretion rates tend to rotate *slower* than their counterparts that lack accretion disks. Hence, there must be some process, probably involving magnetic fields, that allows the star to accrete large amounts of material from the disk without increasing its rotational velocity. Young stars typically do *not* have optically thick inner disks that do not accrete. Hence, either planets form within accretion disks, or the timescale for planetary formation is considerably shorter than $\sim3\times10^6$ yr, the duration of the classical T Tauri star phase of young stellar evolution.

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DISK INSTABILITY AND THE SPECTRAL EVOLUTION OF THE 1992 OUTBURST OF THE INTERMEDIATE POLAR GK PERSEI. S.-W. Kim[1], J. C. Wheeler[1], F. C. Bruhweiler[2], M. Fitzurka[2], K. Beuermann[3], K. Reinsch[3], and S. Mineshige[4], [1]Astronomy Department, University of Texas at Austin, RLM 15.308, Austin TX 78712, USA, [2]Physics Department, Catholic University of America, Washington DC 20064, USA, [3]Göttingen Universitäs-Sternwarte, Geismarlandstrasse 11, 37083, Göttingen, Germany, [4]Astronomy Department, Kyoto University, Sakyo-ku, Kyoto 606-01, Japan.

The disk instability model can explain the previous history of dwarf-nova-like outbursts in the intermediate polar GK Per, which occur about once every three years. Disk models that reproduce the recurrence time and outburst light curves suggest that GK Per has a large effective inner disk radius ($\sim30-40$ white dwarf radii) truncated by a strong magnetic field (10^7 G). In this context, the effective radius is that of the portion of the disk that participates in the disk thermal instability. The radius derived is larger than the co-rotation radius, which must be an upper limit on the true dynamical inner radius of the disk. Disk instability models with this large effective inner radius predict that the ultraviolet continuum should be rather flat. Here we compare the predictions of the disk instabilty model to IUE observations of the 1981 outburst and to IUE and ROSAT observation of the recent 1992 outburst of GK Per. The model disk continuum spectral evolution is consistent with the observed UV and optical spectra, especially at maximum and in the early decay phase of the outburst. The consistency of the model with the observed UV spectra suggests that the effective inner radius of the disk is almost constant, independent of mass accretion rate, and that whatever structure lies between the effective inner radius and the corotation radius neither participates in the disk instability nor radiates substantially in the UV. The related physics of the inner disk region will be briefly discussed.

N94-31124

DISK IRRADIATION AND LIGHT CURVES OF X-RAY NOVAE. S.-W. Kim[1], J. C. Wheeler[1], and S. Mineshige[2], [1]Astronomy Department, University of Texas at Austin, RLM 15.308, Austin TX 78712, USA, [2]Astronomy Department, Kyoto University, Sakyo-ku, Kyoto 606-01, Japan.

We study the disk instability and the effect of irradiation on outbursts in the black hole X-ray nova systems. In both the optical and soft X-rays, the light curves of several X-ray novae, A0620-00, GS 2000+25, Nova Muscae 1991 (GS 1124-68), and GRO J0422+32, show a main peak, a phase of exponential decline, a secondary maximum or reflare, and a final bump in the late decay followed by a rapid decline. Basic disk thermal limit cycle instabilities can account for the rapid rise and overall decline, but not the reflare and final bump. The rise time of the reflare, about 10 days, is too short to represent a viscous time, so this event is unlikely to be due to increased mass flow from the companion star. We explore the possibility that irradiation by X-rays produced in the inner disk can produce these secondary effects by enhancing the mass flow rate within the disk. Two plausible mechanisms of irradiation of the disk are considered: direct irradiation from the inner hot disk and reflected radiation from a corona or other structure above the disk. Both of these processes will be time dependent in the context of the disk instability model and result in more complex time-dependent behavior of the disk structure. We test both disk instability and mass transfer burst models for the secondary flares in the presence of irradiation.

N94-31125

TIME-DEPENDENT BEHAVIOR OF ACTIVE GALACTIC NUCLEI WITH PAIR PRODUCTION. H. Li[1] and C. D. Dermer[2], Department of Space Physics and Astronomy, Rice University, Houston TX 77251, USA, [2]Code 7653, Naval Research Laboratory, Washington DC 20375-5352, USA.

We study the properties of coupled partial differential equations describing the time-dependent behavior of the photon and electron occupation numbers for conditions likely to be found near active galactic nuclei (AGN). The processes governing electron acceleration are modeled by a stochastic accelerator, and we include acceleration by Alfvenic and whistler turbulence. The acceleration of electrons is limited by Compton and synchrotron losses and the number density of electrons depends on pair production and annihilation processes. We also treat particle escape from the system. We examine the steady, (possibly) oscillatory, and unstable solutions that arise for various choices of parameters. We examine instabilities related to pair production and trapping as proposed by Henri and Pelletier [1] and consider the formation of pair jets.

References: [1] Henri G. and Pelletier G. (1991) *Astrophys. J., 383*, L7.

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OBSERVATIONAL CONSTRAINTS ON BLACK HOLE ACCRETION DISKS. E. P. Liang, Department of Space Physics and Astronomy, Rice University, Houston TX 77215-1892, USA.

We review the empirical constraints on accretion disk models of stellar-mass black holes based on recent multiwavelength observational results. In addition to time-averaged emission spectra, the time evolutions of the intensity and spectrum provide critical infor-