

We have following results from the analysis of the observed data. No long period variables less than 300 days have been detected SiO masers in this study : no evidence is found that the dust grains in the outer envelope had an influence on the SiO maser line intensity ; the time variation of the intensity of the maser lines are not consistent with star do not play an important role for the pumping of the SiO maser lines.

It is found that the collision works more efficiently than the radiation for the inversion in excited vibrational states. However in an expanding envelope model we could not get the strong line intensity as observed one because the population inversion is possible only in a small restricted region. For the enough population inversion to get the observed maser intensity, the number density of SiO and hydrogen molecules should be up to about $2 \times 10^5 \text{ cm}^{-3}$ and $1 \times 10^9 \text{ cm}^{-3}$ respectively, and the inversion should be occurred in the region of no less than $1 \times 10^{14} \text{ cm}$

Spectral Evolution of Asymptotic Giant Branch Star

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The space and ground based infrared spectra of asymptotic giant branch stars are modeled and arranged in order of their evolutionary status with their theoretical model parameters. The possibility of the superwinds at later stages of AGB which may affect the overall energy distribution has been tested. Planetary nebulae often show two, and sometimes three, shell like structures around them. These may be due to abrupt changes in the mass loss rate (i.e., superwinds) back when the star was a dusty AGB star. Miras, carbon stars, and OH/IR stars have a close link in their evolution in many aspects, i.e., the chemical composition, the optical depths, and the mass loss rates. The evolutionary tracks for the three classes of AGB stars on infrared two-color diagrams have been made from model calculations and IRAS data

Monte Carlo Simulation of Comptonization in a Spherical Shell Geometry.*

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We present the calculation of X-ray spectra produced through Compton scattering of soft X-rays by hot electrons in the spherical shell geometry, using fully relativistic Monte Carlo simulation. With this model, we show that power-law component, which has been observed in the low luminosity state of low-mass X-ray binaries (LMXBs), is explained physically. From a spectral analysis, we find that spectral hardness is mainly due to the relative contribution of scattered component. In addition, we see that a Wien spectral features are appear when the plasma is optically thick, especially in the high energy range $E \geq 100 \text{ keV}$. We suggest that the escaping probability after a number of scattering approaches an asymptotic from

depending on the geometry of the scattering medium rather than on the initial photon spectrum.

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Local and Global Oscillations in Radiation-Dominated Accretion Flows

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Many high luminosity low mass X-ray binaries exhibit Quasi-Periodic Oscillatory luminosity change. Three different behaviors of QPO found so far are classified as Horizontal Branch (HB), Normal Branch (NB), and Flaring Branch (FB). Beat frequency model is generally believe to provide the decent explanations for HB. However, there is no single universally accepted model for NB and FB. Only Lamb, Miller, and Fortner's radiation hydrodynamic model based on the numerical simulation has shown some hopes toward understanding these objects.

In this work, we linearized the time-dependent radiation hydrodynamic equations and sought for the instabilities of the flow by using symbolic manipulation programs and numerical multiple shooting technique. Even after including general relativistic effects, the flow is stable to spherically symmetric perturbation, mainly due to the advection. But we found non-radial global modes have more interesting properties. The feedback between the production of radiation and the flow of gas controlled by the outcoming radiation generates mostly damped global modes, each of which is associated with a characteristic oscillation about the steady configuration. Under the conditions typical of low-mass X-ray binaries, some weakly damped modes exist and would be observable. These modes, especially when the luminosity of the system is close to the Eddington critical value, show some desirable properties QPO in these objects.

CCD Photometry of an Open Cluster NGC 7039

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A BVRI CCD-Photometry of the open cluster NGC7039 using data taken by 72 inch telescope at Dominion Astrophysical Observatory is presented. As the limiting magnitude of the CCD data is lower than that of photographic or photoelectric data, we were able to drive more accurate estimates of the distance modulus and age of the cluster. Our best estimate is $(m-M)_0 = 10.3$ (i.e. 1150 pc) which is larger than Schoneigh's estimate of 700pc. When