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SPECTROSCOPIC STUDY OF THE BE STAR 88 HER

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Since its discovery as a variable star, 88 Her has undergone three photometric long-term variation cycles with transitions between Be-Shell and normal B phases. From the spectroscopic analysis of fifteen high resolution spectra obtained by the IUE satellite between 1981 and 1992, we were able to set parameters such as optical depths and location of line forming regions. We also found that the periodic radial velocity variations of UV Fe II lines agree with the orbital period (86.7 days). The residual intensity variations of Fe II lines have a cycle of 1560 days.An analysis of Mg II lines allowed us to measure for the first time the radial velocities of both stars of the binary system. Our aim is to ralate the properties of a circumstellar envelope to the variability phenomena observed in Be stars, in order to understand the mechanisms which cause them.

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SPECTRAL ENERGY DISTRIBUTIONS OF TAURUS CLASS I OBJECTS

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In this contribution we present the analysis of the SEDs corresponding to three of the Taurus protostars (IRAS 04248+2612, IRAS 04295+2251 and IRAS 04365+2535). We compile from the literature the Spectral Energy Distributions (SEDs) of these embedded Class I objects. We use the radiative transfer code of Whitney et al. (2003) to model the SEDs. This code computes models for combinations of several physical and geometrical parameters such as: the accretion rate (M) and the centrifugal radius (R_c), in the first case, and the inclination angle (i) and cavity opening angle (θ), in the second. In our analysis we varied these parameters and fixed other parameters of the star + disk/envelope system. In this manner, we constructed a grid of models that were used to choose an initial set of parameters for each of the analyzed protostars. We then refined this initial solution by constructing a new grid around this set of values. We proceeded in this way until we obtained a synthetic SED that reproduced the observed data. In General our initial results for the three objects presented in this contribution agree the ones obtained by other authors. Our goal is to refine these initial solutions to achieve a better fit to the observed data and to perform a similar analysis for the rest of the Taurus Class I sources (12 in total). The results for the complete set of Taurus protostars should allow us to begin to investigate statistical tendencies among physical and geometric parameters and better characterize the properties of these extremely young objects.

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X-RAY AND GAMMA-RAY RADIATION OF COLD NEUTRON STARS DUE TO NEUTRAL INTERSTELLAR GAS ACCRETION

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Effects of neutral gas (hydrogen and helium) accretion onto a cold (surface temperature about 0.3×10^5 K) neutron star are studied. Capture of charged particles from interstellar medium is suppressed because of electro-magnetic wave of neutron star magneto-dipolar radiation and ejected plasma with freezing-in magnetic field pressure. But the wave has no effect on neutral gas. Neutral gas is captured by gravity into neutron star magnetosphere, then it is ionized by surface thermal emission and then accelerated by electro-magnetic field of neutron star magnetosphere. Energy of accelerated particles transforms into gamma-ray emission and thermal energy of polar caps radiating in X-ray. It was calculated that neutron star with magnetic field 10^{12} G and rotation period P=1 sec radiates most efficiently when it has surface temperature 0.3×10^5 K (accretion of hydrogen) and 0.45×10^4 K (accretion of helium). When concentration of interstellar gas is $1\,\mathrm{cm}^{-3}$, temperature of polar caps appears to be about 1.5×10^6 K and their X-ray radiation is about $2 \times 10^{29}\,\mathrm{ergs\,s}^{-1}$. Such high level of radiation cannot be provided by retuning positron flux. Gamma radiation of neutron star with these parameters due

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to accretion is about $0.2 \times 10^{29}\,\mathrm{erg\,s^{-1}}$ that is small in compare with radiation of primary electron beam $4 \times 10^{29}\,\mathrm{erg\,s^{-1}}$. The example of such source can be radio and X-ray pulsar J0826+2637. This work was supported by RFBR (project code 04-02-17590).

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ON THE STABILITY OF THE LONG-TERM VARIABILITY OF THE DOUBLE PERIODIC VARIABLES

R. E. Mennickent,[1] P. Assmann,[1] and B. Sabogal[1]

We have analyzed times of maxima and minima in the long-term light curves of the recently discovered double periodic variables (DPVs, Mennickent et al. 2003, A&A, 399, L47) in order to enlighten the nature of their photometric variability. Whereas it seems well established that the short-term variability is strictly periodic and seems to be well explained as ellipsoidal variations in a close binary system, we find the long-term variability non strictly periodic, with an hitherto unexplained origin.

We have examined OGLE and MACHO light curves of DPVs spanning a time range of 11 years. We measured times for maxima and minima, using the centers of polynomial fits to the peaks. Poorly-resolved peaks were rejected from our analysis. The method was successful for all stars except for the eclipsing systems, where the crowding of the photometric points avoided to find accurate timings. In order to increase the statistical significance of our results, and using the observation that the long-term variability is well represented by a sinusoid (M03), we considered maxima and minima altogether in our analysis. We considered the nth observed peak HJDn and calculated the period P2, by fitting the data with the function HJDn = HJD0 + n(P2/2) . In order to test the stability of the period we constructed O-C diagrams. We find that the systems can be grouped in: G1-type, those systems with brief but significant excursions of timings around the predicted value (7 cases), G2-type, those with short-lived tendencies of increasing or decreasing period (9 cases), G3-type, those with a global pattern of decreasing or increasing period (7 cases) and G4-type, those with random distribution of timings around the predicted value (7 cases).

In a forthcoming paper we will provide an atlas for the long-term variability of double periodic variables.

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MODELLING AND SIMULATION OF ASTRONOMICAL PHENOMENA WITH FEEDBACK USING SYSTEM DYNAMICS

O. J. Katime[1] and C. J. Barrrios-Hernández[2]

The hypothesis of implementing system dynamics as a methodological tool for the construction of mathematical models of astronomical phenomena that show feedback is proposed. These processes are described as dynamic systems because feedback loops are present in the influence relationships between the variables of the system. The feedback loops or feedback refers to the situation where variable X affects variable Y, and Y in turn affects X, producing a series of causes and effects. The interaction $X - Y$ cannot be studied independently, only the study of both interactions as a whole will lead us to the correct results. Modelling and simulation with system dynamics can be summarized as follows: Analyze the theory and/or observations of the problem, establish the influence relationships to find the feedback and verify the dynamic nature of the system, translate the influence relationships into mathematical relationships and obtain its numerical solution under different simulation conditions. The step from influence relationships to differential equations is facilitated through a series of representations based on the correlation: *state variable-rate*, where the state variable expresses the evolution of the system and the rate expresses the change of the state variable. Three cases where this methodology is used were shown; in the Proton Proton Chain case the model is completely developed and the results are in accordance with the theory and observations. In the cases of the CNO cycle and the galactic evolution the authors are developing these models to verify the hypothesis aforementioned.

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