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ABSTRACTS OF CONTRIBUTED PAPERS

ANOMALOUS GRAVITY DARKENING AND MASS LOSS IN SEMI-DETACHED CLOSE BINARY SYSTEMS

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From a quantitative analysis of the observed photometric ellipticity effect, values of the exponent of gravity darkening can be empirically deduced for the distorted components of close binary systems (Kitamura & Nakamura 1988, Ap&SS, 145, 117; Kitamura & Nakamura 1989, Publ.Natl.Astron.Obs. Japan, 1, 43; Kitamura 1990, in Active Close Binaries (NATO ASI), 69). These researches reveal that the empirical gravity darkening exponents determined for the main sequence components are generally consistent with existing theories of radiative and convective stellar atmospheres (Kitamura & Nakamura 1986, Ann. Tokyo Astron. Obs., 2nd Ser., 21, 311; Kitamura & Nakamura 1989). On the other hand, the empirically deduced gravity darkening is significantly greater than unity ($2.25 < \alpha_{obs} < 9.73$) for Roche-lobe filling secondary components of semi-detached systems.

This is interpreted by the enthalpy transport associated with the mass-outflow from the secondary filling the Roche-lobe. Quasi-radial flow in the subadiabatic stellar envelope from the deep interior is the cause of darkening. The speed of the flow, however, is essentially given by the condition of the subsonic-supersonic transition through the region in the neighborhood of the L_1 – Lagrangian point. The consequence of the mass-outflow is the formation of star spots at low gravity regions on the front and back sides of the secondary towards the primary. These star spots show photospheric depressions caused by lower opacities, like the Wilson depression in sunspots. The anomalous gravity darkening can be considered as being a manifestation of the internal structure of the secondary of a semi-detached binary, measuring the subadiabaticity in the interior through which the flow has traversed. Stars showing strong and less strong gravity darkening are stars of relatively high and low temperatures having radiative and convective envelopes, respectively. The mass-loss rate, which accounts for anomalous gravity darkening, is estimated to be about $10^{-6}\ M_\odot\ \mathrm{y}^{-1}$ (Unno, Kiguchi, & Kitamura 1994, Publ. Astron. Soc. Japan, 46, 613).

R ARAE IN THE VISUAL REGION OF THE SPECTRUM

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Echelle spectrograms of the eclipsing binary R Arae were secured at the CTIO and at the CASLEO, covering the spectral regions λλ5500–7000 Åand λλ4300–7300 Åwith spectral resolutions of 27 000 and 15 000, respectively.

The present material makes it possible to understand the meaning of the measurements made on the photographic region on the early 40 Å mm^{-1} Córdoba spectrograms (Sahade 1952, ApJ, 116, 27), and permits to propose a model of the gaseous structure in the system.

Emission intensity variations at different times are observed in Hα, and they may correspond to the variations in the *IUE* fluxes found by McCluskey & Kondo (1983, ApJ, 266, 755) and by Kondo, McCluskey, & Parsons (1985, ApJ, 295, 580).