B T1 A new concept in stellar astrophysics based on internal rotation: Effective mass and its place in the A- and B-star Puzzle

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Putting their chemically peculairity aside, Ap and Am stars have many common properties. The discrmiminating property between them can be rotation of their internal regions beneath their slowly rotating surface. In the PV Cas binary system whose light curve shows Ap like variation, the agreement between the theoretical and observed apsidal advance rate is satisfied only with the differentially rotating models of the component stars in which rapid rotation is extended to the surface. Thus, it seems that there is a steep rotation rate gradient near the surface of the Ap stars. There are two other studies, which support this confirmation: 1) The zero-age-main sequence of models with such a gradient is almost parellel to and takes in the cool side of that of non-rotating models. A similar difference is found between the effective temperatures of the blue sides of magnetic Ap stars and *normal* stars (Hubrig et al. 2000). 2) The other supporting result comes from the study of Arlt et al. (2003), in which it is stated that the time-scale of decay of differential rotation in radiative envelopes of Cp stars as compared to the life-time of A-type stars.

The conclusion we reach in the analysis of PV Cas system leads us to introduce the *effective mass* as a new conceptual tool in stellar astrophysics: $M_{\rm eff} = M_\star(1-\bar{\Lambda})^2$, where $M_\star$ and $\bar{\Lambda}$ are mass of the star and average of ratio of centrifugal to the gravitational acceleration throughout the model, respectively. We find that the *effective mass* of PV Cas A whose real mass is $2.81\pm0.05 M_\odot$ is $2.6 M_\odot$ for both of the solar and the metal rich compositions. On the other hand, *effective mass* of an Am star is equal or very close to its real mass.