Multi-technique Study of the Dynamical Evolution of Be Star ω CMa

M.R. Ghoreyshi[1]*, A.C. Carciofi[1], D.M. Faes[1]

[1]Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, Rua do Matão 1226, Cidade Universitária, São Paulo, SP 05508-900, Brazil

Cyclic photometric behavior is a characteristic which can be seen in the light curve of many classical Be stars. ω CMa ($m_v = 3.6$ to 4.2) is one of them, showing an alternating 2.5 $\sim$ 4.0 years of outburst (during which a new disk forms) and 4.5 $\sim$ 6.5 years of quiescence (as the disk dissipates).

Using the viscous decretion disk (VDD) model (Lee et al. 1991), which has become the current paradigm to explain the disks around Be stars (Rivinius et al. 2013), Carciofi et al. (2012) modeled the dissipation phase of ω CMa's light curve from 2003 to 2008, and derived for the first time the viscosity parameter, α, of a Be star disk.

In the work of Carciofi et al. (2012) α was determined only during the phase of disk dissipation. To advance upon the work of Carciofi et al. we modeled the full light curve of ω CMa since 1982 to 2015 including several outburst and quiescence phases. To find a working model we varied the value of α, the disk-feeding rate and the duration of the successive outburst and quiescent phases.

The main result of this work is that it demonstrates, for the first time, the VDD model is capable of reproducing the disk variability both at outburst and quiescent phases. Another quite intriguing result is that different values of α, in the range of 0.1 $\sim$ 1.0, were required at different phases (Fig. 1, top).

Moreover, for the first time we calculate the history of average temperature of a Be disk (Fig. 1, bottom).

In this contribution we build upon our previous work, and extend the modelling of other observables such as polarimetry and line emission. The importance of looking at these observables, in addition to photometry, is that each one probes a different physical process (e.g., scattering vs. bound-bound recombination) and different disk regions.

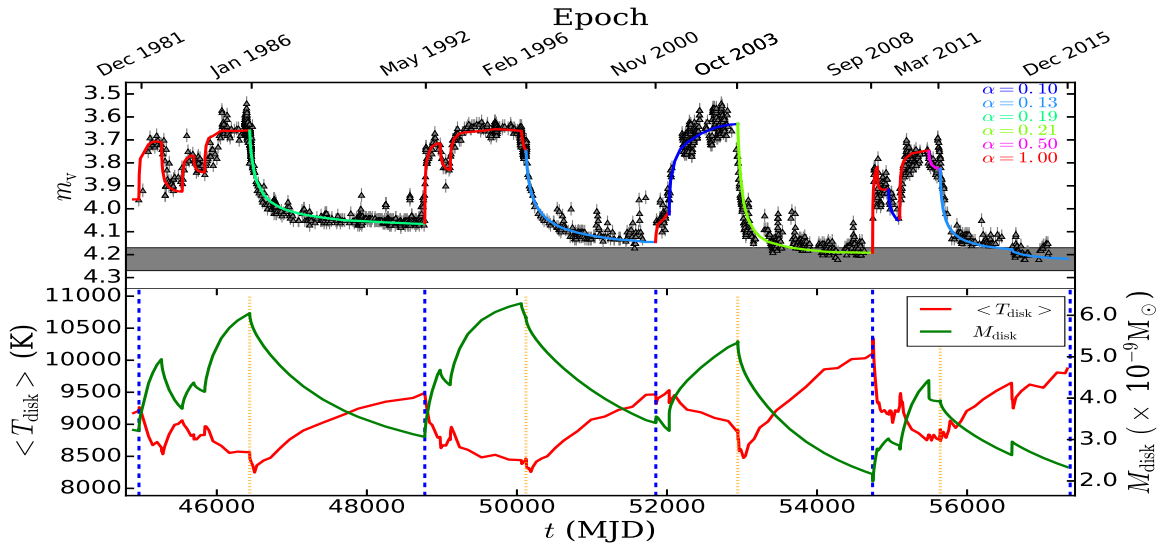

Figure 1: *Top*: Fit model of the full light curve of ω CMa. Each coloured solid line represent an individual value for α parameter, as indicated. *Bottom*: Evolution of average tempertaure (red line) and total mass (green line) of ω CMa's disk.

*E-mail: mohammad@usp.br