

THE BE STAR ACHERNAR AND ITS CIRCUMSTELLAR ENVIRONMENT

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The circumstellar disks ejected by many rapidly rotating B stars (so-called Be stars) offer the rare opportunity to study the structure and dynamics of gaseous disks at high spectral as well as angular resolution. Recent works, largely based on optical long baseline interferometry, showed that Achernar (α Eridani, HD10144), the brightest ($V = 0.46$ mag) and nearest (distance of 42.75 pc) Be star is a key target to a deeper understanding of the physics of Be stars, because it displays most of features that characterizes the Be phenomenon: (i) Strong rotational rate; (ii) Residual disk; (iii) Episodic mass ejections; (iv) Quasi-cyclic disk formation/dissipation; (v) Polar wind; and (vi) Binarity.

Our work aims to describe the recent history of Achernar. For that, we employ a large set of observational data, such as AMBER spectro-interferometry and PIONIER interferometry (VLTI/ESO), broadband optical polarimetry (OPD/LNA) and multi-instruments spectroscopy. The radiative transfer code HDUST (Carciofi & Bjorkman, 2008) is used to analyze and interpret the observational dataset, aiming at obtaining a realistic physical model of the circumstellar environment (disk and/or wind) in interaction with the stellar photosphere. In particular, here we describe a preliminary inconsistency between Achernar's 2009 AMBER and 2011 PIONIER interferometric data that can be solved by the existence of a residual disk at the time of the first observations.

Our recent analysis of Achernar's visibilities data from PIONIER (Domiciano de Souza et al., in prep.) indicates the stellar equatorial radius ($R_{eq} = 9.16 \pm 0.1 R_{\odot}$) is smaller than the one obtained from AMBER differential phases (Domiciano de Souza et al., 2012; $R_{eq} = 11.6 \pm 0.3 R_{\odot}$). The origin of this discrepancy can be associated with the presence of a residual disk around the star.

This must be a tenuous disk that, due to the high opacities involved in atomic Hydrogen lines, may change the target's photocenter in high spectral resolution observations (i.e., phases) with neg-

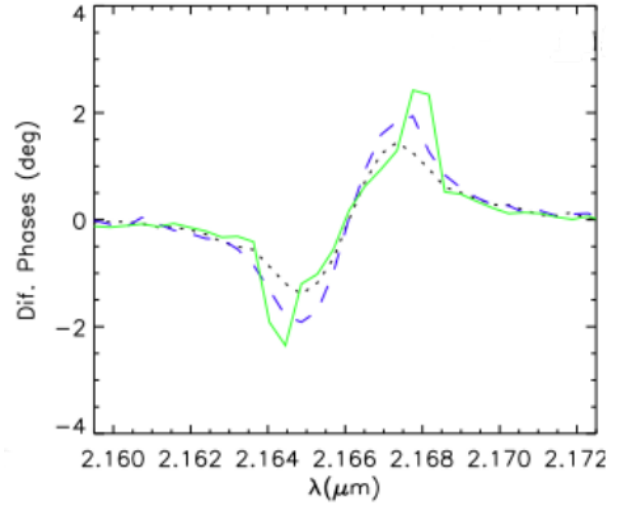


Fig. 1. Differential phases signal for Achernar Br γ line based on different models: (i) photospheric properties from AMBER data (Domiciano de Souza et al., 2012 - dashed line); (ii) photospheric properties from PIONIER data (Domiciano de Souza et al., in prep. - dotted line); (iii) the latter photosphere including a residual disk (solid line). The presence of a residual disk can change the phase signal and even amplify the pure photospheric one.

ligible effects in other observables (as polarimetry, spectroscopy or low spectral resolution visibilities).

As shown by Carciofi et al. (2008), the presence of a circumstellar disk plays a significant role in the interpretation of photospheric parameters obtained with the interferometric data. Our goal now is to make the characterization of this residual disk at the time of AMBER observations with photospheric parameters based on PIONIER data and compare it with the circumstellar disk at the active phase of 2003 and, after seven years of no positive detection, the present active phase (2013).

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