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VLTI/AMBER OBSERVATION OF HD113449

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Evolutionary tracks are of key importance for the understanding of star formation. Unfortunately, tracks published by various groups differ so that it is fundamental to test them observationally. In order to do this, we derived the masses of the two components of the Pre-Main Sequence (PMS) binary HD113449 by combining radial velocity (RV) measurements with AMBER data.

The most fundamental parameter of a star is its mass which determines almost everything about the birth, life and death. For PMS stars this parameter is pratically always derived by comparing the location of the star in the HR diagram with theoretically calculated evolutionary tracks. These have to be tested by measuring masses of a few young stars. This can be done by combining RV data with optical/IR interferometry measurements. In order to carry out this project we identified 15 suitable young binaries (Guenther et al. 2007). In here we presente the results for HD113349.

HD113449 is a young nearby (22.1 ± 0.6 pc, Hipparcos Catalogue) SB1 system. The primary is a G9V, and has an equivalent width of the LiI6708λ line of 160 mÅ. The secondary is an early M star. Using Harps we have solved the SB1 orbit, determining the orbital elements asini, e, T_{per}, ω and P. Using CRIRES we were able to detect the lines of the secondary in the spectra and from these, we derived the mass ratio between the two components, that is M_2/M_1=0.57 ± 0.05. The first AMBER observation of this object allowed us to give a first estimation of the inclination of the system i=$57 \pm 3°$, of the longitude of the ascending node Ω=$124 \pm 4°$ together with the flux ratio in the H and K band, respectively of 0.15 ± 0.02 and 0.17 ± 0.02.

Combining all these results we derived the masses of the two components that are: $M_1 = 1.05 \pm 0.13\ M_\odot$ and $M_2 = 0.60 \pm 0.07\ M_\odot$. There is a slight difference between these values and the one derived using three of the most often used set of PMS evolutionary tracks (Palla & Stalher 1999; Baraffe et al. 1998; Siess et al. 2000; Figure 1). Boden et al. (2005) found exactly the same difference for the components of HD98800B a young binary of rather similar properties. The explanation in this case was attribuited to low degree of metallicity. In the case of HD113449 this explanation is not possible as the metallicity is [Fe/H] = −0.03 (Paulson & Yelda, 2006). Our measurements will be improved by further observations, but since our results agree well with those of Boden et al. (2005), we conclude that there is in fact a slight difference between observations and tracks for PMS stars.

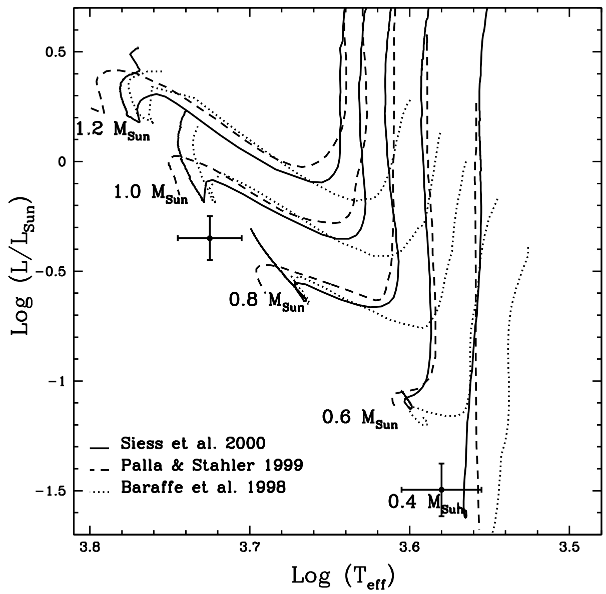

Fig. 1. HR diagram for the two components of HD 113449 together with three different sets of evolutionary tracks for PMS.

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