

DYNAMICAL MASSES OF NEARBY PRE-MAIN SEQUENCE BINARY SYSTEMS:

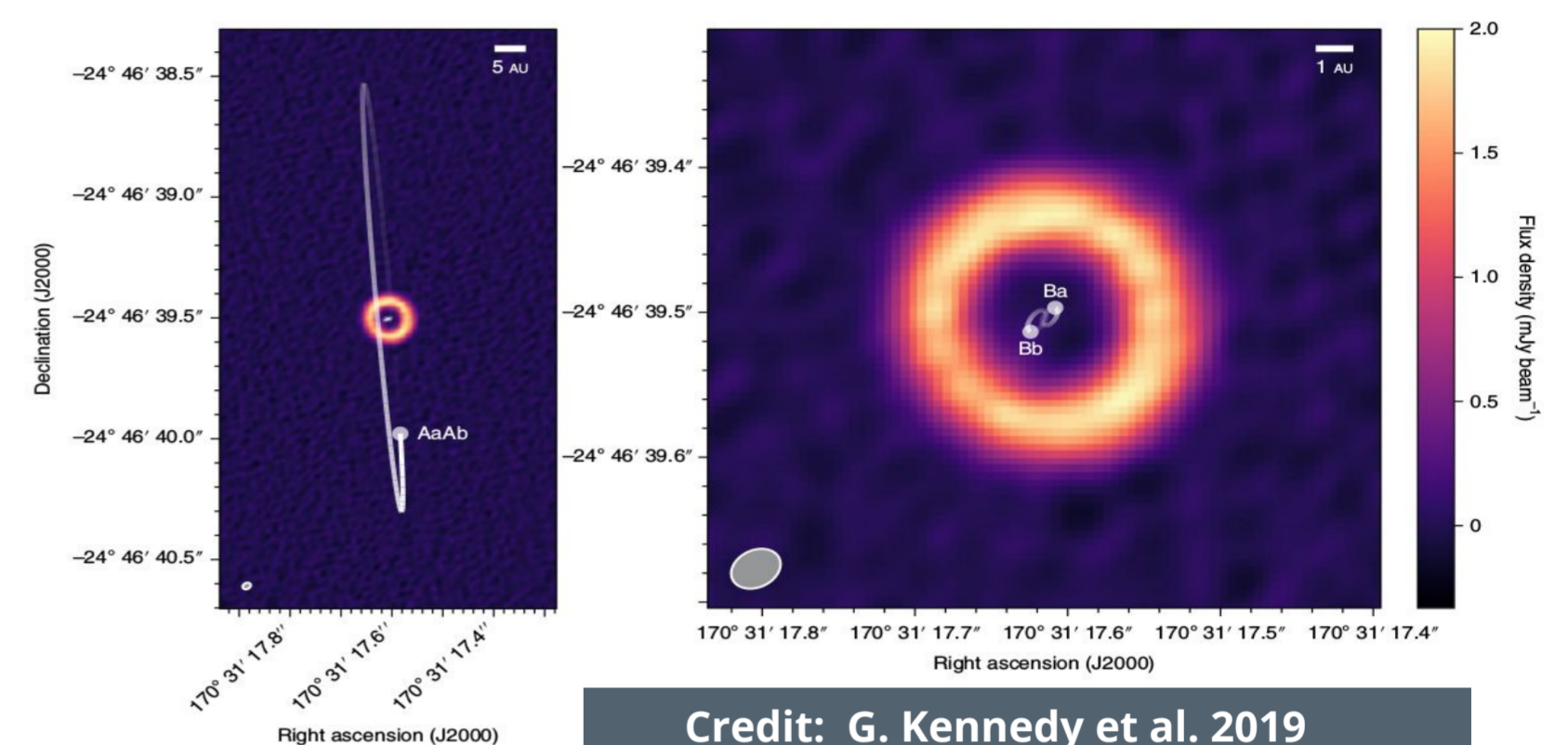
REFINING THE ORBIT OF HD 98800 B USING VLT/INTERFEROMETRY OBSERVATIONS

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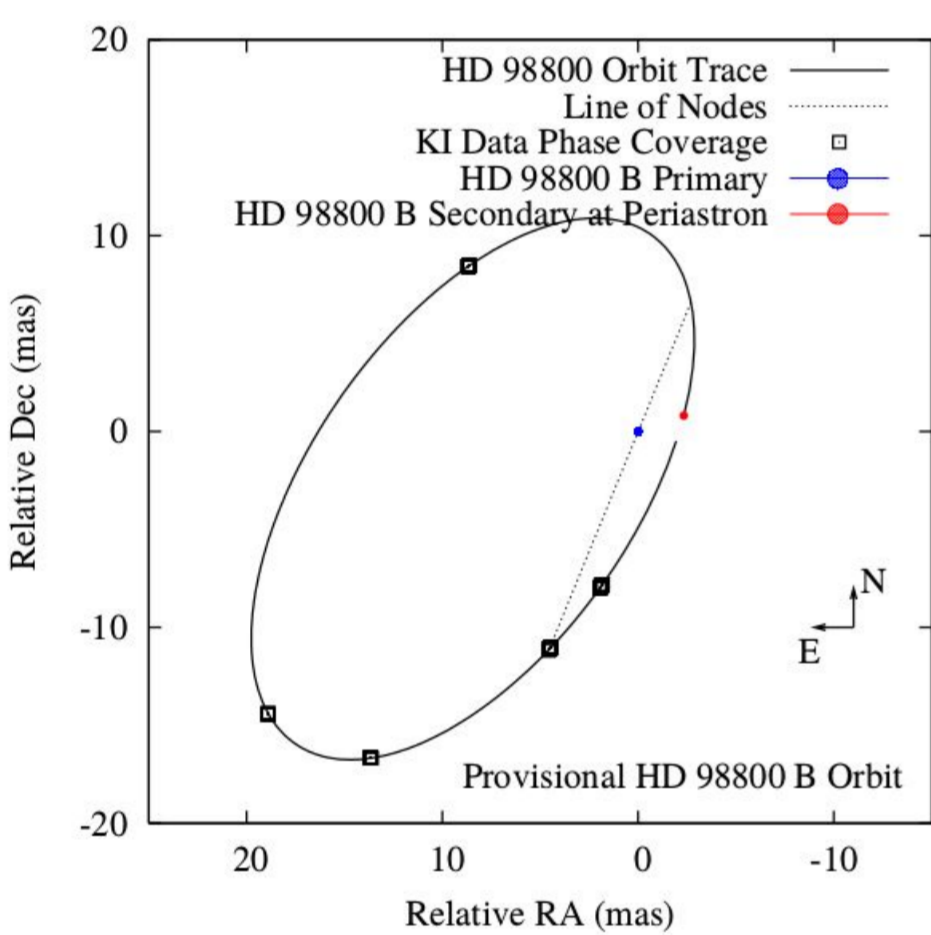
THE QUADRUPLE PRE-MAIN SEQUENCE SYSTEM HD 98800

HD 98800 is a young nearby (44.9 pc) quadruple system member of the ~10-Myr-old TW Hydrae association, composed of two spectroscopic binaries (SB) orbiting around each other (AaAb and BaBb). The BaBb component harbours a proto-planetary disk that has very recently been spatially resolved with ALMA (Kennedy et al. 2019 Nature Astronomy). The AB and BaBb components have orbital solutions in the literature, and the ALMA observations revealed that the disk is in a polar configuration with respect to the BaBb orbital plane.



Credit: G. Kennedy et al. 2019

LAST ORBITAL SOLUTION ON HD98800 B



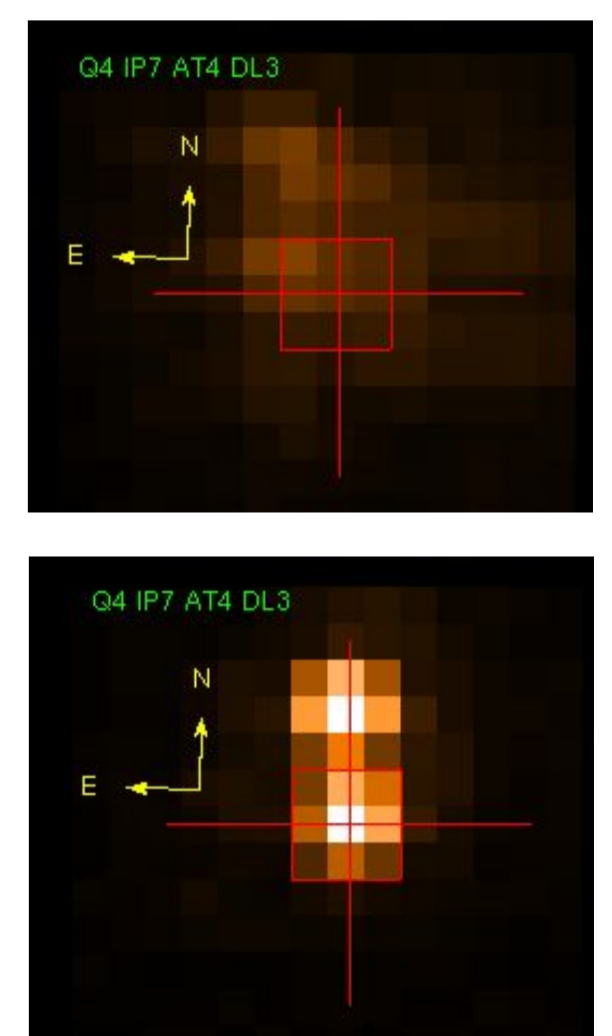
Credit: Boden et al. 2015, Uncertainties not included in the figure.

Preliminary orbit of the HD98800 B subsystem estimated by Boden et al. in 2005 (ApJ 635) using interferometric observations from the Keck Interferometer (KI) combined with astrometric measurements made by the Hubble Space Telescope Fine Guidance Sensors (FGS), and published radial velocity from Torres et al 1995 (ApJ 512).

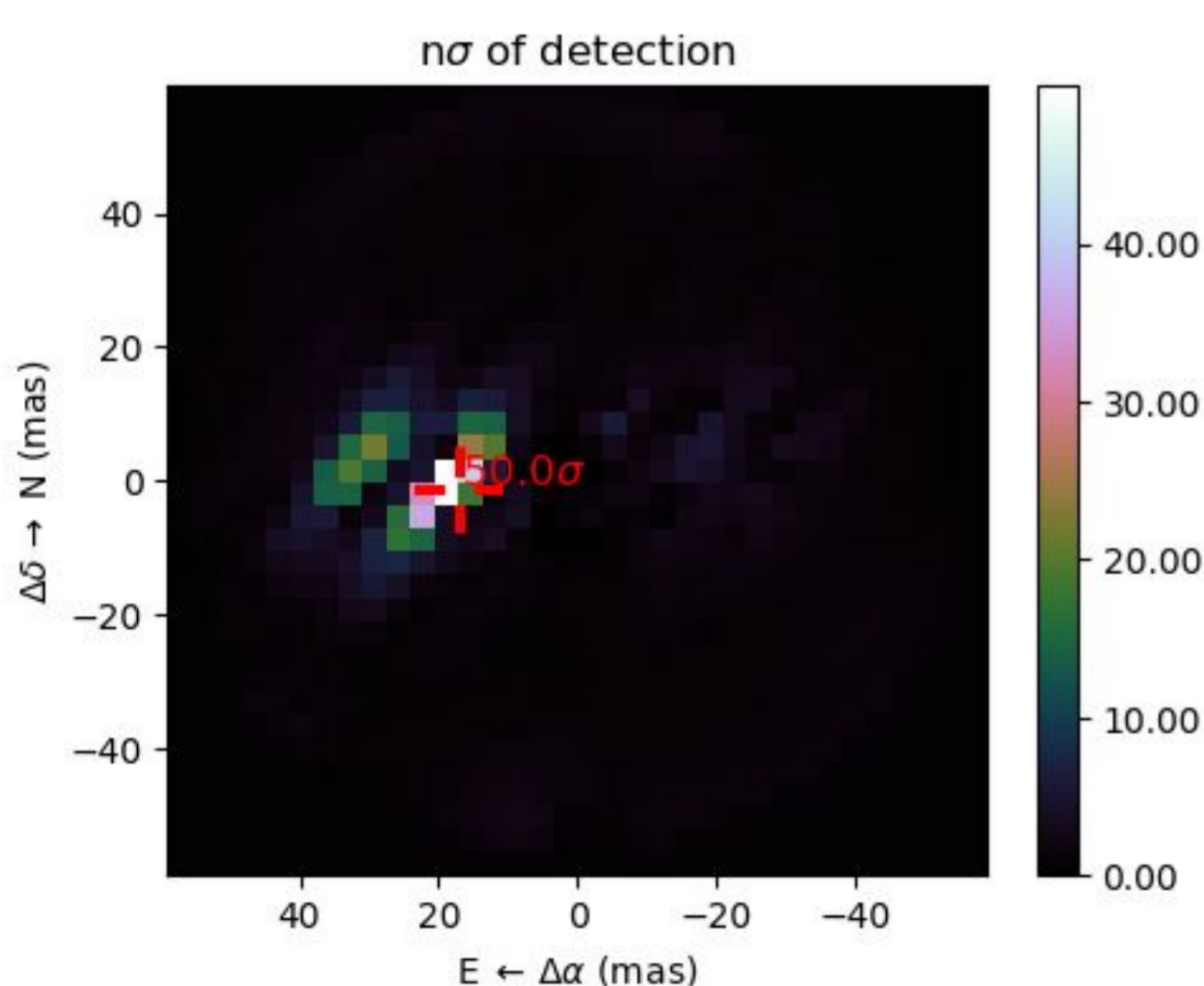
NEW AO MODULE FOR INTERFEROMETRY

The New Adaptive Optics Module for Interferometry, or NAOMI (Woillez et al. 2019, A&A submitted), have been installed on each of ESO's 1.8-metre Auxiliary Telescopes (ATs) which form part of the VLT/INTERFEROMETRY at Paranal Observatory.

We were awarded with time for the NAOMI science verification (SV) observations for the HD 98800 system. In the Figure, an Infrared Image Sensor (IRIS) capture with and without NAOMI correction in one of our observations (0.4" A-B angular separation) where the upper object correspond to BaBb subsystem.



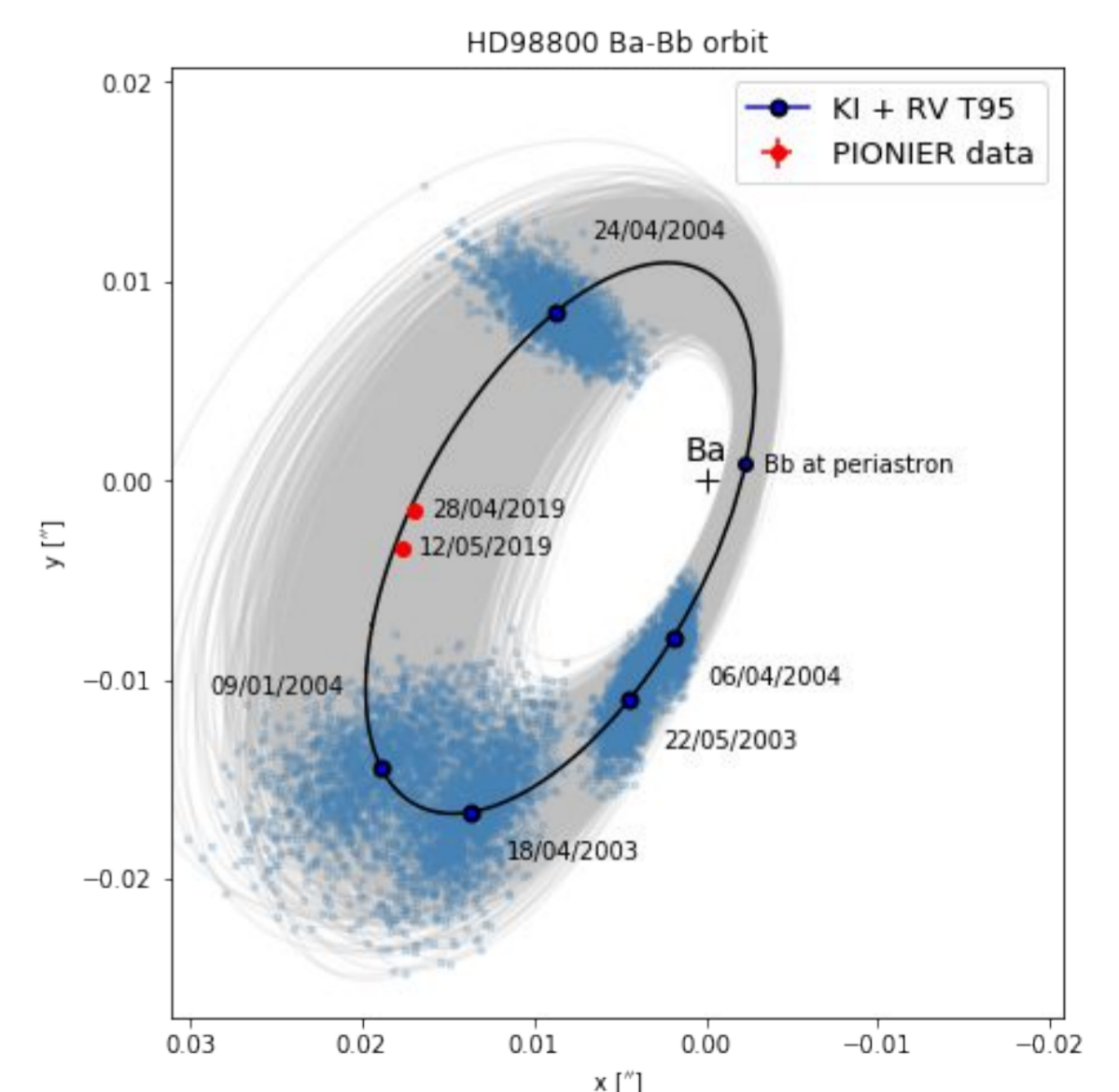
VLT/INTERFEROMETRY + NAOMI OBSERVATIONS



We use CANDID (Companion Analysis and Non-Detection in Interferometric Data, Gallene et al. 2015 A&A 579) in our SV observations of the HD 98800 B to obtain the astrometric positions and flux ratios.

Left: Detection of the Bb component using CANDID, the Ba being at the center of the image.

Right: Boden et al. orbital solution with the estimated range of allowed orbits propagating the uncertainties in the Boden orbital parameters. The red dots are the new astrometric position from our NAOMI SV observations.



FUTURE WORK AND REMARKS

- With the new astrometric positions combined with the radial velocity measurements and the Keck interferometric observations, we will be able to verify and refine the orbital parameters of the BaBb subsystem.
- We were awarded with PIONIER observation time for the AaAb subsystem for monthly measurements (Dec 2019 - Mar 2020). We will propose additional monthly observations to complete the orbital coverage.

Importantly, the AaAb pair will transit behind the disk in ~2026, presenting an unprecedented opportunity to characterise the disk structure along a ~10 au long chord, with the width of this chord set by the projected extent of the AaAb orbit.

ACKNOWLEDGEMENTS

S.Z-F., A.B. and J.O. acknowledge support from Iniciativa Científica Milenio via Núcleo Milenio de Formación Planetaria. S.Z-F acknowledges financial support from the European Southern Observatory via its studentship program and CONICYT via PFCHA/Doctorado Nacional/2018-21181044. A.B acknowledges support from Fondecyt (grant 1190748). J.O. acknowledges support from Fondecyt (grant 1180395).

