VLTI/AMBER aperture-synthesis imaging of θ¹ Orionis C: Tracing the young, massive high-eccentricity binary system through periastron passage

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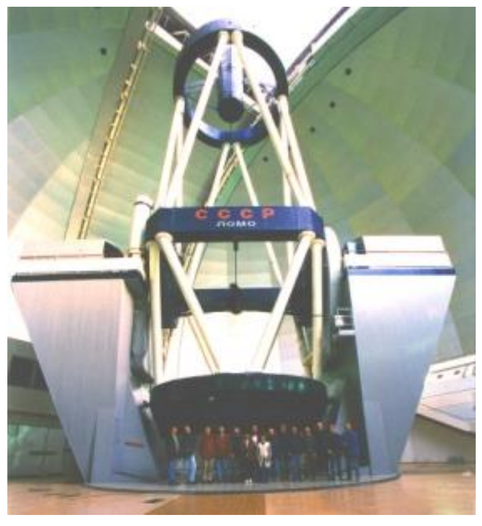
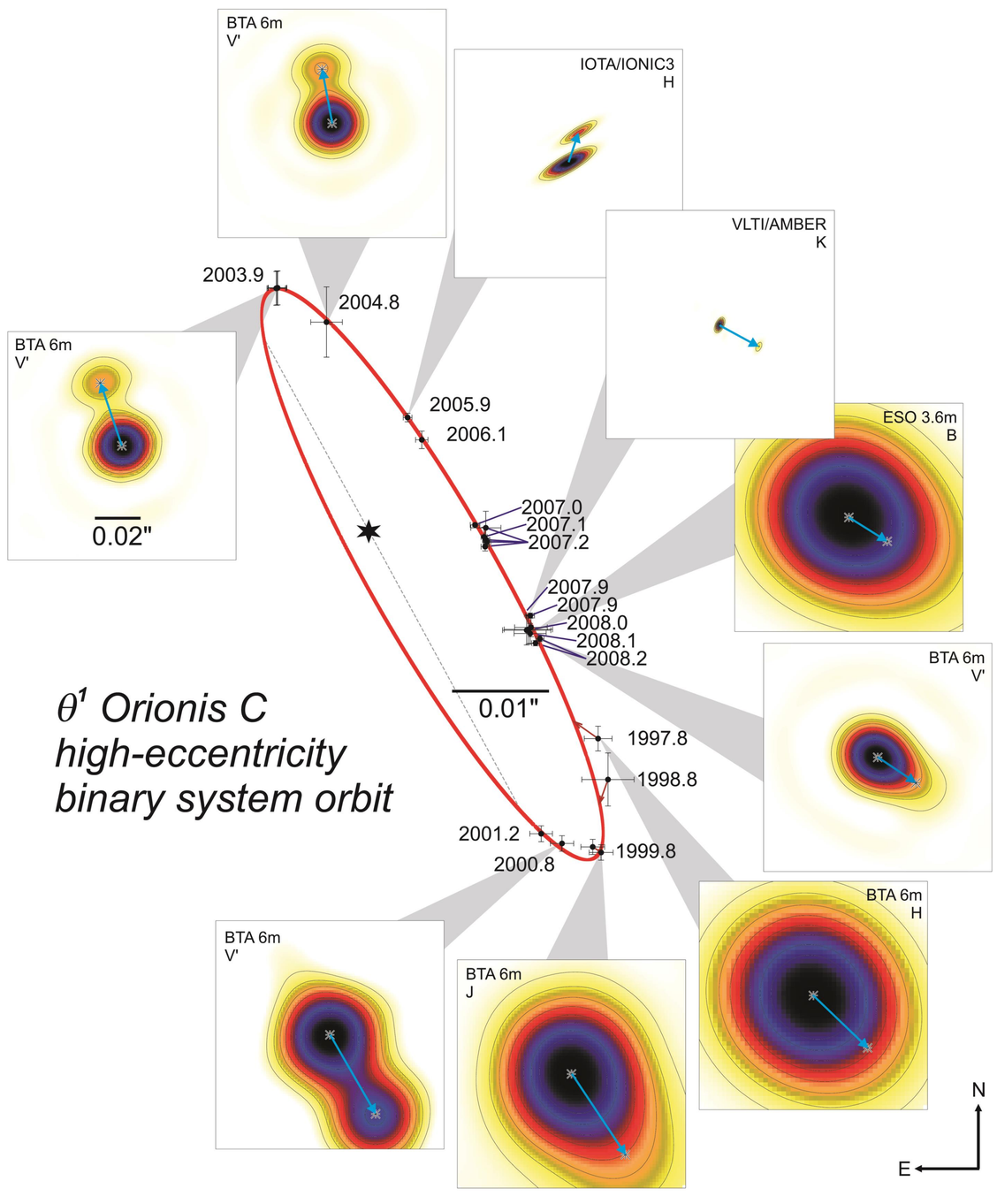


The nearby high-mass star θ¹ Ori C (O5–O7) is the brightest and most massive of the Trapezium OB stars at the core of the Orion Nebula Cluster, and it represents a perfect laboratory to determine the fundamental parameters of young hot stars. Since the discovery of θ¹ Ori C's companion by our group, we have traced its orbital motion with the aim of determining the orbit and dynamical mass. In addition to a characterization of the individual components, ultimately, this will yield new constraints for stellar evolution models in the high-mass regime. In 2007/2008, we observed θ¹ Ori C with VLTI/AMBER long-baseline interferometry (NIR H and K bands), as well as with bispectrum speckle interferometry (B and V band). Combining AMBER data taken with three different 3-telescope configurations, we reconstructed the first VLTI/AMBER aperture-synthesis image of θ¹ Ori C (separation ~ 19 mas; Fig. 14 right). The derived orbital elements imply a short-period (P ~ 11.3 yr) and high-eccentricity (e ~ 0.6) orbit. The observations are consistent with recently published radial velocity measurements, from which we can derive direct constraints on the mass ratio (M_1/M_2 = 0.22 ± 0.05). We derive the system mass (M_{system} = 44 ± 7 $M_\odot$) and the dynamical distance (d = 410 ± 20 pc), which is in good agreement with trigonometric parallax measurements obtained with radio interferometry (d = 414 ± 7 pc; Menten et al. 2007). (see Kraus et al., *A&A*, 497, 195 (2009))



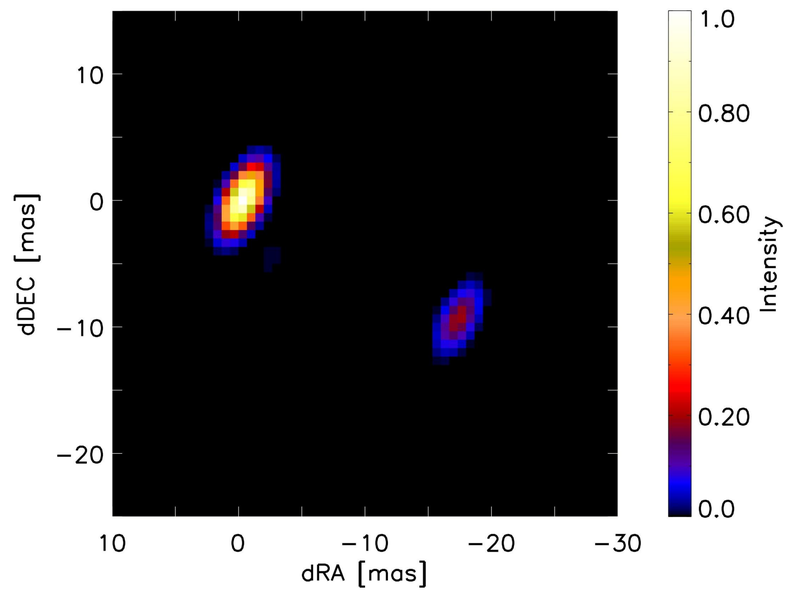


Figure 1 Left: Dynamical orbit of the young high-mass binary system θ¹ Ori C, as derived from our long-term interferometric monitoring campaign. Using bispectrum speckle interferometry, as well as IOTA and VLTI interferometry, our observations cover a wide position angle range of 350°. The insets show the interferometric images obtained at various epochs, where the highest angular resolution could be achieved with VLTI/AMBER aperture-synthesis imaging. Right: VLTI-AMBER aperture-synthesis image.