

On the Circumstellar Environment of HR 4796: Mid-infrared Imaging with Gemini North and South. R. S. Fisher¹, C. M. Telesco², and S. A. Knights¹, ¹Gemini Observatory, Northern Operations Center, 670 N. A'ohoku Place, Hilo, HI 96720, ²University of Florida, Dept. of Astronomy, 211 Bryant Space Science Center, P.O. Box 112055, Gainesville, FL, 32611-2055.

Introduction: It is a widely held belief that planets form in the circumstellar environment of young stars. Because of this, the discovery of extended structure around the nearby star HR 4796A [1][2] was of some importance as it provided a new laboratory for the study of circumstellar disk evolution and perhaps planet formation. In addition, its relatively close proximity (67 pc) and its well known age (~10 Myr) have helped make HR 4796 a new archetype in the arena of circumstellar disks.

In this work we present imaging data taken with T-ReCS on Gemini South and MICHELLE on Gemini North to address two specific questions: 1) Is there a significant brightness and/or temperature asymmetry between the NE and SW lobes? [3] and 2) Is there evidence for an exo-zodiacal ring near the central star? [4]

High-resolution Imaging with T-ReCS and MICHELLE: We imaged HR 4796 in the Qa (18.3 μm) and Qa & Qb (24.5 μm) filters between 2004 Feb. and 2005 Mar. from Gemini North and South respectively. In Figure 1 we show a T-ReCS image of the circumstellar ring with brightness color-coded. Contours highlight the lobes of dust emission on either side of the central star, seen here as the middle red spot. Lines denote asymmetries in the ring, the black line is toward the companion M-star. The 'kink' in the SW arm of the ring is also evident in lightly deconvolved Qb images. In this and in equivalent MICHELLE images

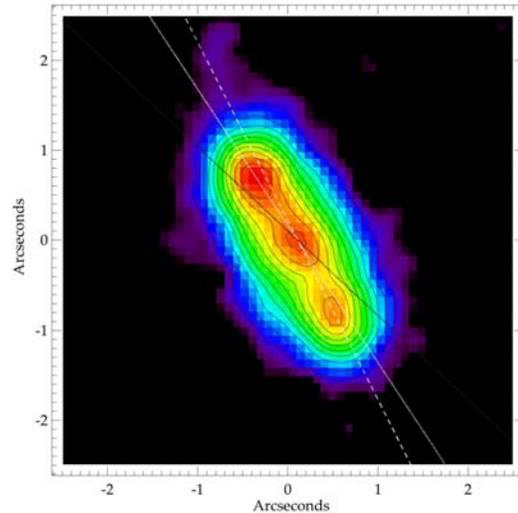


Figure 1: T-ReCS image of HR 4796 at 18.3 μm there is clearly a brightness difference between the NE and SW lobes. Also, the grains in the NE lobe are ~10 K warmer than those in the SW. As 'pericenter glow' is no longer a viable explanation, we offer alternative theories on the cause of the asymmetries.

We also carefully analyzed the data to look for evidence of an exo-zodiacal ring or cloud of unresolved emission around the star as has been suggested previously. [4] We find little evidence for any central dust emission at 18 μm and no hint at all for an unresolved dust component at 25 μm . Indeed, the morphology of the central region of our 18 μm data is consistent with photospheric emission from the central A-star, which seriously calls into question the existence of an exo-zodiacal cloud within a few AU of HR 4796 itself. In Figure 2 we show a representation of our 25 μm data and its corresponding PSF star. We believe that this 'profile analysis' illustrates that our observations are consistent with a non-detection of the central star at 25 μm . Similar analysis for our 18 μm data will be presented.

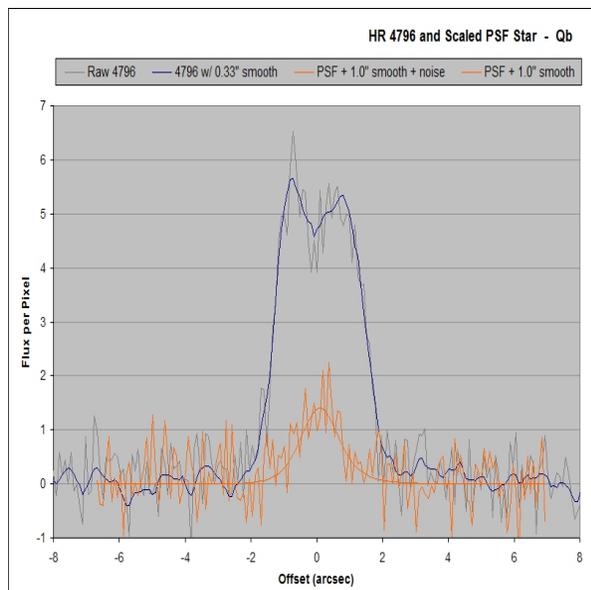


Figure 2: Profile Analysis of 25 μm Data

References: [1] Jayawardhana, R. et al. (1998) *ApJ*, 503, L79. [2] Koerner, D. W. et al. (1998) *ApJ*, 503, L83. [3] Telesco, C. M. et al. (2000) *ApJ*, 530, 329. [4] Wahhaj, Z. et al. (2005) *ApJ*, 618, 385.