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MID-IR EMISSION FROM THE NUCLEUS OF CENTAURUS A

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We present high spatial resolution mid-IR images of the nuclear region of Centaurus A. Images were obtained at 8.8μm, N-band (10.5μm), and 18.3μm using the mid-IR instrument T-ReCS on Gemini South, a progenitor to CanariCam on the Gran Telescopio Canarias (GTC).

Centaurus A (NGC 5128, hereafter Cen A) is a nearby elliptical galaxy and the prototypical Faranoff-Riley Class I source. However, despite intensive studies of the nuclear regions of Cen A, observations at UV and optical wavelengths have been especially hampered by the dust lane that bisects the galaxy and heavily obscures the nuclear regions. High spatial resolution mid-IR observations now available with 8m class telescopes such as Gemini (and soon the 10.4m GTC) offer an ideal way to study the obscured central region of galaxies like Cen A, having extinction 25-75 times lower than observations at optical wavelengths (Radomski et al. 2002, 2003; Packham et al. 2005).

Our observations show a bright unresolved mid-IR nucleus surrounded by low-level emission in the central region of Cen A. We find the bright central nucleus to be unresolved in the mid-IR at the level of the FWHM. Using multiple PSF measurements and their variation, we place an upper limit on the size of the mid-IR nucleus of 3.1 pc (0$''\!.$185) at 8.8μm and 3.4 pc (0$''\!.$205) at 18.3μm at the level of the FWHM. This is consistent with our clumpy tori models which predict the mid-IR emission from a torus in Cen A to be unresolved with a size of <0$''\!.$05. The primary source of the nuclear mid-IR emission is likely to be associated with this dusty torus and NLR emission with minimal contributions from starburst and synchrotron emission.

Extended mid-IR emission in Cen A (Figure 1), is generally coincident with Pa-α regions and most likely due to stellar activity. A ridge of mid-IR emission perpendicular to the radio axis and devoid of much Pa-α emission may be associated with a CO, H_2 outer ring/bar. Emission associated with Pa-α clumps A and B from Schreier et al. (1998) could be due to shock heating or possibly centrally heated dust in a NLR if anisotropic beaming of radiation along the radio axis is taken into account. A new mid-IR source RPL 1, is detected in the N-band along the radio axis at a distance of 18.4$''$ (PA=53°) and is possibly due to shock heating of material impacted by the jet or synchrotron emission. Overall our observations highlight the importance of mid-IR observations in understanding the fundamental aspects of AGN and provide a glimpse into the future of AGN research using CanariCam on the GTC.

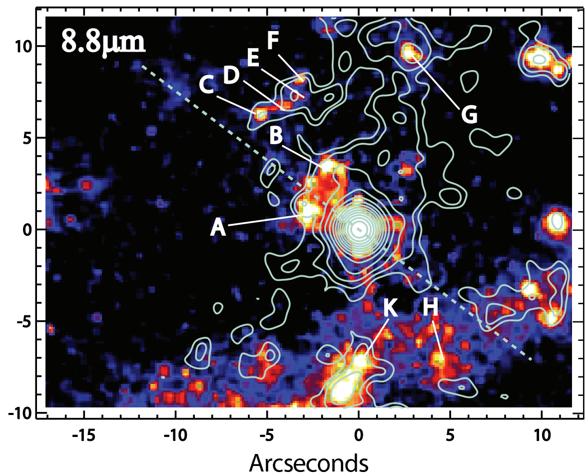

Fig. 1. Grey contours represent our heavily smoothed (10 pixel gaussian=0.89$''$) mid-IR data at 8.8μm. Pa-α emission from HST (Marconi et al. 2000) is in color. Letters represent the bright Pa-α emission regions detected by Schreier et al. (1998) while the dotted line represents the axis of the radio jet.

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