Spitzer Observations of Classical Cepheids

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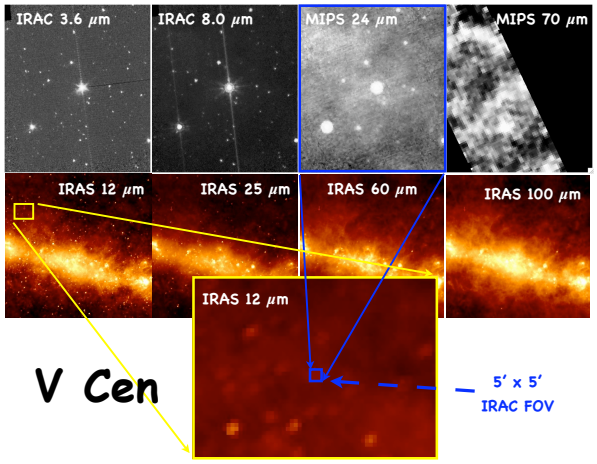
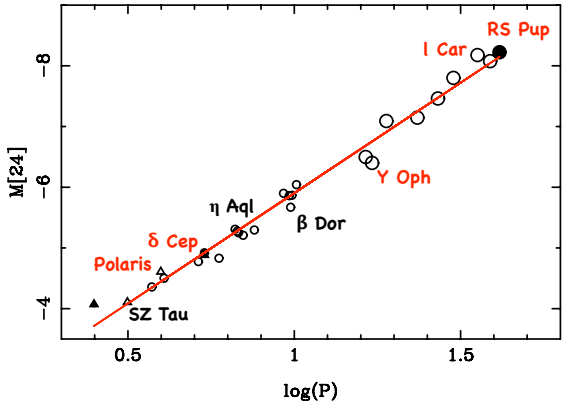
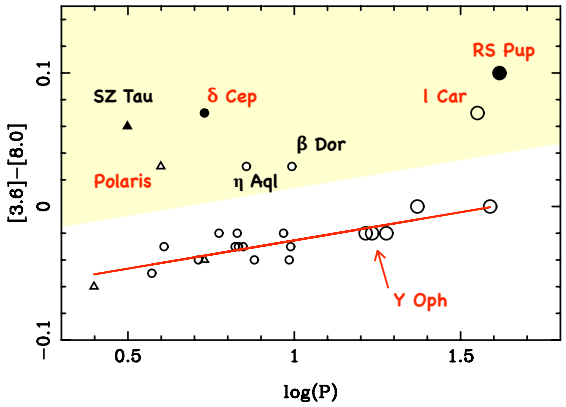
There remains a discrepancy between measured masses and masses from evolutionary and pulsation calculations for classical Cepheids. One possible explanation for this is mass loss. We have observed a sample of Cepheids with *Spitzer* IRAC and MIPS in order to search for an infrared excess indicative of mass loss. Our sample of 29 Pop I Cepheids includes a range of mass, luminosity, pulsation amplitude, and binary status, all of which could influence mass loss. Included in the list are Cepheids which were found to have infrared excesses in IRAS data (McAlary & Welch 1986) or evidences for a circumstellar shell in interferometric observations (Mérand et al. 2006, 2007; Kervella et al. 2006).

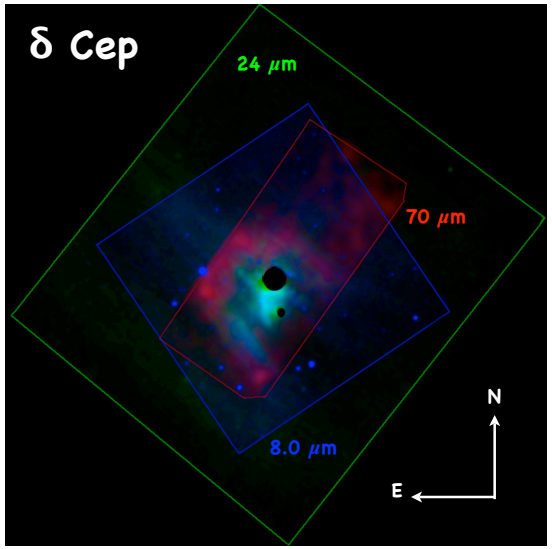
V Cen as seen by Spitzer, compared with the IRAS maps. The superior sensitivity and angular resolution of Spitzer allows the detection of fainter structures and better separation from diffuse galactic background emission not associated to the star.



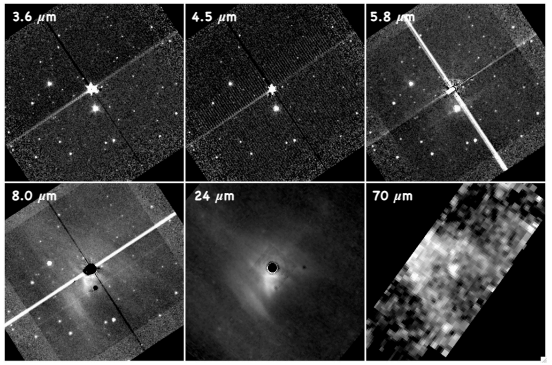


IRAC & MIPS Period-Luminosity and Period-color diagrams of the observed targets. Circles and triangles represent fundamental mode and first overtone pulsators respectively. Large symbols are for long period Cepheids. The three targets marked with filled symbols have local extended emission clearly associated with the star. The sources in red were found to have circumstellar emission by IRAS or by interferometric observations. The yellow region in the plot below indicates the area where IR excess larger than 0.04 mag is measured by the [3.6]-[8.0] IRAC color (sensitive to dust with temperature of ~ 500K).





We detected circumstellar emission around the class prototype, δ Cep. The emission appears asymmetric and layered. The 70 μm image (possibly thermal emission from cold dust) shows a semi-circular shell surrounding the 24 and 8 μm emission from hotter material. The IRAC field of view (blue square in the color composite above) is ~5'x5' in size.



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