SHARP IMAGES OF WR104

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ABSTRACT

Some carbon-rich Wolf-Rayet stars are permanent dust producers, as seen by their infrared excess. In famous targets like WR104, the dust is found in the form of a pinwheel nebula around the central source, providing an indirect evidence of binarity. We present here images obtained with the SPHERE instrument and last modelling efforts on AMBER data. First results shown that the pinwheel appears to be diluted by diffuse emission. Moreover, a minimum distance between the central binary and the dust-formation zone is necessary to reproduce both AMBER and SPHERE data.

SPHERE IMAGES

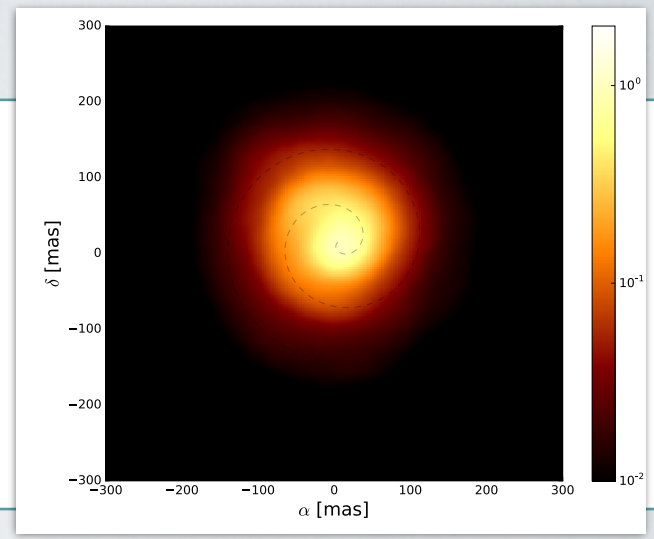


FIG.1 : Reduced images in continuum H (1.66µm) with the ESO instrument SPHERE :

The reduced SPHERE images exhibit the spiral structure around the central system well represented by an archimedian spiral seen approximately face-on (Fig.1). An over-resolved component can be seen in all filters and mostly at larger wavelength. The orientation and global size of the object are consistent with previous observations (Tuthill, Monnier et al. 2004). We deconvolved the H band images of WR104 using the PSF associed with the Lucy-Richardson (L-R) algorithm (Lucy 1974). We stopped the deconvolution at 60 iterations, as the deconvolved images do not show significant evolution and due to increases of noises after 80 iterations. We also performed a Wiener deconvolution (Orieux et al. 2010) to compare the results with the (L-R) algorithm (Fig.2).

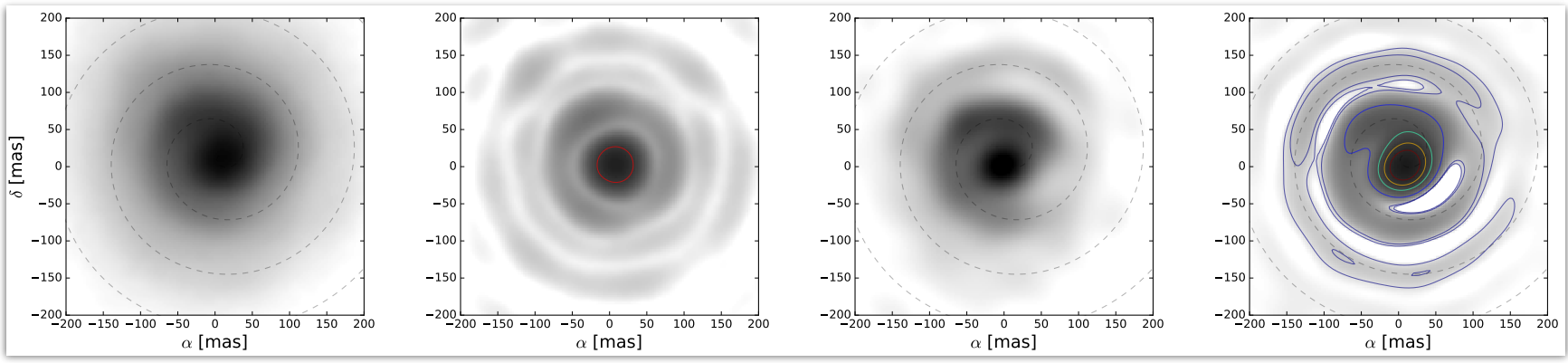


FIG.2 : Example of deconvolution at 1.66 µm; All images are in log scale. **Left:** Reduced data; **Middle/left:** Reduced PSF with FWHM of 50 mas/Rayleigh criterium (red circle); **Middle/right:** Lucy-Richardson deconvolution (60 iterations); **Right:** Wiener deconvolution, contour levels are .5, 1, 10, 30, 50, 70% of the peak. We also represent the best archimedian spiral fit.

HIGH RESOLUTION WITH INTERFEROMETRY

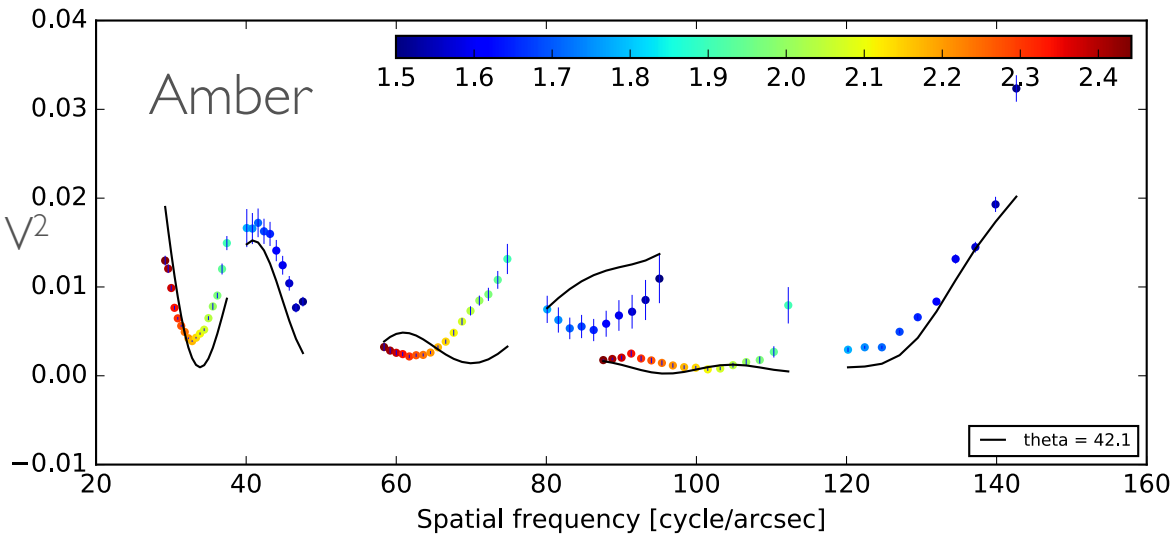


FIG.3 : Squared visibility and model fitting (work in progress).

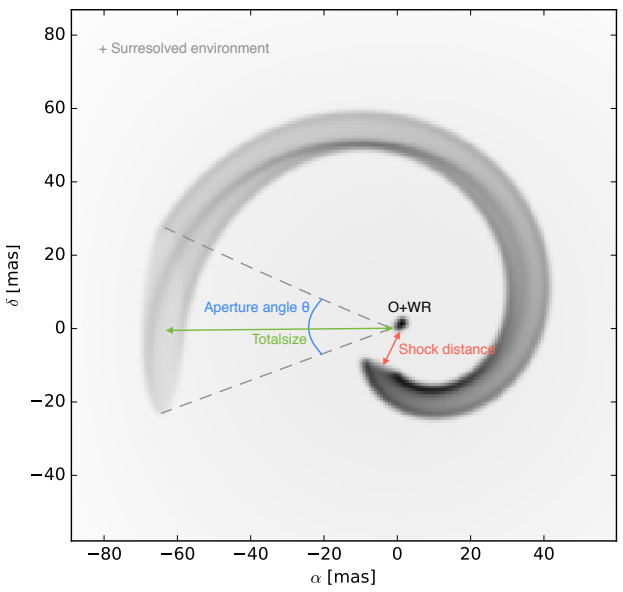


FIG.4 : Model used to fit AMBER data

We developed a toy model aiming at generating visibilities and images for a variety of parameters. We made a model formed by a pinwheel, an unresolved source (central binary WR+O) and a Gaussian envelope (diffuse emission). The pinwheel is formed by a succession of rings growing linearly and following Archimedian spiral pattern (Millour et al. 2008).

- Unresolved component between 13% (H band) and 1% (K band)
- Over-resolved environment
- Dust formation zone at 11-13mas
- Aperture angle of θ = 42°
- Sublimation temperature T_s = 1200K and law temperature with q = 0.35

PROSPECTIVES

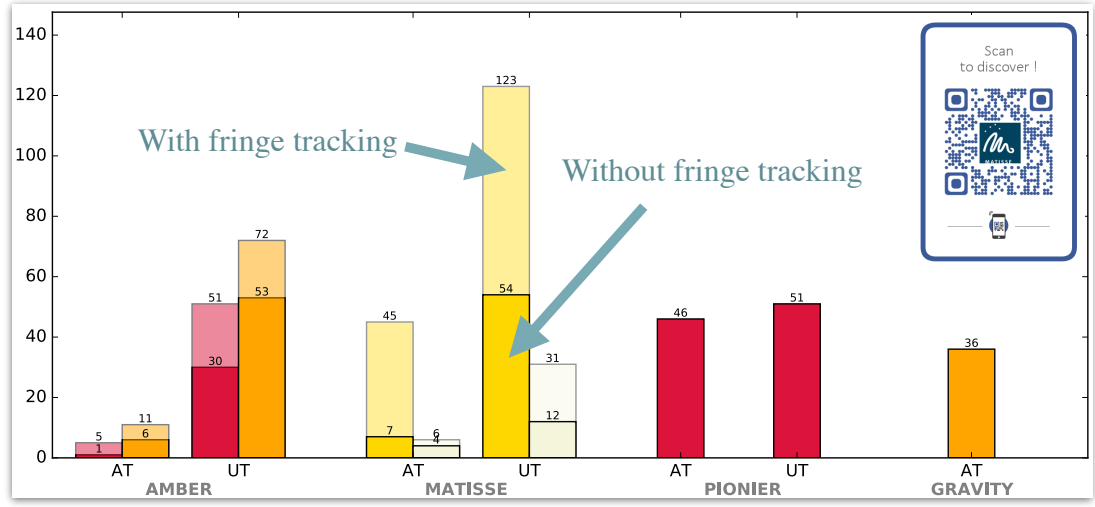
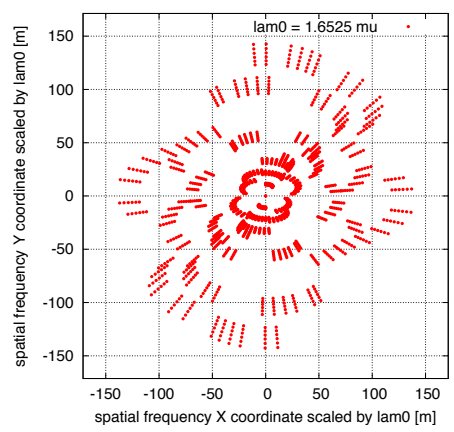


FIG.5 : VLTI/ESO possibilities on WR stars. Observable stars with actual and future interferometer.



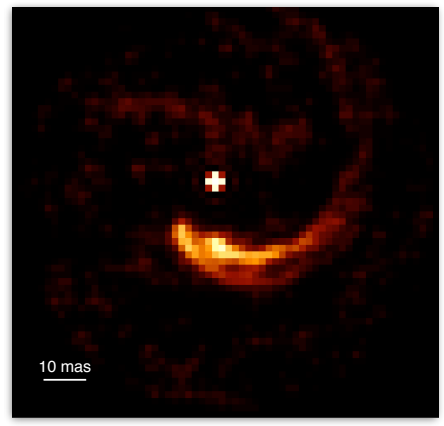


FIG.6 : PIONIER data obtained and expected image reconstruction with IRBIS software.

Contact and link to the paper :

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