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THE "GHOST SHELL": DISCOVERY OF THE FORWARD SHOCK FROM COLLIDING WINDS ABOUT ETA CARINAE

B. N. Dorland,[1,2] D. G. Currie,[2, 3] A. Kaufer,[4] and F. Bacciotti[5]

We report on the newly discovered "Ghost Shell" around η Carinae. We have detected a high-velocity ($\approx -850\,\mathrm{km\,s^{-1}}$), spatially extended, narrow emission feature lying in front of the southeast lobe of η Carinae's homunculus. This feature has the speed of a high-velocity shock but the spectrum of a low-velocity shock. We propose that the Ghost Shell is the forward shock between the fast stellar wind of the great eruption of 1842 and the older, slow, massive wind. This discovery is described in more detail in Currie, Dorland, & Kaufer (2002).

The Ghost Shell was first observed in emission using long-slit spectra obtained with ESO's VLT/UVES instrument between 1999 and 2000. Narrow ($\approx$ 35 km s^{-1}, resolved) intrinsic emission lines were detected for Hα, Hβ, Hγ (6562.8, 4861.3, 4340.5 Å, respectively), [N II] (6548.1, 6583.5 Å), [S II] (6716.4, 6730.8 Å) and [Ar III] (7135.7 Å) (reference wavelengths given for air). Very good agreement ($\approx$ 1% or better) was obtained in velocity for various spatial positions.

The velocity and spatial structure of the Ghost Shell indicates that it lies outside the homunculus. Under an assumption of unaccelerated motion (which appears to hold for much of the ejecta in the vicinity of η Carinae), the shape of the Ghost Shell is directly proportional to its shape in velocity space. The upper panel of Figure 1 shows the positions in velocity space of the homunculus and Ghost Shell along the homunculus's axis of symmetry (homunculus position from Currie et al. 1996).

Using the method of "channeled spectra" (e.g., Bacciotti et al. 2000), we have used all seventeen long-slit observations to construct a cube of data with two spatial and one velocity dimension. Isovelocity slices through this cube are shown in the lower panel of Fig. 1. These slices show clearly the quasi-spherical nature of the Ghost Shell in three dimensions.

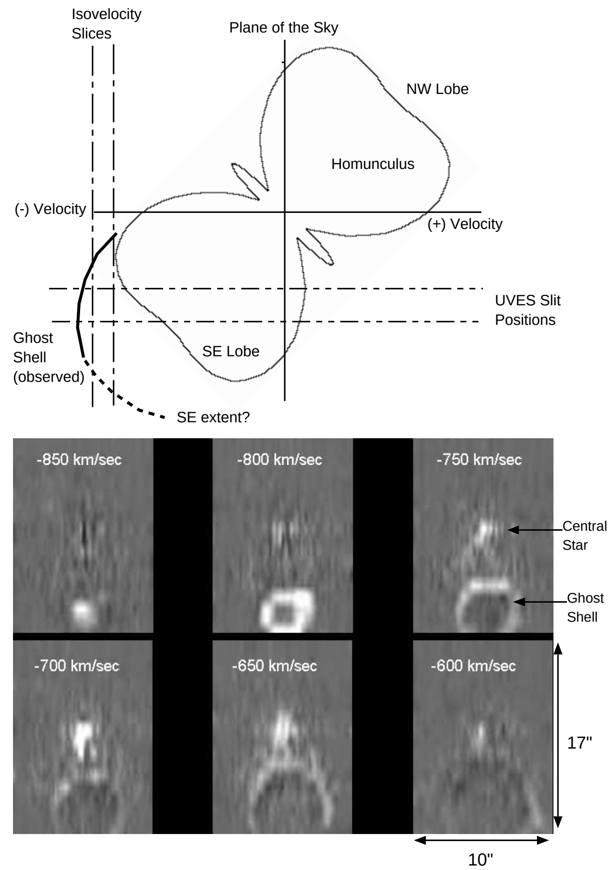

Fig. 1. Top: Ghost Shell position in velocity space along with representative slit and isovelocity slice positions. Bottom: resultant isovelocity slices of the Ghost Shell for selected velocities.

We are currently developing a physical model that takes into account the geometrical shape and anomalous emission features in order to explain the Ghost Shell. Additional observational data and simulations are needed to fully understand the physics of this remarkable phenomenon.

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[1]Astrometry Department, United States Naval Observatory, 3450 Mass. Ave. NW, Washington, D.C. 20392, USA (bdorland@usno.navy.mil).

[2]Dept. of Physics, Univ. of Maryland, College Park, Maryland, USA.

[3]European Southern Observatory, Garching bei Muenchen, Germany.

[4]European Southern Observatory, Santiago, Chile.

[5]Arcetri Observatory, Arcetri, Italy.