The H-band Emitting Region of the Luminous Blue Variable P Cygni: Spectrophotometry and Interferometry of the Wind

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We present the first high angular resolution observations in the near-infrared H-band (1.6 microns) of the Luminous Blue Variable star P Cygni. We obtained six-telescope interferometric observations with the CHARA Array and the MIRC beam combiner. These show that the spatial flux distribution is larger than expected for the stellar photosphere. A two component model for the star (uniform disk) plus a halo (two-dimensional Gaussian) yields an excellent fit of the observations, and we suggest that the halo corresponds to flux emitted from the base of the stellar wind. This wind component contributes about 45% of the H-band flux and has an angular FWHM = 0.96 mas, compared to the predicted stellar diameter of 0.41 mas. We show several images reconstructed from the interferometric visibilities and closure phases, and they indicate a generally spherical geometry for the wind. We also obtained near-infrared spectrophotometry of P Cygni from which we derive the flux excess compared to a purely photospheric spectral energy distribution. The H-band flux excess matches that from the wind flux fraction derived from the two component fits to the interferometry. We find evidence of significant near-infrared flux variability over the period from 2006 to 2010 that appears similar to the variations in the H-alpha emission flux from the wind. Future interferometric observations may be capable of recording the spatial variations associated with temporal changes in the wind structure.

Reference: ApJ, in press
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/1304.1560

Comments: 34 pages, 8 figures, 5 tables

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