The H-alpha Variations of the Luminous Blue Variable P Cygni: Discrete Absorption Components and the Short S Doradus Phase

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P Cygni is a prototype of the Luminous Blue Variables (or S Doradus variables), and the star displays photometric and emission line variability on a timescale of years (known as the "short S Doradus phase" variations). Here we present new high resolution H-alpha spectroscopy of P Cyg that we combine with earlier spectra and concurrent V-band photometry to document the emission and continuum flux variations over a 24 y time span. We show that the emission and continuum fluxes vary in concert on timescales of 1.6 y and longer, but differ on shorter timescales. The H-alpha profile shape also varies on the photometric timescales, and we describe the observed co-variations of the emission peak and absorption trough properties. We argue that the episodes of photometric and emission brightening are caused by increases in the size of the emission region that are related to variations in wind mass loss rate and outflow speed. We find evidence of blueward accelerating, Discrete Absorption Components (DACs) in the absorption trough of the H-alpha profile, and these features have slower accelerations and longer durations than those observed in other lines. The DAC strengths also appear to vary on the photometric timescales, and we suggest that the propagation of the DAC-related wind structures is closely related to changes in the overall wind mass loss rate and velocity.

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