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High-Speed Optical Spectroscopy of a Cataclysmic Variable Wind: BZ Cam (0623+71)

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The nova-like variable BZ Cam (also called 0623+71) is an unusual cataclysmic variable star in that it resides in a nebula, discovered by Ellis, Grayson, & Bond (1984) and designated EGB 4. It is more unusual in that its *optical* spectrum reveals a wind from its accretion disk. This was discovered serendipitously during a radial velocity study to find orbital period by Thorstensen, Thomas, & Patterson (1993; see also Patterson et al. 1996), who found intermittent P Cygni profiles in the He I λ5876 Å and Hα emission lines.

The 4.2-m William Herschel Telescope and its ISIS spectrograph were used to obtain time-resolved spectra of these lines with 0.4 Å/pixel dispersion and 30-second time resolution. These new spectra have about 5 times the spectral resolution and 24 times the time resolution of those of Thorstensen et al. (1993). These observations were obtained on the nights of 1995 February 6 – 8 UT. The blue arm of ISIS was centered on the He I λ5876 Å; the red arm covered Hα. Typical signal-to-noise ratio was 18 per resolution element.

At least six definite P Cygni absorption events appeared, in a total of 6.6 h of observations spread over 7.5 h. Surprisingly, we find that the absorption troughs of the P Cygni profiles of He I λ5876 Å move redward over time, not to the blue as might be expected for an object ejecting blobs. The maximum velocity of these absorption troughs were about 1700 km s^{-1} from the rest frame. The events appeared from within 6 to 8 to as many as 20 min, and lasted typically for 30 – 40 min. Both the accelerations and decelerations were linear with time; several events resemble each other closely, with regard to these slopes and timescales. There is some evidence, however, particularly in the last event of Night 2, that these events may show a variety of rise and decay times.

The P Cygni absorption events show *no clear correlation with phase.* This is more obvious with the He I λ5876 Å lines, since the orbital velocity variation shows clearly, the observations on both nights spanning just over one orbital period (3.63 h, Patterson et al. 1996). The intervals between events are uneven: on Night 1, events occurred near maximum blueshift and maximum redshift; on Night 2, events occurred near descending node and maximum redshift.

Hα also shows intermittent P Cygni profiles, which occur at the same time as those of He I λ5876 Å. The behavior of the red wing of Hα is also of interest. This wing flares by as much as 2400 km s^{-1} on both nights, usually, but perhaps not necessarily, preceding absorption events. The red wing can appear and

disappear quite suddenly, within minutes. There is some evidence for structure in both lines, but by and large, the whole wind is turning on and off.

Only now is evidence for mass loss in cataclysmic variables accumulating from their optical spectra, from V1315 Aql (Hellier 1996), AT Cnc (Smith et al. 1996), and BZ Cam. It would be of interest to check the fields of V1315 Aql and AT Cnc for faint nebulae. It would also be of interest to carry out observations of BZ Cam that span more time. Now that the timescales for the appearance and disappearance of the wind events are known, better statistics on the frequency and velocity behavior of these events would be desirable. This could be done with half the spectral resolution and half the time resolution used here, bringing it within the realm of 2-m-class telescopes.

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