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Multiple Absorption Components in the post-periastron He I P Cygni Absorption Troughs of eta Carinae

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on 11 Nov 2014; 01:28 UT

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We have obtained more than 100 high spectral resolution ($R \sim 90,000$) spectra of the massive binary star eta Carinae since 2012 in an effort to continue our orbital and long-term echelle monitoring of this extreme binary (Richardson et al. 2010, AJ, 139, 1534) with the CHIRON spectrograph on the CTIO 1.5 m telescope (Tokovinin et al. 2013, PASP, 125, 1336) in the 4550-7500A region. We increased our monitoring efforts and observation frequency as the periastron event of 2014 has approached, and resumed observations in October. We note that since mid-October, we have observed unusual multiple absorption components in the P Cygni troughs of the He I lines (4714, 5876, 6678, and 7065; 4921 and 5015 are blended with Fe II). In particular, we note that these components extend to -700 km/s, well beyond the terminal wind speed of the primary.

Figure: He I 6678 + [Ni II] (black) overlaid with He I 5876 + Na D (red), highlighting the complicated absorption profile(s) on 3 November 2014: <http://www.astro.umontreal.ca/~richardson/HeIrecent.png>

These absorptions are likely related to clumps and turbulence in the wind-wind collision region and bow shock, as suggested by the high-velocity absorption observed by Groh et al. (2010, A&A, 519, 9) in the He I 10830A transition and our pre-periastron observations (Richardson et al. 2014, ATel #6336). In these cases, we suspect that we look along an arm of the shock cone and that we see a fast absorption change from the other collision region shortly after periastron. Further, high spectral resolution data are highly encouraged, especially for resolving powers greater than 50,000.

These observations were obtained with the CTIO 1.5 m telescope, operated by the SMARTS Consortium, and were obtained through both SMARTS and NOAO programs 2012A-0216, 2012B-0194, and 2013b-0328. We thank Emily MacPherson (Yale) for her efforts in scheduling the observations that we have and will obtain in the coming weeks and months.

Line Profile plot

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