Using MOST to reveal the secrets of the mischievous Wolf-Rayet binary CV Ser

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The WR binary CV Serpentis (= WR113, WC8d + O8-9IV) has been a source of mystery since it was shown that its atmospheric eclipses change with time over decades, in addition to its sporadic dust production. The first high-precision time-dependent photometric observations obtained with the MOST space telescope in 2009 show two consecutive eclipses over the 29d orbit, with varying depths. A subsequent MOST run in 2010 showed a seemingly asymmetric eclipse profile. In order to help make sense of these observations, parallel optical spectroscopy was obtained from the Mont Megantic Observatory (2009, 2010) and from the Dominion Astrophysical Observatory (2009). Assuming these depth variations are entirely due to electron scattering in a beta-law wind, an unprecedented 62% increase in mass-loss rate is observed over one orbital period. Alternatively, no change in mass-loss rate would be required if a relatively small fraction of the carbon ions in the wind globally recombined and coaggulated to form carbon dust grains. However, it remains a mystery as to how this could occur. There also seems to be evidence for the presence of corotating interaction regions (CIR) in the WR wind: a CIR-like signature is found in the light curves, implying a potential rotation period for the WR star of 1.6 d. Finally, a new circular orbit is derived, along with constraints for the wind collision.

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