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The WR/LBV system HD 5980: wind-velocity – brightness correlations

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Abstract. The massive eclipsing system HD 5980 in the Small Magellanic Cloud presented sudden ∼1–3 mag eruptive events in 1993-1994, the nature of which is still unexplained. We recently showed that these brief eruptions occurred at the beginning of an extended high state of activity which is characterized by large emission-line intensities and that this high state is currently ending (Koenigsberger *et al.* 2010). *Star A*, the more massive member of the 19-day binary, is responsible for the spectacular spectral variations observed over the past 3 decades (see Figure 1). It has a He-enriched stellar wind and is over-luminous for its mass, implying an advanced evolutionary state (Koenigsberger *et al.* 1998). Data obtained over the past 3 decades show that *Star A's* wind speed slowed down as the system brightened. Also present in these data is a correlated increase in emission-line strength, visual and UV brigthness. The latter suggests that the high activity state in HD 5980 may be attributed to a bolometric luminosity increase, consistent with the results of Drissen *et al.* (2001). Hence, HD 5980 may be providing the important clues needed for understanding the behavior of other luminous blue variables and for understainding the evolutionary transition between massive O-type stars and Wolf-Rayet stars.

Keywords. binaries: eclipsing, stars: Wolf-Rayet, stars: individual (HD 5980)

References

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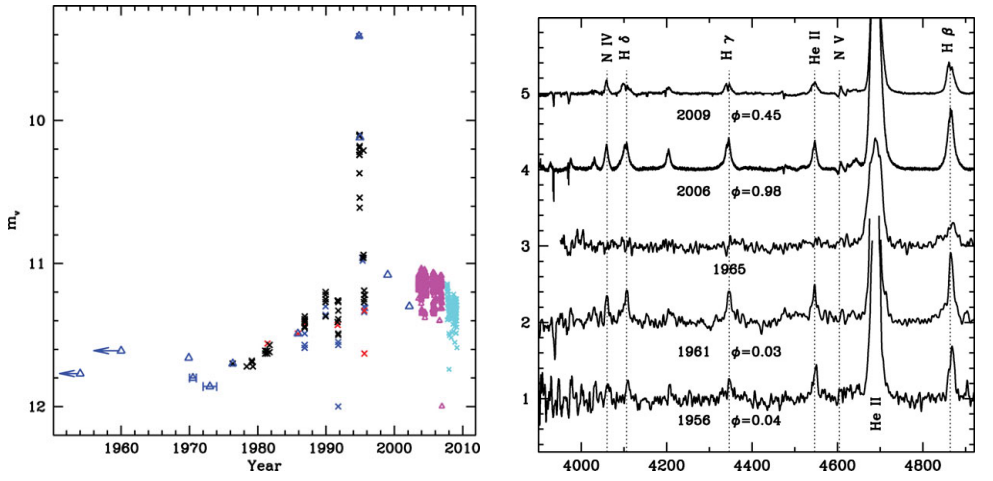

Figure 1. Visual magnitude measurements of HD 5980 from *IUE* (crosses), *SWOPE* and *ASAS* and other sources (left) and evolution of the visual spectrum between 1956 and 2009 illustrating the varying strength in emission-line intensities (right).

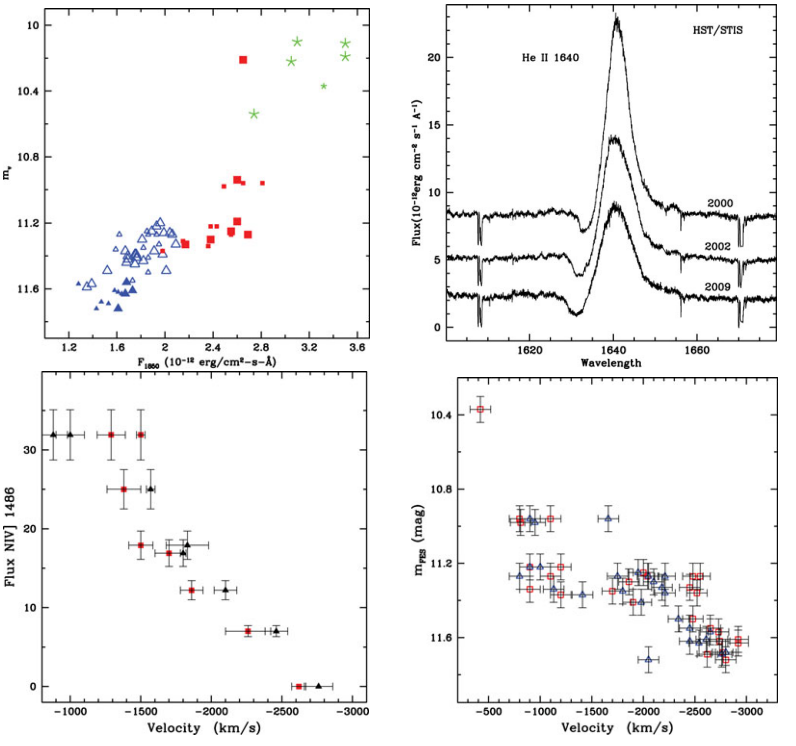

Figure 2. Top: m_v values plotted against the corresponding UV continuum flux level at λ1800 Å, showing a correlated increase in continuum brightness over a broad wavelength region (left). The right-hand plot shows the HST/STIS spectra obtained at orbital phase ∼0.0 (when *Star A* eclipses its companion), at 3 different epochs, showing how emission line intensity correlates with extent of P Cygni absorption components. **Bottom:** The emission-line intensity *vs.* wind-velocity correlation (left) and the visual-magnitude *vs.* wind-velocity correlation (right), from *IUE* and *HST/STIS* spectra obtained between 1979–2009.

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