

Creating an instrument response and atmosphere corrected profile of eta Carinae from spectra taken with the ALPY 600 spectrograph

Paul Luckas

April, 2017

1 Creating an instrument response and atmosphere correction profile

HD99556, a type-B3III star located in the same area of the sky as the target is chosen as a reference star. 6 x 10 second images have been combined with wavelength registration left unchecked due to an unexplained wavelength shift issue in *ISIS*. The spectrum is bias, dark and flat field corrected and has been wavelength calibrated using the mixed method (Alpy calibration module + Balmer lines) in *ISIS*. Figure 1 shows the result compared to the type-B3III Miles standard HD207330. The spectral profile differs significantly as it has not been corrected for instrument response or atmospheric attenuation.

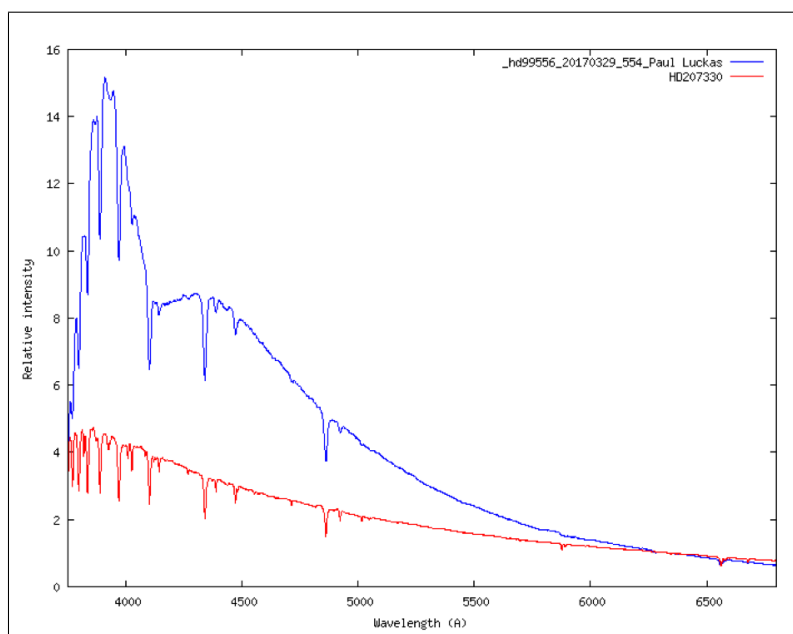


Figure 1: A calibrated, non-instrument and non-atmosphere corrected spectrum of HD99556 (blue) compared to the Miles standard HD207336 (Type B3III).

The *Response assistant* in ISIS is used to create a response curve using a master flat field, and Miles standard (see Figure 2).

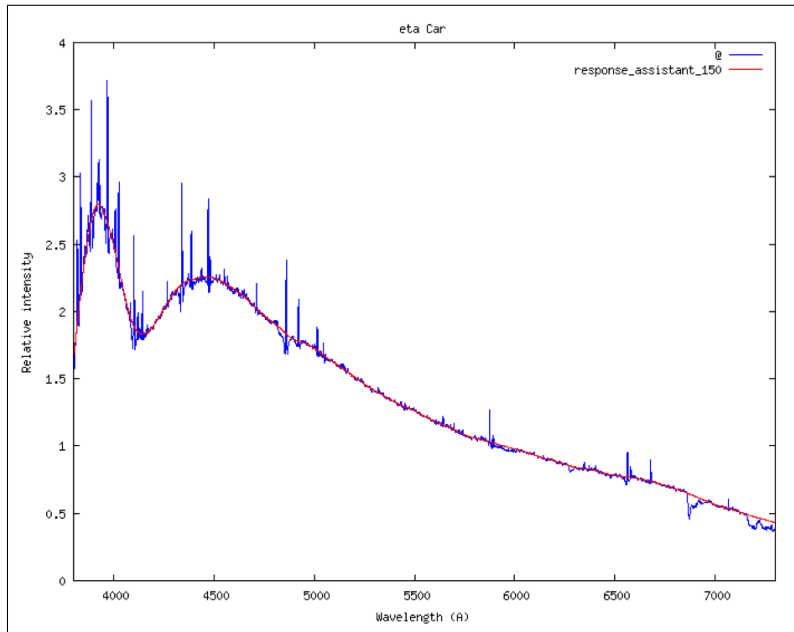


Figure 2: Response assistant generated curve (red) computed using a master flat field and Miles standard HD207330.

The derived response curve is applied to the reference star HD99556 during processing in *ISIS* and the result compared to the Miles standard HD207330. The temperature profile and absorption features are a perfect match (see Figure 3).

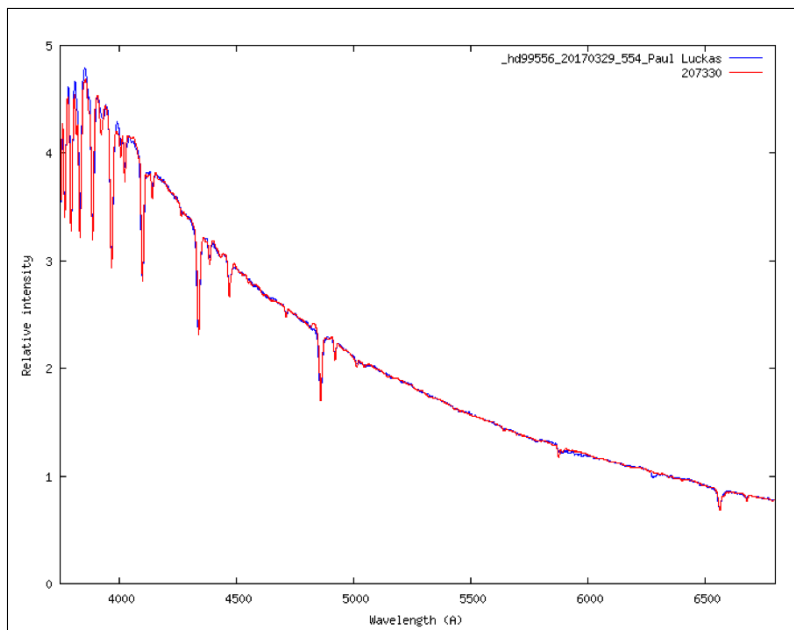


Figure 3: Response corrected HD99556 (blue) compared to Miles HD207337 (red).

It is also possible to create a response curve using the conventional manual method, i.e. dividing by a Miles standard of the same type, masking large features and using the continuum shaping tool in *ISIS* to ‘smooth’ the profile. Comparison shows that using the Response assistant can yield near identical results compared to the manual method.

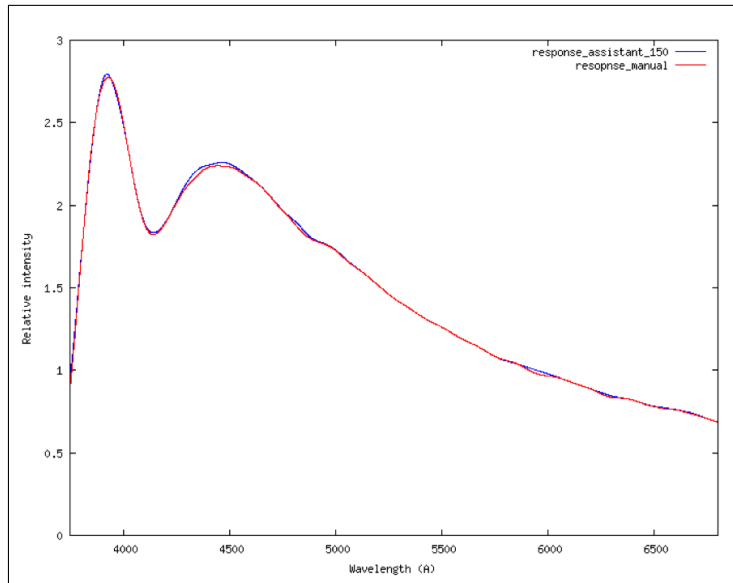


Figure 4: Response profile comparison using the Response assistant (blue) and the conventional ‘manual’ method (red).

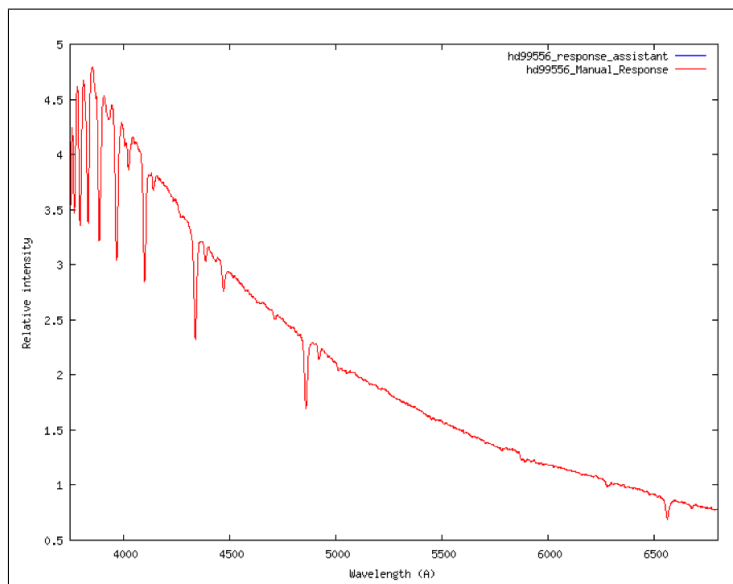


Figure 5: Response corrected spectrum of HD 99556 using the response assistant (blue) and the conventional ‘manual’ method (red). The profiles are identical.

2 Creating an instrument and atmosphere corrected spectra of eta Carinae

Figure 4 shows the uncorrected spectrum of eta Carina created from 10 x 6 second images, bias, dark and flat field corrected and wavelength calibrated.

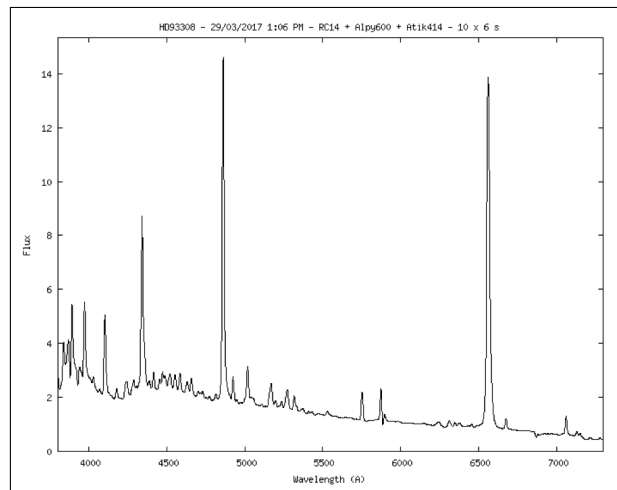


Figure 6: eta Carina wavelength calibrated spectrum. No atmospheric or instrument response correction has been applied.

Figure 7 shows the result of applying the response curve generated in the previous section to the spectrum of eta Carina during processing in *ISIS*. This effectively provides a relative flux calibrated spectrum.

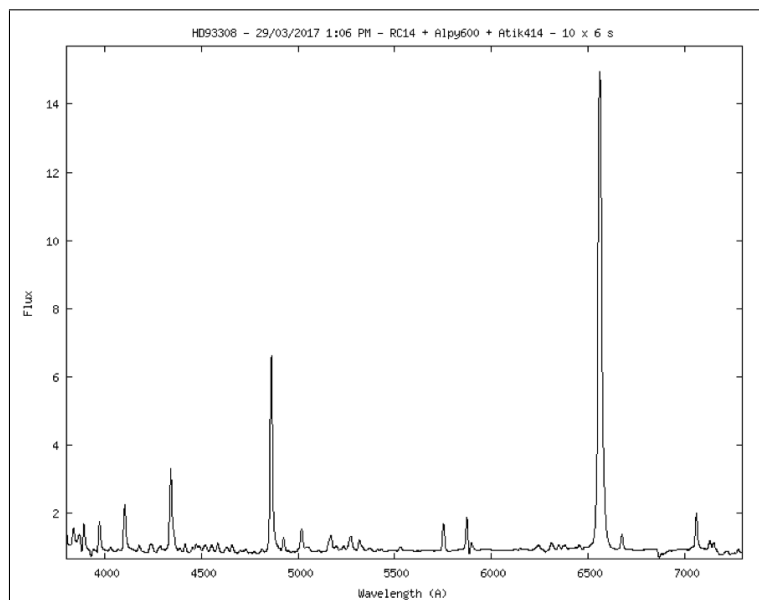


Figure 7: eta Carina with atmospheric and instrument response correction.